

International Sourcing and Employment in Times of Financial Crisis: The case of France

Jean-Charles Bricongne* Fabrizio Coricelli[†] Margarita Lopez Forero[‡]

July 2016

PRELIMINARY

Abstract

This paper studies the transmission of global shocks during the Great Recession and its impact on French employment. Particularly, we explore the role of trade credit in the propagation of cross-border shocks. Using a sub-sample of importing enterprises that were active over 2004-2009, our findings imply that strong pre-crisis sourcing ties with countries that were more resilient to the global crisis, translated into better performance in terms of employment growth over 2008-2009. This effect dramatically varies with trade credit intensity. Strongly relying on trade credit made firms more vulnerable to unanticipated shocks, for whom the adverse impact of the crisis was exacerbated. This effect intensified among firms with important sourcing ties with severely shocked countries. While the negative effect of the crisis was mitigated when sourcing relations with countries subject to milder shocks were stronger. Supporting, therefore, the hypothesis that trade credit was an alternative source of financing for enterprises during the crisis, where implicitly borrowing from suppliers helped importers overcoming financial constraints.

JEL classifications: .

Keywords: Trade credit, Employment, Imports, Financial Frictions.

*Banque de France - European Commission. E-mail: Jean-Charles.BRICONGNE@ec.europa.eu

[†]Paris School of Economics - University of Paris 1 Panthéon-Sorbonne. E-mail: fabrizio.coricelli@univ-paris1.fr

[‡]Paris School of Economics - University of Paris 1 Panthéon-Sorbonne. E-mail: margarita.lopez@psemail.eu. The authors especially thank Julian Hinz, Angelo Secchi and Charlotte Sandoz for the extensive and insightful discussions, as well as Guillaume Horny, Jean Imbs, Lionel Fontagné, Daniel Herrera and Magali Pinat for their valuable comments on this article.

1 Introduction

The Great Recession has prompted an increasing interest on the specificities of financial crises and the propagation of shocks across countries. Particularly, the increased globalization that the world has witnessed in the past decades, both in terms of financial and trade flows, translated what started as a housing bubble in the United States into dramatic cross-border repercussions in economic activity. For instance, one of the most salient features of the 2008-2009 crisis was the 20% decline in global trade relative to global GDP,¹ dubbed the “Great Trade Collapse”.²

As this decline in trade followed a financial crisis, the question of the relative contribution of financial factors versus real factors, such as the fall in demand and the disruption of supply chains, has been extensively debated in the economic literature. Concerning the latter, in addition to financial constraints hurting all the firms, whether they are involved in international trade or not, financial constraints may have affected international firms specifically due to the use of trade finance. Trade finance is characterized by the fact that it involves financial intermediaries and insurance activities. Compared to domestic firms, commercial partners involved in international transactions are less able to evaluate counter-party default risk and usually turn to banks to provide payment insurance and guarantees. Thus, credit restrictions from banks to non financial companies adds to the channels through which shocks across countries can be propagated as international trade related financial instruments are particularly vulnerable during a financial crisis.

Additionally, another strand of the literature seeks to understand the role of trade credit or inter-enterprise credit when institutional financing is scarce, where input suppliers become potential lenders for its clients. Here, a crucial distinction must be made between *trade finance* and *trade credit*: the latter refers to delayed payments owed to firms, while the former refers to short-term loans and guarantees used to cover international transactions involving financial intermediaries. This paper focuses on trade credit and explores the mechanism through which firms may be financed by their suppliers in the presence of a financial shock, that is, the global financial crisis. Even if the financial crisis was global, some countries were hit much harder than others and everything else equal, this may have led suppliers in different countries to react differently towards their clients. More precisely we are interested in answering the following question: *can the development of a relationship between trade partners mitigate the adverse effects associated with limited access to institutional finance?*

¹As documented by Eaton et al. (2011).

²See Baldwin for a comprehensive analysis on the causes and consequences of the collapse.

Concerning the adverse effects of a financial downturn, this paper focuses on a specific one: its effects on the labor market. This is motivated by the fact that unemployment persistence following recessions has been a major concern among economists and in the public debate since the Great Depression and it has regained special interest after the Great Recession in 2008-2009. In this sense, our analysis closely follows a recent paper by Calvo et al. (2014), where the authors document how financial crisis are particularly detrimental for employment compared to other "normal" recession episodes, notably in the presence of low inflation and nominal rigidities. They argue that tighter lending conditions may induce firms to use more capital-intensive technologies given that capital can be pledged as collateral for credit while labor can't, which in turn implies a *jobless recovery*. This is related to the literature on the *inalienability of human capital*³. In contrast with most literature, which explains the jobless recoveries focusing on the role of labor market frictions, Calvo et al. (2014) emphasize the importance of the financial nature of the crisis, by focusing on the *collateral channel* of transmission and study it using macroeconomic data of advanced and emerging economies⁴. Though, as shown by the authors, this channel of transmission of the financial crisis on employment is relevant at the aggregate level and has macroeconomic effects, it relies on a micro argument which begs to be studied with the help of micro-data. On the one hand, one of the major interests of using disaggregated data is the fact that it allows a better empirical identification of the parameters. On the other hand, the availability of micro-level data during the past decades has shown that agents are very different. This has motivated most recent economic literature -in different areas- to depart from the hypothesis that there are homogeneous agents, which generalizes the results for all the economy. Thus, introducing heterogeneity among firms allows identifying how a financial crisis differently affects different firms according to their individual characteristics, in our specific case it will be access to an alternative source of financing: trade credit.

In line with this, we use a very rich set of French firm-level data to analyze the effects of the Great Recession on the French labor market and its connection with the cross-border transmission of shocks through the ability of foreign suppliers to finance their clients. More specifically, we explore how sourcing inputs from countries that were subject to lower financial pressure helped firms mitigating the adverse employment effects of the crisis by alleviating firms' financial constraints through the provision of inter-enterprise credit. Our strategy is to exploit the large differences in firms' exposure to global shocks

³See Hart and Moore (1994).

⁴Most studies on jobless recoveries focus on labor market frictions such as wage rigidities or inflexibility of markets. Some analyze the effect of credit constraints on the dynamics of unemployment, such as Acemoglu (2001) and Dromel et al. (2010) but they focus on long run rate of unemployment and not on recoveries from crisis.

and their reliance on trade credit at the onset of the Great Recession to uncover whether the financial health of its foreign suppliers (that we view as potential lenders) helped cushioning the negative effect of the crisis.

For this purpose and given the data at our disposal, we proceed in two steps. We begin by evaluating the employment variation for French firms (sourcing inputs internationally) that is due to the transmission of different global financial shocks in the countries from where they source their inputs. Next we evaluate whether these effects are intensified for firms strongly relying on trade credit. Our sample period starts in 2004 and ends in 2009 and we rely on a two-way fixed effects panel data model where identification comes from a pre-determined exposure to exogenous global shocks. To this aim, we construct a firm-specific measure reflecting the crisis exposure based on the geographical composition of its *international sourcing structure* prior to the global crisis. This measure accounts for cross-country differences in the severity of the financial shocks where each country's shock is weighted by the firm's pre-crisis sourcing ties with each specific country.

Given that the hypothesis that this paper puts forward is that an additional channel of transmission of the global financial shocks is through the ability of foreign suppliers to finance their clients by "lending them inputs", we then interact the exposure-to-crisis with the firm's average pre-crisis reliance on trade credit. The reason for this is twofold: first, we don't observe the amount of trade credit involved in each bilateral transaction with different countries which we would ideally have liked to observe, in order to evaluate how suppliers subject to different shocks varied their trade credit provision. Therefore, the interaction provides an alternative way of evaluating our hypothesis by telling us whether the transmission effects are intensified for Trade Credit intensive firms. Second, given that the provision of inter-enterprise credit requires trust and reputation, firms with well established relations with suppliers may have less difficulty in benefiting from trade credit financing. Thus, the ratio of accounts payable over total imports averaged in the years before the crisis is used as a proxy for established relations with its partners that we expect to be only affected by the partners' ability to provide trade credit. The latter argument can be motivated by the fact that this measure is determined by the technology of the firm and its established commercial relations rather than any other firm-level characteristics related to the firm's ability to react during the crisis, as described above. Hence, using this ex-ante measure is safer in terms of endogeneity.

In this sense, the exposure-to-crisis measure allows assessing the employment effects of the crisis due to shocks suffered by firms' international suppliers by comparing the evolution of employment at different firms with varying pre-crisis exposure to the global financial

shocks. The interaction with Trade Credit intensity assesses the importance of the effect conditional on the average use of trade credit in the production of the firm. In order to assess any causal effect it is required that the exposure-to-crisis is as close to randomly assigned as possible. We argue that conditional on firm-level characteristics, this is indeed the case given that firms could choose ex-ante their sourcing strategies conditional on gravity variables, technology and any other firm-level characteristics independent to their ex-post exposure to the crisis (through their suppliers) given that the Great Recession could not possibly be anticipated by firms.

Using a sub-sample of importing enterprises that were active over 2004-2009, our findings imply that strong pre-crisis sourcing ties with countries that were more resilient to the global crisis, translated into better performance in terms of employment growth over 2008-2009. This effect dramatically varies with trade credit intensity. Strongly relying on trade credit made firms more vulnerable to unanticipated shocks, for whom the adverse impact of the crisis was exacerbated. This effect intensified among firms with important sourcing ties with severely shocked countries. While the negative effect of the crisis was mitigated when sourcing relations with countries subject to milder shocks were stronger. Supporting, therefore, the hypothesis that trade credit was an alternative source of financing for enterprises during the crisis, where implicitly borrowing from suppliers helped importers overcoming financial constraints.

More specifically, our findings suggest that the suppliers' ability to provide trade credit was weakened under declines in the perceptions of the country's creditworthiness, economic recessions, equity market collapses, credit contractions or sharp currency appreciations. This added to the adverse impact of the crisis for French importers, particularly, if trade credit was an important source of short-term external finance for the firm.

Living in an increasingly globalised world has brought new challenges to policymakers due to the higher vulnerability that a tight interconnectedness comes with. Raghuram Rajan, former IMF chief economist, wrote in 2006: "While this helps the system diversify across small shocks, it also exposes the system to large systemic shocks"⁵. This has been crystallised during the global downturn in 2008-2009, where the world witnessed an acceleration of the speed at which economic shocks propagated around the world. Hence, well understanding the economic forces behind the cross-border transmission of shocks has become crucial. In this sense, our contribution to the literature lies in suggesting an additional channel of transmission of global financial shocks to the labor market. We do this by linking different economic literature and bringing empirical micro-evidence of the

⁵Rajan (2006).

mechanism put forward in the paper.

The rest of the paper is organized as follows. Section 2 introduces and describes our data sources; section 3 explains our econometrical methodology. Results are analysed in section 4, while a robustness analysis and a discussion about possible future paths is presented in section 5. Finally, 6 concludes our analysis.

2 Data

In this section we provide a detailed description of our data sources, how we selected the data included in the analysis and the construction of our main variables of interest. Additional details are presented in Appendix 6. Our analysis makes use of detailed French firm-level information for 14,703 importers, it contains firms' relations (imports, exports and FDI) with the rest of the world and covers the period 2004-2009. The main reason why the analysis stops in 2009 is because of data availability where the last year that we observe is 2009. However we do not think that the fact of not being able to expand the analysis beyond 2009 is problematic as we want to focus on the specific effects of the global financial shocks and its transmission. Whereas it is well-known that the crisis in 2009 was followed by the Eurozone crisis triggering additional sovereign debt problems related to the structure of the Eurozone being a currency union without a fiscal union. Thus, even if studying these additional implications of the Great Recession remain very interesting, extending the analysis to the following years would mix our results with additional implications of the crisis that are beyond the scope of the current analysis.

The firm-level base is constructed by merging three different data bases with the help of the French fiscal unique identifier for each firm (the siren number in French):

Balance-sheet data. We use the French fiscal files BRN (Benefices Réels Normaux) which is provided by the French statistical agency, the INSEE, in order to get firms' characteristics. Those firms whose turnover is above 730,000 Euros in the manufacturing sectors and 230,000 in the services sectors are subject to fiscal declaration by these means. Therefore, this base covers almost the whole universe of French importing firms given that these are usually big enterprises. From this base we use information on employment, principal economic activity, total sales, trade credit and total assets. Unfortunately, the analysis will be limited to some extent by data availability given that we only observe employment and sales until 2009, while the rest of the variables are only available until 2008. We exclude services because even if firms pertaining to these sectors might also source foreign

inputs for their functioning we also believe that the effect that we aim at testing is better identified in the production in manufacturing sectors⁶. Additionally, since we want to analyze firms' employment behavior during the crisis, we only keep firms surviving in 2009. Finally, provided that our analysis is based on the assumption that trade credit is extended to clients with well-established relations with their suppliers and that we use pre-crisis variables in order to measure the firm's *international sourcing strategy* we focus only on firms that existed already in 2004. Thus, based on this sub-sample of importers conditional on existing in 2004 and surviving in 2009 we also drop firms for which we observe negative values for value added, sales at some point of the whole period and drop those observations with other extreme values based on our variables of interest⁷.

Trade flows. The second source of firm-level data that we use comes from the French Customs. It contains detailed information of values of imports and exports for each firm and month at the 8-digit (NC8) product level, discriminated by bilateral destination and origin, for exports and imports, respectively. In what concerns import flows, values aggregated at the firm, destination and year level are exploited in order to construct the firm-exposure variable, while for exports, only the exporter status for each firm is used in our analysis, as will be explained in the empirical section. Reporting is required for each firm and flow if the extra EU transaction value exceeds 1 000 Euros or 1 000 kilograms. As for the within EU flows, transactions have to be reported as long as the firm's annual trade value exceeds the threshold of 150 000 Euros. Our selection criteria for this base is based on importer status: we kept firms if they were importing from at least one country over the period 2004-2007 conditional on continuing importing in 2009, which is the moment where we expect them to be receiving trade credit from their suppliers. Therefore, given that importers are typically the biggest and more productive firms, as will be shown in descriptive statistics in subsection 2.3, these thresholds do not affect our sample representativeness.

FDI. In the sensitivity analysis we consider an alternative economic channel that could also be consistent with our results, which will be exposed in 5.2 and it is related to the fact that firms can also be linked with each bilateral partner by foreign direct investment (FDI). We will test whether this link is relevant and especially it will allow ruling out other economic phenomena that might be driving our results. For this purpose, we use the Banque de France Foreign Direct Investment base. It is collected at the firm-level and it reports stocks and flows of outward and inward FDI for each firm, by destination and origin, broad foreign sector (i.e., financial, real estate and all others) and year. The data is very rich as it reports the composition of total FDI, that is, discriminated by equity capi-

⁶A complete list of the sectors included in the sample is available in the Appendix 6

⁷Outliers were defined in terms of employment growth and trade credit for values below 5th and above 95th percentiles, this will be discussed in detail later.

tal, reinvested earnings and other capital associated with inter-company debt transactions⁸.

In the next subsections we describe how the main variables of interest are constructed and how they contribute in allowing establishing a causal effect on employment growth during the crisis. Our aim is to replicate as closely as possible the conditions of a natural experiment which requires the exposure-to-crisis variable to be randomly assigned among firms. This requires defining our strategy in such a way that the self-selection into exposure is minimized, we thus proceed as follows: we exploit cross-country differences in the severity of the crisis during 2008-2009 and weight them by the geographical composition of the firms' sourcing strategy in the onset of the crisis in order to assess the transmission of the global financial shocks and its effects on employment. In this sense, we obtain a firm-specific variable reflecting the "intensity" of exposure to the financial crisis given its pre-crisis international sourcing structure, which can reasonably considered to be determined by gravity variables and other ex-ante firm characteristics but not chosen as way to minimize its exposure to the global financial shocks. We argue that this a fair proposition, given that firms could not possibly anticipate the global financial crisis as not even banks were able to do so.

Certainly, the existence of a pre-crisis relationship with more resilient suppliers during the crisis would be irrelevant if firms whose suppliers were hit harder by the crisis could readily switch to suppliers that were in a better financial shape. We think that this is not likely to be the case for two reasons: in order for the exposure variable not to be capturing the firm's ability to switch to "healthier suppliers" during the crisis, the variable should only reflect the firm's technological reliance on each foreign partner. Using the average pre-crisis geographical sourcing structure provides a proxy for this. On the other hand, as it has been extensively documented in the literature, the provision of trade credit requires considerably trusting the counter-party, this is likely to happen if the partners have developed strong commercial ties through repeated interactions⁹. Hence, if we observe a firm with lower or null pre-crisis relations with a healthy partner, we believe that it is reasonable considering that the likelihood of receiving trade credit from this new partner is low.

Furthermore, provided that we aim at exploring the idea that suppliers are potential lenders for their clients helping them to overcome financial constraints, we need evaluating the exposure-to-crisis conditional on the use of trade credit. This will be done with the help of an additional variable where the same reasoning as before applies in terms of its construction, as we also expect this variable to be a proxy for the firm's technological trade

⁸For a full description of these bases see: Bricongne et al. (2010) chapter in the Conseil d'Analyse Economique report by Fontagné et al. (2010).

⁹See for instance Antras and Foley (2015) and Fisman and Love (2003).

credit intensity in order to safely assume that it is only affected by the financial health of the supplier. Sub-sections 2.1 and 2.2 describe in detail the way these variables are constructed.

2.1 Variables of interest: Imports-Exposure-to-Crisis

Given that our empirical strategy exploits differences in the severity of shocks during 2008-2009 across countries we begin by presenting the way we measure these shocks. Next we discuss the way these can be linked with the firm-level data which we use to obtain the firm-specific exposure variable.

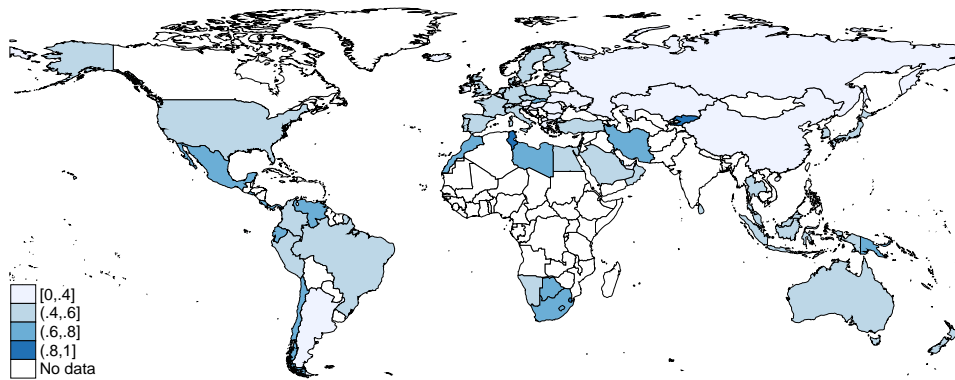
The Financial Crisis. As it has been already argued by different authors, quantifying the cross-country intensity of the financial crisis, as well as the timing and its duration is not an easy task¹⁰. Crisis manifest in several dimensions and some of these dimensions can be the outcome of government policies. In this sense, GDP growth is the most standard indicator of the severity of the crisis, but one could think that an aggressive fiscal and monetary intervention could have made the GDP drop milder during the crisis, even in the case where the financial sector was severely harmed. On the other hand, each dimension might differently affect different countries.

For this reason, we use six alternative measures reflecting the manifestation of the crisis and evaluate each one at a time: (1) Growth Index ; (2) Credit Index; (3) Special Drawing Right (SDR) Index; (4) Equity Index; (5) Rating Index and (6) Resilience Index. Where except from Credit Index, which is constructed using World Bank data, we mainly rely on the work done by Rose and Spiegel (2012) who provide four different indicators of the consequences of the financial crisis as manifested between 2008-2009. Namely, the percentage change of the following variables during the financial crisis: real GDP, the national equity market, the country credit rating and the SDR exchange rate.¹¹ Additionally, we construct an overall resilience to crisis measure where we account for its different manifestations by simple averaging the three of these indicators for which an increase translates into a stronger resilience: GDP, the stock market and country credit rating. Finally, since we are interested in the broad financial conditions in the supplier's country given that we aim at assessing its likelihood of providing trade credit to its foreign clients, we also include the standard proxy for overall financial conditions used in the literature. That is, credit to private sector over GDP from the World Bank, which we also transform to get the percentage change between 2008 and 2009. The interpretation for most of these

¹⁰For a further discussion on identifying the incidence and intensity of crisis see: Rose and Spiegel (2012) and Berg et al. (2005)

¹¹A full description of the way the authors construct these variables is presented in Appendix 6.

Figure 1: Cross-country Crisis as measured by: Resilience Index



measures is self-explanatory and except for the SDR measure, the higher the value taken by each of these, the less severe was the crisis. They reflect, therefore, the *resilience to the crisis* in the respective country. In what concerns the SDR measure, it reflects the country's currency depreciation during the crisis. Thus, a higher value taken by this variable means a greater severity of the crisis.

In order to avoid negative values and for the sake of comparability across the different resilience indicators, we transform each of these by normalizing the measure with the highest and the lowest values taken by the countries included in the sample. At this point it is convenient mentioning that oil-exporting countries were kept out of the sample given that these countries' specificities could introduce some noise in our analysis¹². On top of this, we kept only the 71 countries for which all measures were available. Therefore, focusing on one measure at a time, we obtain an index ranging from zero to one, where the highest value of each index is assigned to the country that was the most resilient to the global shocks with the exception of the SDR index where the highest value should be interpreted as a stronger incidence of the crisis.

The cross-country crisis severity using each of these measures can be visualized in figures 1- 3. These figures display the Resilience Index (which summarizes the growth, equity market and credit rating indexes based on Rose and Spiegel (2012)), the SDR Index and the Credit Index (which are not included in the resilience measure).¹³.

Table 1 reports the correlation between the six indicators where it can be seen that they are not particularly strongly related, except for the Resilience index which is tightly related

¹²The oil-exporting countries that we drop are: Algeria, Ecuador, Indonesia, Iran, Kuwait, Libya, Qatar, Saudi Arabia and United Arab Emirates. Nevertheless, for the sake of robustness, we include these countries in our regressions and find the estimations unaltered. Results are available upon request.

¹³Appendix 6 presents the figures for each of the other 3 alternative measures: Growth Index, Equity Index and Rating Index.

Figure 2: Cross-country Crisis as measured by: SDR Index

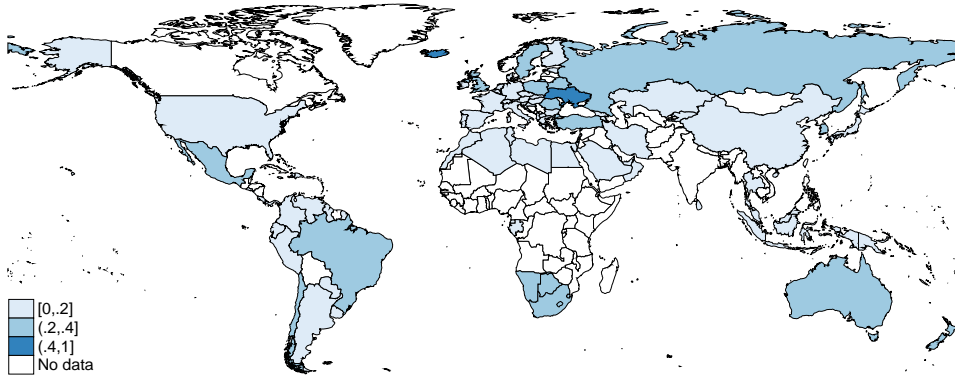


Figure 3: Cross-country Crisis as measured by: Credit Index

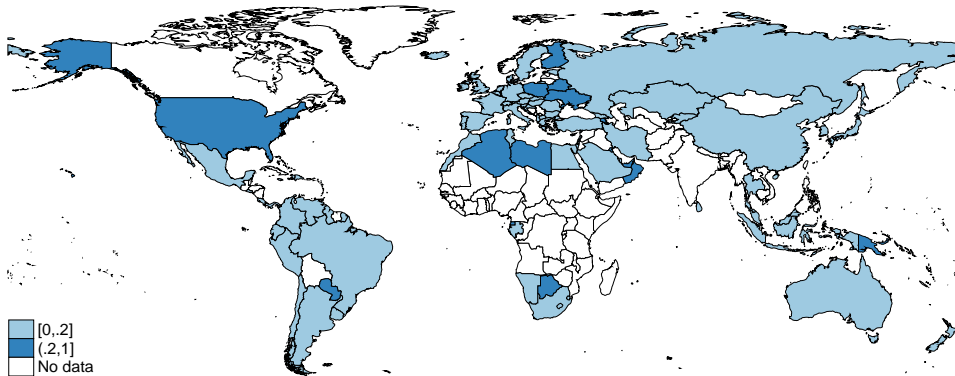


Table 1: Cross-correlation between crisis indicators

	Growth Index	Credit Index	SDR Index	Equity Index	Rating Index	Resilience Index
Growth Index	1.000					
Credit Index	0.032	1.000				
SDR Index	-0.315	-0.226	1.000			
Equity Index	0.168	-0.131	-0.140	1.000		
Rating Index	0.277	0.268	-0.542	0.459	1.000	
Resilience Index	0.312	-0.068	-0.250	0.978	0.603	1.000

71 countries. *Source:* Author's calculations using data from World Bank and Rose and Spiegel (2012)

to the Equity index and the Rating index (although, to a lower extent). This means that the consequences of the crisis manifested in various dimensions that differently affected different countries according to their specific characteristics. Which in turn, turns out to be convenient for the aim of our empirical analysis provided that the interest of using different measures is that they all reflect the severity of the crisis but there would be no point in considering them as alternative measures if there was no variation among them.

Geographical Composition of International Sourcing Strategy. Next, in order to get a firm-specific variable, we combine each of these indicators with the average reliance on imports coming from each country in the years before the crisis, this is what we call

Table 2: Descriptive statistics: Imports ratios

	mean	sd	p50	min	max	N
imports/inputs	173.58	219.95	111.15	0.00	8929.37	66492
imports/production	147.89	242.69	76.35	0.00	8608.87	66496
imports/sales	118.08	147.18	71.38	0.00	4935.80	66496

Source: BRN, French Customs. Units: Imports, Production and Sales given in Euros.

”international sourcing strategy of the firm”. More precisely, we compute the following measure for each firm f in our sample:

$$Imports\ Exposure\ Crisis_f = \sum_{t=2004}^{2007} \frac{1}{4 \cdot Sales_{ft}} \sum_c (Imports_{fct} \cdot Res_c) \quad (1)$$

Where $Sales_{ft}$ is total sales of firm f in year t , $Imports_{fct}$ is the total value of inputs that the firm imports from country c in year t and Res_c is each one of the resilience indexes using the measures discussed above by focusing on one measure at a time. Since the resilience indexes are comprised between 0 and 1, ideally, this measure should also range between 0 and 1, giving us an indication of the share of inputs that are sourced internationally out of the total inputs needed for production. Nevertheless, even if the data at our disposal is very rich, it does have some drawbacks that limit our analysis. In fact, in 12,982 cases (out of 66,496 observations from our sub-sample) imports are bigger than total inputs, which are directly recovered from the balance-sheet data¹⁴. So, for many observations we get an index that is higher than one, where the average is around 173, as can be seen in the first row in Table 2. We therefore tried normalizing this measure by other variables such as value added and total sales, however it also happens to be the case that imports are higher than each of these variables for a big proportion of our observations. The variable that pushes down this ratio the most is total sales and this is the reason why it was chosen.

Even when normalizing by $Sales_{ft}$, the imports ratio is much bigger than 1 with an average value around 118. We think that this is mainly due to two reasons. On the one hand, the level at which we actually observe the data is the firm, however many firms are part of bigger economic groups and it can perfectly be the case that one firm of the group is in charge of importing for the whole group while total production takes place at the group

¹⁴As measured by ”Achats de marchandises”, ”Achats de mat. prem. et autres approv.” and ”Autres achats et charges externes”.

level. In this case, the correct way of assessing any effect on employment would obviously be at the group level. Unfortunately, we are not able to observe the group structure and identify these cases. Nevertheless, this problem can be overcome with the help of the financial linkages LIFI base (Liaisons Financières). This base comes from INSEE and provides information about the composition of economic groups through firm's ownership (foreign and domestic) of companies residing in France. We plan to include this in future work when the data will be readily available.¹⁵

On the other hand, there may be another reason, linked to the fact that imports is not an information available in income statements, and must be taken separately, from Customs data, leading to possible mismatches. Hence, imports and firm variables (such as sales or total inputs) that we use may not necessarily relate to the same period of time. Indeed, firms are not obliged to report their balance sheets and income statements over 12 months and they can choose to change over time both the date at which they display the figures, and the number of months under reporting. In this case, if a company chooses to settle its accounts over a period shorter than twelve months, making the ratio between annual imports and sales coming from the income statements may lead to inconsistencies such as imports to intermediate consumption or imports to sales higher than what they would be using the same period for the numerator and the denominator.

This means that a straightforward interpretation of the regression coefficients on these variables is not evident, given being aware of these limits, the *Imports Exposure Crisis_{it}* still provides a sense of the extent to which the firm is exposed to international shocks in its suppliers' countries given their average sourcing ties before the crisis. Finally, the importance of the normalization should also be highlighted. Even if a time-varying proxy for size will be included in the econometric analysis, we want to avoid that the exposure measure captures time-varying heterogeneity in terms of firm size (which could be the case if we kept only the numerator of the exposure measure given that it will be interacted with crisis dummy in 2009).

2.2 Variables of interest: Trade credit

A crucial variable in the mechanism that is put forward in this paper is the provision of Trade Credit granted by the firm's supplier. Thus, one would ideally like to observe this variable as disaggregated as possible, that is, discriminated by foreign and domestic suppliers and in the best scenario by country of origin (as imports). In the absence of this

¹⁵The INSEE has already given us an official confirmation to our demand access for this base but the administrative procedure is currently in process in order to be able to use the data

data, we can still make use of the amount of yearly Trade Credit at the firm-level that we observe from the balance-sheet base in order to make conjectures about the mechanism that we are exploring.

The construction of this variable is guided by the same motivations as Imports-Exposure-to-Crisis as we want this to be determined by other things not related to the firms' ability to react to the crisis in order to be safe in terms of endogeneity. We thus view this variable as a technologically determined reliance of each firm on Trade Credit. In particular, this will allow us making conjectures pointing towards the mechanism that we test, provided that we do not directly observe the share of trade credit coming from each country. Our reasoning is as follows: given that the granting of trade credit requires trust and reputation, benefiting from it should be the result of repeated interactions with the supplier. So firms with longer relations with suppliers may find it less difficult benefiting from trade credit financing. Hence, the use of an averaged pre-crisis measure covering a fair number of years can reasonably be thought as being determined by technology and the firm's establishment of relations with its supplier, which in turn, allows assuming that trade credit during the financial crisis is only affected by shocks. Thus, its interaction with the exposure-to-crisis during the crisis should reflect the ability of its suppliers to continue providing trade credit to its clients.

An additional motivation for this hypothesis is provided by Antras and Foley (2015), who show that as trade partners begin developing a relationship over time, they trade more frequently on "post-shipment terms" (or trade credit) than in cash in advance terms -in which case, the importer is required to pay before the shipping is done. Additionally, the authors show that the choice between all possible trade financing terms is closely related to the quality of institutions in each partner's country: the partner located in the country with the weakest institutions is more likely to finance the transaction. In this sense, if the exporter's client is located in a country with weak contractual enforcement then it is more likely that it requires the importer to pay in cash in advance in the absence of legal guarantees in case the importer defaults or doesn't fully cover its payments. Hence, given that in our case the importer is always a French firm where institutions are strong, we can safely assume that suppliers usually trust their French clients and we have no reason to believe that this trust was affected during the crisis. Thus, allowing French clients to trade on post-shipment terms should be only affected by their financial health.

We thus, construct the following firm-level average of use of Trade Credit over total imports

in the onset of the crisis (2004-2007),

$$Trade\ Cred_f = \frac{1}{4} \sum_{t=2004}^{2007} \left(\frac{Trade\ Cred_{ft}}{\sum_c Imports_{fct}} \right) \quad (2)$$

where $Trade\ Cred_{ft}$ is the total yearly value of *accounts payable* for a given firm f at year t as reported in the firm's balance-sheet. We normalize by $\sum_c Imports_{fct}$, the total value imported by the firm from all countries c in the respective year. The use of imports in this measure captures the idea that what is important for our argument is the share of trade credit out of its foreign suppliers. For instance, it could be the case that a firm receives only trade credit from domestic suppliers (which we do not observe), at the same time as we observe an important amount of trade credit and a low exposure to crisis -due to sourcing from a more resilient partner. In this case we could falsely interpret this as evidence for our hypothesis, thus, the ratio of trade credit to imports should provide a better approach for evaluating our hypothesis. However, for robustness checks, we will alternatively normalize this measure by total inputs of production.

2.3 Descriptive Statistics

Before presenting summary statistics, it is convenient commenting the criteria used for selecting outliers. As already mentioned in the previous paragraphs, the construction of our data has some limits, hence some extreme values in our sample can reflect real measurement issues related to this. On the other hand, even if some other extreme observations can indeed be informative, it is also undeniable that firms are extremely heterogeneous. Which in turn, makes it difficult finding an average effect among such different firms. Hence, we were obliged to drop some extreme observations but it was done based on the minimum number of variables as possible: yearly employment growth and average pre-crisis trade credit (over imports). Table 3 displays the relevant statistics for these variables based on the whole sample of *surviving importers* that were left after the data cleaning. Outliers were defined for values being below the 5th and above the 95th percentiles of the distribution of each of these. The figures show that there is extreme heterogeneity across observations, specially for employment growth, where the standard deviation for all measures is on average 35 times bigger than the mean value, while for trade credit it is around 9 times as big than the mean. At this point it is worth noting that a possible explanation for these unreasonable numbers in terms of employment growth can be linked to the fact that a company can acquire one or several firms from one year to

Table 3: Descriptive statistics: Outliers definition

outlier	variable	mean	sd	min	p1	p50	p99	max	N
0	Employment growth	-0.29	10.05	-25	-24.53	0.00	26.67	30	66477
	Trade credit/imports	0.01	0.02	0.00	0.00	0.00	0.10	0.12	66477
1	Employment growth	13.22	180.62	-99.70	-78.76	0.00	231.03	12500	15225
	Trade credit/imports	0.14	0.81	0.00	0.00	0.00	1.96	23.93	15225
Total	Employment growth	2.22	78.52	-99.70	-50.00	0.00	83.33	12500	81716
	Trade credit/imports	0.04	0.35	0.00	0.00	0.00	0.47	23.93	81716

Source: BRN, French Customs. Units: Employment given in num. of employees, Imports and Trade Credit in Euros.

another, but we don't observe these mergers and acquisitions transactions in our data¹⁶. Motivating, therefore, the exclusion of extreme observations from the analysis in order to avoid that these observations drive the results. In this sense, all the following statistics are presented among the selected sub-sample excluding these outliers.

Now, why are only importers kept in the sample? An overall comparison between importers and non-importers is given in Table 4, where it can be seen that importers are on average much bigger in terms of employment and sales, as well as more productive. Furthermore, employment and sales fell much more among importers than among non-importers during the crisis, suggesting that the transmission of global shocks was more important for strongly internationally active firms. It should be reminded that even if importer and exporter status are tightly linked (with a correlation of 0.6), our definition of non-importers is not mutually exclusive with exporter status, where the former can be exporters as well but they just source their inputs domestically. These big differences among importers and other firms, motivates our sample selection based on importer status. For instance one could argue that keeping other firms in the analysis could provide a control group for the econometric analysis when assessing the exposure effects during the crisis. Nonetheless, the two groups of firms significantly differ before the crisis and the way they face the shocks is certainly related to these differences (for example, productivity can be a strong determinant of how a firm reacts to shocks). Additionally, one of the interests of the Imports-Exposure-to-Crisis measure is its continuous nature, in which case the "control group" are the years prior to the crisis provided that the exposure variable is randomly assigned among importers.

Finally, Table 5 presents relevant statistics for our main variables of interest, Imports-Exposure-to-Crisis and Trade Credit intensity among the sub-sample of firms that were

¹⁶However, this issue can easily be solved with the LIFI database, which we will be able to use in the near future.

Table 4: Comparison among Importers and Non-Importers

	Non-Importers					Importers				
	Employment	Sales	Prod.	% Δ Emp.	% Δ Sales	Employment	Sales	Prod.	% Δ Emp.	% Δ Sales
2005	12	1,305	49.72	0.54	5.55	91	22,642	61.08	0.53	6.98
2006	12	1,377	51.51	0.69	6.48	90	24,076	63.84	0.77	9.20
2007	12	1,482	54.05	0.79	7.09	90	25,491	66.25	1.09	8.82
2008	12	1,589	55.14	0.60	4.44	92	26,655	67.40	0.51	4.19
2009	11	1,431	52.04	-2.09	-6.67	88	23,063	64.88	-3.24	-8.31

Source: BRN, French Customs. Units: Employment given in num. of employees, Sales in Euros and Productivity is the ratio of employment to value added.

Table 5: Descriptive statistics: Imports-Exposure-to-Crisis and Trade Credit Intensity

	mean	sd	min	p1	p50	p99	max	N
Crisis measure								
Growth Index	0.76	22.05	0.00	0.00	0.29	2.76	2083.95	66496
Credit Index	0.97	26.69	0.00	0.00	0.40	3.29	2557.26	66496
SDR Index	0.41	11.75	0.00	0.00	0.17	1.42	1155.79	66496
Equity Index	0.80	21.53	0.00	0.00	0.34	2.92	2066.76	66496
Rating Index	1.38	41.42	0.00	0.00	0.56	4.39	4028.28	66496
Resilience Index	0.97	27.08	0.00	0.00	0.40	3.29	2607.67	66496
Trade Credit measure								
Trade credit/imports	0.01	0.02	0.00	0.00	0.00	0.10	0.12	66496
Trade credit/total inputs	0.25	0.15	0.00	0.07	0.24	0.62	15.37	66496

Source: Author's calculations using data from World Bank, Rose and Spiegel (2012), French Customs and BRN.

kept for the econometric analysis. These numbers show again huge heterogeneity among firms, especially in what concerns the Imports-Exposure-to-Crisis measures, where the standard deviation for all measures is on average 28 times bigger than the mean value. However, one should keep in mind that this is partly due to the fact that outliers were defined in terms of employment and trade credit, and not in terms of exposure in order to avoid dropping much more observations.

3 Empirical analysis

As mentioned above, our empirical strategy exploits exogenous variation in cross-country resilience during the financial crisis at varying levels of firm-level exposure to the shocks in order to study the link between the global financial shocks and firm's employment. Conditional on pre-crisis firm-level characteristics the firm's exposure is pre-determined and it thus isolates the ability of the firm to switch to healthier partners according to the severity of the crisis shocks.

Nevertheless, before presenting the equations that will be estimated, it is convenient presenting some clarifications on the particular choice of our empirical strategy. We are interested in the transmission of the financial shock in the supplier's country where we use the health of financial system to make conjectures about its ability to extend trade credit to its client. In other words, we explore the transmission of the global financial shock due to the exposure to these given international sourcing structure of the firm. Thus, we don't aim at evaluating the direct effect of the variation in imports, in which case the use of an instrumental regression methodology would be required. On top of this, we analyze the yearly growth rate of employment and not the level of employment given that we are analyzing a short term variation due to a financial shock and our aim is not to determine any effect on a long-term level of employment of the firm.

3.1 Financial crisis and Imports-Exposure-to-crisis

Our hypothesis is that firms that had stronger pre-crisis relations with suppliers from countries where the global financial crisis was less severe, were more able to maintain employment during the crisis if they could implicitly borrow from their suppliers by delaying their imports payments. The argument is as follows: if a supplier had established ties with the importer and it is in a good financial shape, then it will more easily grant Trade Credit to its client. This in turn, allows the importer overcoming its financial constraints due to the domestic banking credit contraction if the firms are able to substitute short-term banking finance with trade credit. We therefore begin our analysis by evaluating how shocks in suppliers' countries were transmitted to French importers given their exposure to these shocks which we measure using pre-crisis sourcing relations with each country. In a second step we evaluate whether the effects are stronger among firms that had higher levels of accounts payable before the crisis.

We rely on a panel data model with firm and year fixed effects. Our identification lies in the assumption that the intensity of the exposure variable is randomly assigned among firms. In other words, we assume that conditional on gravity variables and firms' characteristics, the geographical international sourcing strategy is technologically determined and so is the exposure to shocks in suppliers' countries. Therefore, the exposure is exogenous from the point of view of the firm provided that she was not able to anticipate the global crisis; that is to say that $E(\epsilon_{ft}|Z_{ft}, \delta_f, \delta_t) = 0$. In this sense, we perform the following OLS regression where given the firm fixed effects, the identification comes from pure time variation within a given firm,

$$Emp\ Growth_{fit} = \beta_1 Imports\ Exposure\ Crisis_f \times Crisis_t + \alpha_1 Z_{ft} + \delta_f + \delta_t + \epsilon_{ft} \quad (3)$$

where $Emp\ Growth_{fit}$ is employment growth for firm f , pertaining to industry i in year t , $Crisis_t = 1$ [year=2009] is a dummy that takes the value of one in 2009 and zero otherwise, Z_{ft} is a set of time-varying firm-level characteristics used as control variables: size (measured by total sales) and exporter status during the crisis¹⁷. The latter being an important control since importer and exporter status are highly correlated and we would not like the negative effects of the Trade Collapse to be captured by our coefficient of interest.

$Imports\ Exposure\ Crisis_f$ is the exposure measure and it represents the degree to which the firm is vulnerable to global financial shocks given its pre-crisis international sourcing structure. As explained earlier, it is constructed using the six different indexes reflecting the severity of the crisis in the suppliers' country by focusing on one measure at a time. Note that given the fixed-effects estimator, the main effect of this variable is not identified provided that it is constant over time. Nevertheless, since it is constructed in the spirit of a treatment effect, it does not really make sense interpreting it in a different context than the crisis. The double interaction $Imports\ Exposure\ Crisis_f \times Crisis_t$ provides the effect of interest since it captures the realization of the crisis and how the shocks are transmitted given the ex-ante exposure. More precisely, β_1 estimates the differential effect of crisis across sourcing partners and across firms with varying levels of exposure to these shocks. Since a higher value of the exposure measure reflects stronger input reliance on more resilient countries, we expect the sign of this coefficient to be positive. In other words, we expect to find a more adverse effect of the global financial shocks among firms whose pre-crisis ties with countries that were severely hit by the crisis were stronger.

Equation 3 is estimated using the fixed-effect estimator, δ_f , which allows accounting for time-invariant sources of firm heterogeneity that affects the average pattern of employment growth across firms. In particular, this controls for firm-level size, productivity and firms' characteristics that might influence the firms' ability to face the crisis. Most importantly, this allows accounting for the initial level of employment which can be a great source of employment growth heterogeneity across firms. Additionally, we include time dummies, δ_t , in order to account for year-specific aggregate shocks and trends that are common to all firms. Nevertheless, it could be argued that some sectors suffered a larger drop

¹⁷Note that the period in under analysis for the growth regressions starts in 2005 given that the first year that is evaluated is 2004.

in demand and therefore, employment was more vulnerable during the crisis in some specific industries. Thus, we alternatively include firm and 4 digits industry-year pair fixed effects (δ_{it}) in order to control for sector-level heterogeneity varying over time. Particularly, this accounts for the demand drop during the crisis that was particularly severe for some sectors¹⁸. The results for this alternative specification are reported in Appendix 6. It should be noted that the interest of reporting estimation results with time effects instead of industry-time effects, lies in the fact that we want to recover the average main effect of the crisis which allows computing the total average effect conditional on exposure (given by equation 5, as described in the next section). Finally, in order to allow for correlation of errors at the level of the firm we report standard errors that are clustered at the firm-level.

With this strategy, we assess the transmission of international financial shocks given the firm's exposure to the crisis and its effects on employment growth. Now, what are the channels through which these shocks are transmitted across borders? This paper argues that a better financial health in the supplier's country makes it is more likely that the importer receives Trade Credit from its partner, which in turn will help the firm face the adverse effects of the lack of short-term liquidity due to the crisis. Thus, we next examine the Trade Credit channel and expect the effect to be concentrated among firms that heavily rely on Trade Credit.

3.2 Is the effect conditional on the use of Trade Credit?

We now extend the regression specification by allowing the employment effect of Imports-Exposure-to-Crisis to vary with the firms' technological use of Trade Credit. We do this by interacting the Imports-Exposure-to-Crisis measure with the average use of Trade Credit over total imports during the years prior to the global crisis and the crisis dummy. We basically re-estimate equation 3 augmented by this interaction term as follows,

$$\begin{aligned}
 Emp\ Growth_{fit} = & \beta_1 Imports\ Exposure\ Crisis_f \times Crisis_t \\
 & + \beta_2 Trade\ Cred_f \times Crisis_t \\
 & + \beta_3 Imports\ Exposure\ Crisis_f \times Trade\ Cred_f \times Crisis_t \\
 & + \alpha_1 Z_{ft} + \delta_f + \delta_t + \epsilon_{ft}
 \end{aligned} \tag{4}$$

where the same control variables as before (Z_{ft}) and firm and time effects are kept and errors are clustered at the level of the firm. $Trade\ Cred_f$ is constant at the firm-level, thus,

¹⁸For instance, Eaton et al. (2011) and Levchenko et al. (2009) analyse the disproportionate decline in durable goods sectors during the crisis, those most important to trade.

given the fixed-effects estimator it is only possible identifying its effect conditional on a variable that changes over time. That is, its interactions with the crisis dummy. In this way, $Trade\ Cred_f \times Crisis_t$ establishes whether firms strongly relying on Trade Credit were more vulnerable during the crisis period. Note that the double interaction between Trade Credit and Imports-Exposure-to-Crisis as well as the main effect of this variable are absorbed by the firm-effects.

The triple interaction $Imports\ Exposure\ Crisis_f \times Trade\ Cred_f \times Crisis_t$ is our main effect of interest. Our assumption is that a firm's supplier was more willing or better able to extend trade credit to its client, the less severe the financial shock in its country was. This can't be directly tested without observing the proportion of trade credit coming from each country but β_3 provides an alternative way of evaluating this conjecture as it allows establishing whether the effect of the global crisis was lessened for firms that were less exposed given their sourcing strategy and whether this effect was concentrated among firms having a greater propensity to use inter-enterprise credit with their suppliers. Since β_3 tests whether the effect was stronger for the most trade-credit intensive firms, we expect this coefficient to be positive.

As for β_2 , we do not have any particular expectation in terms of the direction of its sign. One could argue that higher reliance on trade credit helps firms facing the crisis - through short term liquidity provision- but it could also be the case that this makes them more vulnerable to unexpected shocks. Especially, in the case where their partners are severely hit by the shock and thus not able to grant any trade credit. This particular argument is what is taken into account in the triple interaction term, that is, the health of the firm's (potential) lender and how strongly they were attached through commercial ties.

4 Results and discussion

This section presents the main empirical findings. We start with our baseline specifications where the transmission of the firms suppliers' financial shock is analyzed using different measures of resilience to crisis in section 4.1. Next, we present the results of this effect conditional on the firm's reliance on trade credit in order to assess our main empirical question in subsection 4.2.

Table 6: Baseline regressions

Dependent Variable: Yearly employment growth						
Crisis resilience measure:	Growth Index	Credit Index	SDR Index	Equity Index	Rating Index	Resilience Index
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis_t$	-3.160 ^a (-11.92)	-3.160 ^a (-11.92)	-3.160 ^a (-11.92)	-3.160 ^a (-11.92)	-3.160 ^a (-11.92)	-3.160 ^a (-11.92)
$Crisis_t \times Exposure_f Index 1$	0.00220 ^a (6.94)					
$Crisis_t \times Exposure_f Index 2$		0.00172 ^a (7.12)				
$Crisis_t \times Exposure_f Index 3$			0.00402 ^a (9.41)			
$Crisis_t \times Exposure_f Index 4$				0.00211 ^a (6.97)		
$Crisis_t \times Exposure_f Index 5$					0.00112 ^a (8.40)	
$Crisis_t \times Exposure_f Index 6$						0.00170 ^a (7.47)
Observations	66408	66408	66408	66408	66408	66408
R^2	0.290	0.290	0.290	0.290	0.290	0.290
Adjusted R^2	0.090	0.090	0.090	0.090	0.090	0.090
F	210.7	210.6	210.7	210.6	210.6	210.6

t statistics in parentheses.

All regressions include firm and time F.E., errors clustered at firm level.

^c $p < 0.10$, ^b $p < 0.05$, ^a $p < 0.01$

4.1 Baseline specification: Imports-Exposure-to-Crisis

How does the crisis transmission vary at different levels of firm-exposure to the shocks? The coefficient estimate of the interaction term in equation 3 assesses this effect on the firm's employment growth. Estimation results are reported in Table 6, where each column displays one of the 6 alternative measures for the severity of shocks, as described above in section 2.1. If it is the case that sourcing ties with more resilient partners contribute to relaxing a firm's financial constraints, we expect to find a positive coefficient for all measures with the exception of the exchange rate index (SDR).

The sign and significance of most of the coefficients confirm our hypothesis. The estimates suggest that firms facing a lower pre-crisis exposure to global shocks given the geographical composition of their sourcing strategies tend to have higher employment growth during the crisis period ($\hat{\beta}_1 > 0$). Although the magnitude of all coefficients is very small, partly driven by the construction of the measure, the effect is significant at the highest levels regardless of the resilience measure used. Nonetheless, the small magnitude of the coefficients could also be reflecting the substitutability between labor and imports. Even if the exposure measure has been constructed in such a way that it reflects cross-country shocks during the crisis, it should also be capturing the direct negative effect that international

sourcing can have on employment changes regardless of the crisis shocks¹⁹. For this reason, it is important evaluating the exposure effect conditional on the use of trade credit in order to better identify the positive impact that we expect.

As mentioned above, providing a straightforward and quantifiable interpretation of these effects is not evident given the construction of the exposure indexes and the huge heterogeneity among firms. Perhaps, the most adequate way of interpreting the estimates is by analyzing the marginal effects for those firms reporting the highest and lowest exposure level in our sample as well as for the average firm exposure. Before doing this, however, it is convenient discussing the coefficient sign of exposure-to-crisis when the SDR index is used, reported in column (3). Given that a higher value for the SDR index indicates a greater exchange rate depreciation, which in itself is considered as one of the manifestations of the severity of the crisis, the coefficient on this measure was expected to be negative. Surprisingly, it turns out to be positive, statistically significant at the 1-percent level and the one with the highest magnitude across all measures. We believe that a possible explanation behind this result could be the fact that a currency depreciation translates into more competitive prices for the exporter, which might in turn provide an incentive for the supplier to extend trade credit by the anticipation of higher future payments. Conversely, a currency appreciation translates into sudden lower revenues for the exporter, which in turn might leave her illiquid and less able to accept delayed payments. Particularly, the supplier can be strongly discouraged to allow delayed payments if she anticipates further currency appreciation, in which case her expected income is lower and decreases proportionally with time.

The main message that can be drawn from the results in Table 6 is that, not surprisingly, the average effect of the crisis is strongly negative, statistically significant at the highest levels and very stable across the alternative specifications. Conditional on the highest exposure to the crisis (that is, when *Imports Exposure Crisis_f* is zero) on average, firms experienced a 3.1 percentage drop in employment growth with respect to 2005²⁰. Additionally, the exposure-effect is always positive and also statistically significant at the 1-percent level, albeit very small (evaluated at the mean value of the exposure measure) for the six specifications. Given that all variables are introduced in levels, our coefficients of interest are interpreted as marginal effects. In this sense, the effect of the exposure-to-crisis variable, given by β_1 can be interpreted as the change in employment growth for a given firm in 2009 (relative to 2005) at different levels of exposure, holding everything else constant. Thus, the total employment effect of the crisis is given by:

¹⁹See Biscourp and Kramarz (2007) for a discussion on the effects of imports on domestic French employment.

²⁰Where the interpretation of the crisis effect is made with respect to employment growth in 2005, the latter being the year dummy that was dropped, hence the reference year.

$$E (Emp Growth_{f_{it}} | 1[year = 2009]) = \hat{\delta}_{t=2009} + \hat{\beta}_1 \times Imports Exposure Crisis_f \quad (5)$$

Now, we turn to the estimates interpretation focusing on one exposure-measure at a time beginning with column 1 which reports the results using the Growth index. As mentioned above, for the highest exposure value (that is when the measure takes the value of 0) the employment consequence of the crisis is -3.1 percent, represented by the coefficient on the crisis year. The effect evaluated at the mean value of exposure is not sizeably different from the latter, provided that the magnitude of $\hat{\beta}_1$ is very small. Nevertheless, when the effect is evaluated at the firm displaying the lowest exposure value (hence, the maximum level of the index) a positive total employment effect arises, 0.09 percent²¹. Thus, despite being close to zero, the exposure effect counterbalances the strong negative effect of the main coefficient on crisis. Nonetheless, these results evaluated at the maximum values of the exposure variable (i.e., the most resilient ones) are to be interpreted with caution given the extreme heterogeneity of our observations. For illustration, Figures 7 and 8 in Appendix 6 plot the distribution of the exposure measure using the Growth Index, the first with all the observations and the second without the relatively few extreme values of these.

In the same way, given the size of $\hat{\beta}_1$ and the mean value of the rest of the exposure measures, the effects evaluated at the sample mean will not significantly differ from the main crisis effect provided by $\hat{\delta}_{t=2009}$. We therefore will comment uniquely the effects evaluated at the lowest levels of exposure for each measure. Column 2 reports estimates using the Credit index, the total employment effect for the least exposed firm in this case is a 0.54 percentage growth. Column 3 reports estimates for the SDR currency index, which as already explained, is different from what we were expecting: a negative sign. The results suggest that the total effect of the crisis for the firm having the strongest sourcing ties with the country that suffered the greatest currency depreciation was a 0.82 percent employment growth. Turning to the effects using the Equity Market Index in column 4, the total effect is 0.49 percent, while for the alternative measure using the Rating Index as a proxy for the severity of the crisis in column 5, the effect is 0.68 percent. Finally, the Resilience Index, which summarizes the severity of shocks by averaging the GDP growth, national stock markets and the country's creditworthiness indexes provides an average total effect of the crisis on employment of 0.56 percent for the least exposed firm.

Therefore, almost invariably, our results always imply that when firms have stronger

²¹Table 5 provides the mean, maximum and minimum values for all indexes.

pre-crisis ties with suppliers in countries that were less affected by the global crisis, employment growth performs better. Where results suggest that the interaction term softens the negative main effect of the crisis for those with the strongest ties with more resilient countries. The exception to this is the results given by the SDR measure, which for the reasons provided above, we interpret as a possible willingness from the supplier to allow delayed payments given the better terms of trade due to the currency depreciation. At the same time, it is also true that this measure differs from the other ones in the sense that European partners share the same currency shocks as French firms, however we are not sure about the implications that this could have on our estimates when using this index.

Finally, we alternatively estimate a more stringent version of equation 3 where time dummies are dropped and instead industry-time effects are included (δ_{it}) to account for time-varying effects specific to each 4-digits industry i as given by the firm's principal activity (NAF). The results are displayed in Table 11 in Appendix 6 and we find that the main effect of the crisis is not significant anymore at any acceptable level, which we don't find surprising given that demand, productivity and financial shocks during the crisis should have very different effects across different sectors. Concerning the coefficients of interest, their magnitude decreases across all measures and remain significant at the 1-percent level.

Now we turn to the estimations of crisis exposure conditional on trade credit intensity in order to assess whether these findings are concentrated among firms that ex-ante were more reliant on trade credit.

4.2 Is Trade Credit the channel of transmission?

Table 7: Trade Credit

Dependent Variable: Yearly employment growth						
Crisis resilience measure:	Growth Index	Credit Index	SDR Index	Equity Index	Rating Index	Resilience Index
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis_t$	-3.127 ^a (-11.37)	-3.130 ^a (-11.38)	-3.133 ^a (-11.39)	-3.132 ^a (-11.38)	-3.132 ^a (-11.38)	-3.132 ^a (-11.38)
$Crisis_t \times Trade\ Cred_f$	-4.303 (-0.82)	-4.519 (-0.87)	-4.539 (-0.87)	-4.844 (-0.93)	-4.699 (-0.90)	-4.809 (-0.92)
$Crisis_t \times Exposure_f\ Index\ 1$	-0.0135 ^c (-1.77)					
$Crisis_t \times Exposure_f\ Index\ 2$		-0.0119 ^b (-2.43)				
$Crisis_t \times Exposure_f\ Index\ 3$			-0.0315 ^b (-2.34)			
$Crisis_t \times Exposure_f\ Index\ 4$				-0.0174 ^b (-2.30)		
$Crisis_t \times Exposure_f\ Index\ 5$					-0.00992 ^b (-2.46)	
$Crisis_t \times Exposure_f\ Index\ 6$						-0.0145 ^b (-2.37)
$Crisis_t \times Trade\ Cred_f \times Exposure_f\ Index\ 1$	45.11 ^b (2.06)					
$Crisis_t \times Trade\ Cred_f \times Exposure_f\ Index\ 2$		39.38 ^a (2.79)				
$Crisis_t \times Trade\ Cred_f \times Exposure_f\ Index\ 3$			102.8 ^a (2.64)			
$Crisis_t \times Trade\ Cred_f \times Exposure_f\ Index\ 4$				56.36 ^a (2.59)		
$Crisis_t \times Trade\ Cred_f \times Exposure_f\ Index\ 5$					31.90 ^a (2.75)	
$Crisis_t \times Trade\ Cred_f \times Exposure_f\ Index\ 6$						46.80 ^a (2.65)
Observations	66408	66408	66408	66408	66408	66408
R ²	0.290	0.290	0.290	0.290	0.290	0.290
Adjusted R ²	0.090	0.090	0.090	0.090	0.090	0.090
F	164.7	164.9	164.7	164.9	164.9	164.9

t statistics in parentheses. All regressions include time-varying firm level controls, firm and time F.E., errors clustered at firm level. ^c $p < 0.10$, ^b $p < 0.05$, ^a $p < 0.01$

Is the employment effect of importing from more resilient countries conditional on the existence of trade credit? In order to assess this question we examine pre-crisis firm-level reliance on trade credit (over total imports) and interact it with our measure of *Pre-crisis Imports-exposure-to-crisis* and the crisis indicator variable. In order to do so, we estimate equation 4, where β_3 tests whether the effect was concentrated on the firms that were the most trade-credit intensive. Results from this procedure are reported in Table 7.

As anticipated, we find that the exposure-to-crisis effect is intensified significantly for trade credit intensive firms ($\hat{\beta}_3$ is positive and statistically significant at the highest levels, except for the Growth Index which is significant at the 5-percent level). This means that stronger pre-crisis sourcing ties with more resilient countries during the crisis, had a positive impact on firms' employment provided that they extensively used trade credit before the crisis. Suggesting, therefore, that trade credit can soften the firm's short-term credit constraints if the supplier is able to allow a delayed payment. Nevertheless, strongly relying on trade credit can in-itself translate into higher vulnerability to unanticipated shocks. This is confirmed by the negative coefficient of trade credit during the crisis ($\hat{\beta}_2 < 0$), although it is not precisely estimated. The lack of significance of this coefficient suggests that there is no overall effect of trade credit intensity during the crisis, given that it mainly depends on whether suppliers continued extending trade credit or not. Which clearly has opposite consequences when the firm is under financial stress and this effect is precisely what the triple interaction term captures. Where we assume that the suppliers' ability to lend goods during the crisis depended on the severity of shocks that took place in their respective country.

Interestingly, the effect of exposure-to-crisis becomes negative and it is statistically significant at the 5-percent level across all the alternative crisis measures (except for the Growth index which is significant at the 10-percent level). Additionally, its magnitude is considerably higher relative to the estimates obtained without conditioning the effect on trade credit use. These results point strongly to our interpretation of the small coefficients given above. Where this might be reflecting the fact that our exposure measure also captures the direct relationship between imports and employment, which should be negative if domestic labor and imports are substitutes. This relation emerges only, once the positive effects of resilience are purged out by the triple interaction, explaining the small magnitude of our previous coefficients.

The negative impact of international sourcing on employment, is in line with the findings in Biscourp and Kramarz (2007), who, using French firm-level data show that increasing imports (in particular, of finished goods) is strongly correlated with job destruction.

Nonetheless, it should be kept in mind that providing evidence of the direct relationship between imports and employment is beyond the scope of our analysis. In which case, a clean analysis would require accounting for different dimensions, such as the different types of imported goods, their country of origin and the type of workers involved²².

Now, we turn to the quantification the total crisis effect, conditional on trade credit intensity and crisis exposure given the sourcing ties with each country. This effect is given by the following expression:

$$\begin{aligned}
 E (Emp Growth_{fit} | 1[year = 2009]) = & \hat{\delta}_{t=2009} \\
 & + \hat{\beta}_1 \times Imports Exposure Crisis_f \\
 & + \hat{\beta}_2 \times Trade Cred_f \\
 & + \hat{\beta}_3 \times Imports Exposure Crisis_f \times Trade Cred_f
 \end{aligned}
 \tag{6}$$

This estimated effect is summarized in table 8. It displays employment growth impact in 2009 conditional on different values for trade credit intensity and exposure-to-crisis, across the alternative exposure measures. Trade Credit, reported in rows, is evaluated at its mean, its minimum and maximum level. The Exposure Indexes are evaluated at its mean, minimum, median and 99th percentile values.

It should be reminded that Trade Credit extreme values were excluded, while those for those for exposure-to-crisis were not. While we don't find it surprising that some firms grow exponentially, even in times of crisis, the total effect for its maximum values provide unreasonably big numbers for employment growth (ranging between -38 to 21,000 percent). Perhaps, this motivates keeping these extremes values out of the analysis as well in future work.

It is convenient evaluating the effects relative to the main effect of the crisis which is -3.13 across the alternative specifications. It is reported in the second column on top of the table (that is, when trade credit and exposure take the value of zero). This is precisely the total impact for firms for whom trade credit is not usually a source of short-term financing. It can be seen that the transmission of shocks from international suppliers seems to be irrelevant for these, given that the total effect is not dramatically different from -3.13 when evaluated at different values of exposure (on top of the table). When the

²²In this line, a new paper by Harrigan et al. (2016) studies the employment polarization in France due to trade conditional on technological change.

exposure measure is the highest, the drop in employment is slightly stronger. Suggesting that stronger pre-crisis ties with more resilient countries, some employment could have been replaced by imports during the crisis, given that this negative additional impact comes from $\hat{\beta}_1$.

However, when Trade Credit happens to be a source of finance for the firm, the exposure measure begins to matter (middle of the table). The main message drawn from this table is that strong reliance on trade credit amplifies the adverse impact of the crisis, notably when the firm's suppliers faced a severe shock or a large currency appreciation (that is, the lowest value for the exposure index). These are the red figures and they suggest a 0.5 percent exacerbation of the crisis impact of the crisis (across all exposure indexes).

On the contrary, when suppliers were located in countries more resilient to crisis (or with a large currency depreciation) and the firm had stronger ties with these, a strong reliance on trade credit softened the negative effects of the crisis. These figures are the blue figures, where the positive effect of the interaction largely counterbalances the direct negative impact for the crisis. While these extreme values are illustrative, perhaps, the mean values are more informative: these are the green figures which show a lower drop in employment relative to the main effect of the crisis. Suggesting that on average, the impact of the crisis was softened by stronger use of trade credit coming from suppliers subject to milder shocks of the crisis or experiencing a stronger currency depreciation.

Finally, we alternatively estimate a more stringent version of equation 4 where time dummies are dropped and instead 4 digits industry-time effects are included. The results are displayed in Table 12 in Appendix 6. As it was the case for the baseline regressions with imports-exposure-crisis, we find that the main effect of the crisis dummy is again insignificant. While the estimates of interest remain unaltered in terms of magnitude, however they are estimated with less precision, being now significant at the 5-percent level. We believe that this should be explained by the fact that firms inside the same sector should have both: similar trade credit intensity determined by technological characteristics of each specific sector, as argued by Fisman and Love (2003) and similar sourcing strategies (e.g., countries have comparative advantages). Therefore, when firm heterogeneity is accounted for as well, very little variation in the data should be left. This is particularly true when there are very few firms within an industry²³.

Nevertheless, with the inclusion of less stringent effects, that is, by defining the industry at

²³Table 10 in the Appendix 6 summarises the number of observations in each of the 2-digits industry in our sub-sample.

the 2-digits level, results remain significant at the 1-percent level as shown in Table 13 in Appendix 6 (with the exception of the Growth index which was already only significant at the 5-percent level in the baseline regressions).

Summing up, our estimates across 5 of our alternative measures of severity of crisis show that the global downturns over 2008-2009 differently affected firms with varying levels of interconnectedness to these shocks, given their different international sourcing strategies. Additionally, we find heterogeneous effects of these transmission across firms differing in their average usage of Trade Credit in production: firms who don't usually use trade credit as a source of finance, are marginally affected by their international sourcing ties. On the other hand, the effect is dramatically different for firms who rely on trade credit depending on the level of exposure. Trade credit mitigates the drop in employment for firms with strong relations with more resilient partners. While with strong relations with countries where the incidence of the crisis was higher intensifies the drop in employment. Nevertheless, when the severity of crisis is measured by the country's currency depreciation, the results point in the same direction as the resilience measures: stronger ties with countries under strong currency depreciation tempered the adverse effects of the crisis for trade credit intensive firms.

5 Robustness and future work

5.1 Alternative Trade credit normalization

Now, we re estimate equation 4 using the total inputs of the firm as an alternative variable to normalize Trade Credit instead of total imports. These estimations are presented in Table 9. With this specification, the effects of crisis-exposure and crisis-exposure conditional on trade credit, become statistically insignificant for all the alternative exposure measures. At the same time as $\hat{\beta}_1$ and $\hat{\beta}_3$ flip signs for all measures except for the Growth index. On top of this, the effect of trade credit during the crisis turns out to be highly significant now (at the 1-percent level). In this sense, the lack of significance of $\hat{\beta}_3$ strongly points to our hypothesis, that what is important in order for the exposure-to crisis-effect to be identified, is trade credit coming from international suppliers. Not being directly observable, it should be proxied by the ratio of trade credit to imports. In other words, given that shocks suffered by French suppliers are not accounted for in the exposure measure, its interaction with trade credit over total inputs should be much less informative than using trade credit over total imports. Additionally, the sign, magnitude and significance of $\hat{\beta}_2$, suggest that on average, a stronger overall dependence on trade credit made firms more vulnerable

Table 8: Total crisis effect conditional on exposure and trade credit intensity

Trade Credit		Exposure Index	mean	min	p50	p99
			(1)	(2)	(3)	(4)
at min	Growth Index		-3.14	-3.13	-3.13	-3.16
	Credit Index		-3.14	-3.13	-3.13	-3.17
	SDR Index		-3.13	-3.13	-3.13	-3.15
	Equity Index		-3.14	-3.13	-3.13	-3.17
	Rating Index		-3.15	-3.13	-3.13	-3.19
	Resilience Index		-3.14	-3.13	-3.13	-3.17
at mean	Growth Index		-2.84	-3.17	-3.04	-1.96
	Credit Index		-2.75	-3.17	-2.99	-1.73
	SDR Index		-2.99	-3.17	-3.10	-2.55
	Equity Index		-2.82	-3.17	-3.02	-1.89
	Rating Index		-2.57	-3.17	-2.92	-1.25
	Resilience Index		-2.75	-3.17	-2.99	-1.73
at max	Growth Index		0.46	-3.64	-2.08	11.26
	Credit Index		1.59	-3.64	-1.48	14.12
	SDR Index		-1.43	-3.64	-2.73	4.02
	Equity Index		0.68	-3.64	-1.81	12.12
	Rating Index		3.81	-3.64	-0.62	20.06
	Resilience Index		1.59	-3.64	-1.48	14.12

Total crisis effect based on OLS estimates of equation (4) when $1[\text{year} = 2009]$ evaluated at different values of Trade Credit Intensity and Exposure-to-Crisis.

during the crisis.²⁴

²⁴Similar results are obtained when using total production and total sales as alternative normalizations.

Table 9: Alternative Trade Credit normalizing by Total Inputs

Dependent Variable: Yearly employment growth						
Crisis resilience measure:	Growth Index	Credit Index	SDR Index	Equity Index	Rating Index	Resilience Index
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis_t$	-2.552 ^a (-7.23)	-2.555 ^a (-7.24)	-2.554 ^a (-7.24)	-2.555 ^a (-7.24)	-2.554 ^a (-7.24)	-2.554 ^a (-7.24)
$Crisis_t \times Trade Cred_f$	-2.567 ^a (-2.62)	-2.557 ^a (-2.61)	-2.558 ^a (-2.61)	-2.556 ^a (-2.61)	-2.561 ^a (-2.61)	-2.559 ^a (-2.61)
$Crisis_t \times Exposure_f Index 1$	-0.0000449 (-0.01)					
$Crisis_t \times Exposure_f Index 2$		0.00482 (0.54)				
$Crisis_t \times Exposure_f Index 2$			0.0101 (0.53)			
$Crisis_t \times Exposure_f Index 4$				0.00623 (0.56)		
$Crisis_t \times Exposure_f Index 5$					0.00200 (0.41)	
$Crisis_t \times Exposure_f Index 6$						0.00386 (0.48)
$Crisis_t \times Trade Cred_f \times Exposure_f Index 1$	0.0102 (0.27)					
$Crisis_t \times Trade Cred_f \times Exposure_f Index 2$		-0.0143 (-0.35)				
$Crisis_t \times Trade Cred_f \times Exposure_f Index 3$			-0.0280 (-0.33)			
$Crisis_t \times Trade Cred_f \times Exposure_f Index 4$				-0.0189 (-0.38)		
$Crisis_t \times Trade Cred_f \times Exposure_f Index 5$					-0.00405 (-0.18)	
$Crisis_t \times Trade Cred_f \times Exposure_f Index 6$						-0.00995 (-0.27)
Observations	66408	66408	66408	66408	66408	66408
R^2	0.291	0.291	0.291	0.291	0.291	0.291
Adjusted R^2	0.090	0.090	0.090	0.090	0.090	0.090
F	164.5	164.4	164.4	164.4	164.3	164.3

t statistics in parentheses

All regressions include time-varying firm controls, firm and time F.E., errors clustered at firm level.

^c $p < 0.10$, ^b $p < 0.05$, ^a $p < 0.01$

5.2 Sensitivity analysis: Are there any other mechanisms consistent with our results?

We aim at testing a mechanism that links ex-ante geographical ties to transmission of ex-post shocks. However, our results could also be consistent with an alternative hypothesis, which is that shocks in the country of either (and mostly) the parent of the firm or one of its affiliates could also be transmitted to the firm during the crisis. This particular mechanism is studied by Kolasa et al. (2010) and Alfaro and Chen (2010). The former use Polish firm-level data and find that foreign ownership resulted in a higher degree of resilience to the crisis, which was possibly due to intra-group lending supporting affiliates' problems of external credit availability. Similarly, Alfaro and Chen (2010) explore the role of FDI in helping affiliates facing credit constraints during the crisis using a firm-level worldwide dataset. It closely relates to our analysis in the sense that they explore financial linkages among groups conditional on the incidence of the crisis in the host and home countries. Their findings suggest that multinationals whose headquarters are located in countries with a greater incidence of the crisis, performed worse than their local competitors.

In this sense, ruling out this alternative explanation is of particular importance given that intra-group loans can directly affect firms' financial constraints, which is central to the mechanism explored in this paper. Therefore, we are currently working on this robustness check with the help of FDI firm-level data from Banque de France.

5.3 Future work

As it was mentioned above, the current data at our disposal limits the scope of our analysis in some dimensions. Nevertheless, in the near future we plan to extend our analysis when access to new data is obtained: an extension of the data we currently use (BRN beyond 2008), as well as access to the Financial linkages French data (LIFI) and the employment base DADS (Déclaration Annuelle des Données Sociales). In this sense, we plan to extend our study to account for financial constraints and specific employment categories effects as explained in the following subsections.

Are financial constraints the channel of transmission? Given that the mechanism that we explore assumes a relaxation of the firm's financial constraints, it is then convenient testing whether the existence of financial constraints is the relevant channel of transmission of the shocks. However, as it was already mentioned, the balance-sheet data at our disposal at the moment is only available until 2008 and this limits the scope of our analysis, particularly, testing whether financial constraints are responsible for the

results presented in this paper. Nonetheless, these data does exist and we will have access to the years 2009-2010. In this sense, we plan to directly introduce a variable reflecting the firm's credit constraints during the crisis and evaluate how these related to its employment growth during the crisis and expect the effect of exposure to crisis during the financial crisis to become insignificant. More precisely, we anticipate that if the financial constraints channel is really the mechanism behind our results, then by re-estimating equation 3 and 4 with the introduction an interaction term between the firm's financial constraint proxy and the crisis dummy our results should become irrelevant.

Are the effects heterogeneous among different types of employees? Our current analysis provides an employment average effect at the firm-level. However, one could think that the effects are certainly not the same among different types of employees. Notably if they are more or less substitutable with capital (the collateral channel implies that firms use more capital at the expense of labor) and also depending on the type of contract with the firm. French institutions are known for protecting employees in several ways, hence one could think that part-time jobs as well as the "interim" ones might be more affected when the firm faces a financial shock given that these are less subject to regulation. Additionally, the number of hours worked provides an additional information allowing to assess how firms adjust employment, both at the intensive and extensive margins.

In this way, a decomposition of the firm-level employment effects could be done with the help of the DADS database (where we will observe our period of interest). This database is based on mandatory annual reports filled by all firms with employees; it contains annual hours paid in a firm, as well as number of workers employed by different socio-professional occupation types. The use of this data is particularly interesting given that for each worker, it provides information on gross and net wages, hours paid, occupation, tenure, gender and age.

6 Concluding remarks

The dramatic cross-border consequences the Great Recession and the speed at which shocks propagated around the world, raised an increasing need of understanding the implications of living in highly interconnected world. This paper adds to the growing literature aiming at doing so. We use French firm-level data on importers and focus on the role of trade credit (or inter-enterprise credit, which doesn't involve financial intermediaries) in shaping the transmission of global shocks and assess its impact on employment growth.

Given that (at least a part of) firm's capital can be seized by lenders in case of credit default, capital can be pledged as collateral in order to raise external funds. While this is obviously not the case for employment. Thus, the inalienability of human capital implies that when external finance becomes scarce, the need of pledging collateral in order secure loan repayment provides an incentive for the firm to shift towards a more capital intensive production. On the other hand, suppliers may finance their clients by requiring the importer to pay goods in the future, as they develop a commercial relationship over time. In this sense they substitute to financial institutions as lenders by providing trade credit. Motivated by this, we evaluate how foreign suppliers can alleviate the firm's short-term financial constraints by accepting delayed payments. Which in turn translates into lower pressure on employment when credit from financial institutions is limited.

Without directly observing trade credit from each foreign partner, our econometric analysis is based on the assumption that suppliers' ability to provide trade credit during the global financial crisis depended on the severity of shocks in each country over 2008-2009 (and pre-established trade relations). Therefore, we exploit cross-country differences in the severity of the crisis and different levels of firm-level exposure to these shocks in order to assess the transmission of these and its impact on employment growth. Next, we evaluate this effect conditional on firm-level technological reliance on trade credit. This allows us uncovering whether the financial health of its foreign suppliers (that we view as potential lenders) helped cushioning the negative effect of the crisis and whether the effect was concentrated among trade credit intensive firms.

Using various measures of the crisis, our findings show that the global downturns over 2008-2009 differently affected firms with varying levels of interconnectedness to these shocks, given their different international sourcing strategies. Where the results point to a particular channel of transmission : trade credit. Our findings summarize as follows, strong pre-crisis sourcing ties with countries that were more resilient to the global crisis, translated into better performance in terms of employment growth over 2008-2009. This effect dramatically varies with trade credit intensity. Strongly relying on trade credit made firms more vulnerable to unanticipated shocks, for whom the adverse impact of the crisis was exacerbated. This effect intensified among firms with important sourcing ties with severely shocked countries. While the negative effect of the crisis was mitigated when sourcing relations with countries subject to milder shocks were stronger. Supporting, therefore, the hypothesis that trade credit was an alternative source of financing for enterprises during the crisis. Where implicitly borrowing from suppliers helped importers overcoming financial constraints.

References

- Acemoglu, D. (2001). Credit market imperfections and persistent unemployment. *European Economic Review*, 45(4):665–679.
- Alfaro, L. and Chen, M. X. (2010). Surviving the global financial crisis: Foreign direct investment and establishment performance. *Harvard Business School BGIE Unit Working Paper*, (10-110).
- Antras, P. and Foley, C. F. (2015). Poultry in motion: A study of international trade finance practices. *Journal of Political Economy*, 123(4).
- Baldwin, R. The great trade collapse: What caused it and what does it mean? *The Great Trade Collapse: Causes, Consequences and Prospects*, 100(105):1.
- Berg, A., Borensztein, E., and Pattillo, C. (2005). Assessing early warning systems: how have they worked in practice? *IMF staff papers*, pages 462–502.
- Biscourp, P. and Kramarz, F. (2007). Employment, skill structure and international trade: Firm-level evidence for france. *Journal of International Economics*, 72(1):22–51.
- Calvo, G., Coricelli, F., and Ottonello, P. (2014). Labor market, financial crises and inflation: Jobless and wageless recoveries.
- Dromel, N. L., Kolakez, E., and Lehmann, E. (2010). Credit constraints and the persistence of unemployment. *Labour Economics*, 17(5):823–834.
- Eaton, J., Kortum, S., Neiman, B., and Romalis, J. (2011). Trade and the global recession. Technical report, National Bureau of Economic Research.
- Fisman, R. and Love, I. (2003). Trade credit, financial intermediary development, and industry growth. *The Journal of Finance*, 58(1):353–374.
- Fontagné, L., Toubal, F., et al. (2010). Investissement direct étranger et performances des entreprises. *Rapport du CAE*, (89).
- Harrigan, J., Reshef, A., and Toubal, F. (2016). The march of the techies: Technology, trade, and job polarization in france, 1994-2007. Technical report, National Bureau of Economic Research.
- Hart, O. and Moore, J. (1994). A theory of debt based on the inalienability of human capital. *The Quarterly Journal of Economics*, 109(4):841–879.
- Kolasa, M., Rubaszek, M., and Taglioni, D. (2010). Firms in the great global recession: The role of foreign ownership and financial dependence. *Emerging Markets Review*, 11(4):341–357.

Levchenko, A., Lewis, L., and Tesar, L. (2009). The collapse of us trade: in search of the smoking gun. *The great trade collapse: Causes, consequences and prospects*, page 71.

Rajan, R. G. (2006). Has finance made the world riskier? *European Financial Management*, 12(4):499–533.

Rose, A. K. and Spiegel, M. M. (2012). Cross-country causes and consequences of the 2008 crisis: Early warning. *Japan and the World Economy*, 24(1):1 – 16.

Appendix

Appendix A: Descriptive Statistics

Figure 4: Cross-country Crisis as measured by: Growth Index

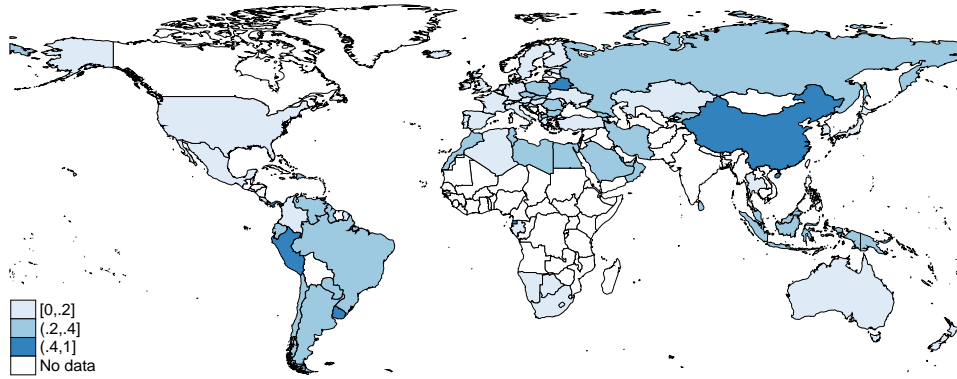


Figure 5: Cross-country Crisis as measured by: Equity Index

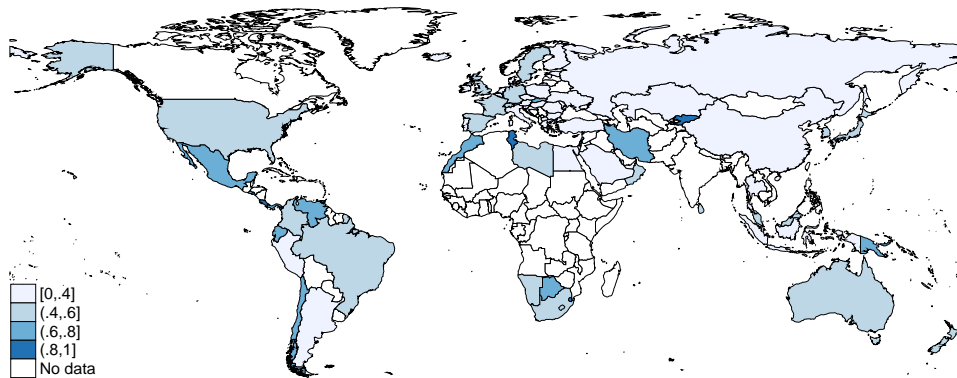


Figure 6: Cross-country Crisis as measured by: Rating Index

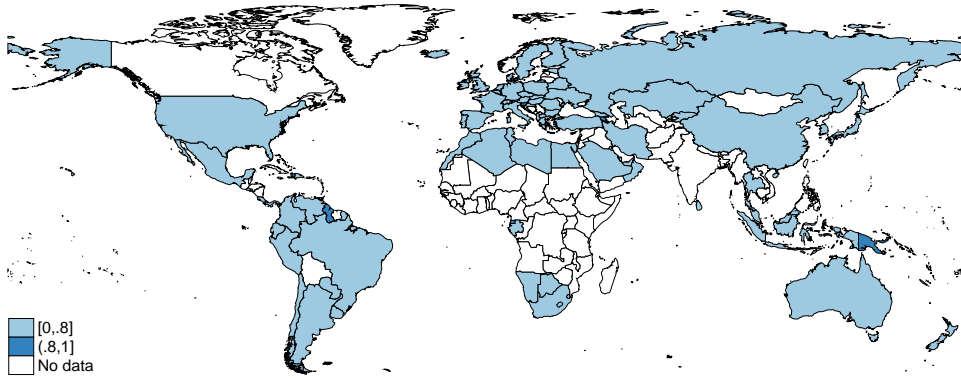


Figure 7: Growth Index

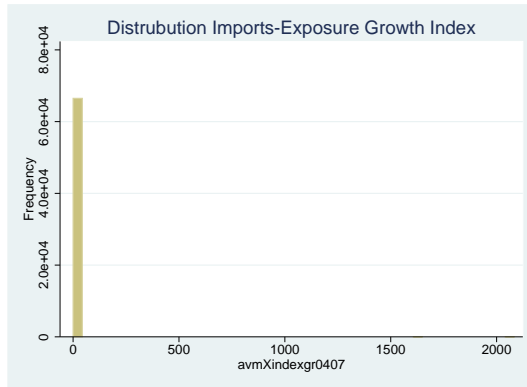
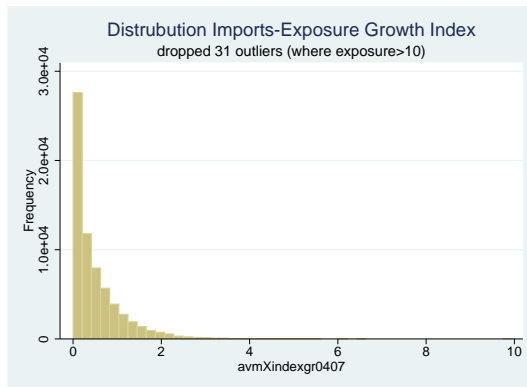


Figure 8: Growth Index



Appendix B. Definitions and sources of crisis variables used in the analysis

Data from World Bank

Credit Measure: Percentage change over 2007-2009 in Domestic credit to private sector by banks (% of GDP).

Data from Rose and Spiegel (2012)

Growth Measure: Real GDP growth over 2008, as estimated by the Economic Intelligence Unit (EIU) in early March 2009.

Equity Measure: Percentage change in the national stock market over the 2008 calendar year (collected from national sources)

SDR Measure: Percentage change in the SDR exchange rate over 2008, measured as the domestic currency price of a Special Drawing Right and taken from the IMF's International Financial Statistics

Rating Measure: Change in the country credit rating from Institutional Investor. The latter are ratings created by Institutional Investor that rank 177 countries on a scale between 0 and 100 where 100 represents the least likelihood of default.

List of suppliers' countries kept

Argentina, Austria, Australia, Barbados, Belgium, Bulgaria, Bahrain, Brazil, Bahamas, Botswana, Switzerland, Chile, China, Colombia, Costa Rica, Cyprus, Czech Republic, Germany, Denmark, Estonia, Egypt, Spain, Finland, UK, Greece, Hong Kong, Croatia, Hungary, Ireland, Israel, Iceland, Italy, Jamaica, Japan, Kyrgyz Republic, Korea, Kazakhstan, Lebanon, Sri Lanka, Morocco, Macedonia (FYR), Malta, Mauritius, Mexico, Malaysia, Namibia, Netherlands, New Zealand, Oman, Panama, Peru, Papua New Guinea, Poland, Portugal, Romania, Russia, Sweden, Singapore, Slovenia, Slovakia, El Salvador, Swaziland, Thailand, Tunisia, Turkey, Trinidad & Tobago, Ukraine, United States, Venezuela and South Africa.

Table 10: 2 digits industries included in the analysis

Division Code	Heading	N
2	Forestry and logging	78
5	Mining of coal and lignite	4
6	Extraction of crude petroleum and natural gas	18
7	Mining of metal ores	6
8	Other mining and quarrying	552
10	Manufacture of food products	7113
11	Manufacture of beverages	846
12	Manufacture of tobacco products	11
13	Manufacture of textiles	2489
14	Manufacture of wearing apparel	1913
15	Manufacture of leather and related products	773
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	3148
17	Manufacture of paper and paper products	1955
18	Printing and reproduction of recorded media	2436
19	Manufacture of coke and refined petroleum products	87
20	Manufacture of chemicals and chemical products	2961
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	690
22	Manufacture of rubber and plastic products	5529
23	Manufacture of other non-metallic mineral products	2796
24	Manufacture of basic metals	1136
25	Manufacture of fabricated metal products, except machinery and equipment	10954
26	Manufacture of computer, electronic and optical products	2727
27	Manufacture of electrical equipment	2070
28	Manufacture of machinery and equipment n.e.c.	5965
29	Manufacture of motor vehicles, trailers and semi-trailers	1657
30	Manufacture of other transport equipment	678
31	Manufacture of furniture	1807
32	Other manufacturing	2386
33	Repair and installation of machinery and equipment	3623
Total		66408

Note: 2-digits Industry NAF (Nomenclature d'Activité Française) division codes and headings.

Appendix C. Additional tables

Table 11: Alternative F.E.: Baseline

Dependent Variable: Yearly employment growth						
Crisis resilience measure:	Growth Index	Credit Index	SDR Index	Equity Index	Rating Index	Resilience Index
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis_t$	-1549.0 (-0.00)	-1548.8 (-0.00)	-1548.8 (-0.00)	-1548.7 (-0.00)	-1548.8 (-0.00)	-1548.8 (-0.00)
$Crisis_t \times Exposure_f Index 1$	0.00160 ^a (3.82)					
$Crisis_t \times Exposure_f Index 2$		0.00123 ^a (3.50)				
$Crisis_t \times Exposure_f Index 3$			0.00289 ^a (3.80)			
$Crisis_t \times Exposure_f Index 4$				0.00152 ^a (3.43)		
$Crisis_t \times Exposure_f Index 5$					0.000817 ^a (3.76)	
$Crisis_t \times Exposure_f Index 6$						0.00123 ^a (3.59)
Observations	66381	66381	66381	66381	66381	66381
R^2	0.311	0.311	0.311	0.311	0.311	0.311
Adjusted R^2	0.097	0.097	0.097	0.097	0.097	0.097
F	6.744	6.412	6.726	6.346	6.678	6.501

t statistics in parentheses

All regressions include time-varying firm controls, firm and 4 digits industry-time F.E., errors clustered at firm level.

^c $p < 0.10$, ^b $p < 0.05$, ^a $p < 0.01$

Table 12: Alternative F.E.: Trade Credit

Dependent Variable: Yearly employment growth						
Crisis resilience measure:	Growth Index	Credit Index	SDR Index	Equity Index	Rating Index	Resilience Index
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Crisis_t</i>	-1157.0 (-0.00)	-1160.6 (-0.00)	-1155.7 (-0.00)	-1161.0 (-0.00)	-1160.3 (-0.00)	-1160.5 (-0.00)
<i>Crisis_t × Trade Cred_f</i>	1.563 (0.29)	1.464 (0.27)	1.428 (0.26)	0.948 (0.18)	1.200 (0.22)	1.018 (0.19)
<i>Crisis_t × Exposure_f Index 1</i>	-0.0154 ^c (-1.80)					
<i>Crisis_t × Exposure_f Index 2</i>		-0.0125 ^b (-2.16)				
<i>Crisis_t × Exposure_f Index 3</i>			-0.0331 ^b (-2.16)			
<i>Crisis_t × Exposure_f Index 4</i>				-0.0199 ^b (-2.24)		
<i>Crisis_t × Exposure_f Index 5</i>					-0.0108 ^b (-2.26)	
<i>Crisis_t × Exposure_f Index 6</i>						-0.0163 ^b (-2.27)
<i>Crisis_t × Trade Cred_f × Exposure_f Index 1</i>	49.07 ^b (1.99)					
<i>Crisis_t × Trade Cred_f × Exposure_f Index 2</i>		39.75 ^b (2.38)				
<i>Crisis_t × Trade Cred_f × Exposure_f Index 3</i>			104.5 ^b (2.36)			
<i>Crisis_t × Trade Cred_f × Exposure_f Index 4</i>				62.04 ^b (2.42)		
<i>Crisis_t × Trade Cred_f × Exposure_f Index 5</i>					33.54 ^b (2.45)	
<i>Crisis_t × Trade Cred_f × Exposure_f Index 6</i>						50.74 ^b (2.46)
Observations	66381	66381	66381	66381	66381	66381
R ²	0.311	0.312	0.312	0.312	0.312	0.312
Adjusted R ²	0.097	0.097	0.097	0.097	0.097	0.097
F	4.188	4.320	4.341	4.243	4.298	4.271

t statistics in parentheses

All regressions include time-varying firm controls, firm and 4 digits industry-time F.E., errors clustered at firm level.

^c $p < 0.10$, ^b $p < 0.05$, ^a $p < 0.01$

Table 13: Alternative F.E.: Trade Credit

Dependent Variable: Yearly employment growth						
Crisis resilience measure:	Growth Index	Credit Index	SDR Index	Equity Index	Rating Index	Resilience Index
	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis_t$	-21952.0 (-0.00)	-21930.7 (-0.00)	-22008.8 (-0.00)	-21960.3 (-0.00)	-22046.4 (-0.00)	-22028.1 (-0.00)
$Crisis_t \times Trade Cred_f$	-3.104 (-0.59)	-3.379 (-0.65)	-3.417 (-0.66)	-3.797 (-0.73)	-3.586 (-0.69)	-3.735 (-0.71)
$Crisis_t \times Exposure_f Index 1$	-0.0151 ^c (-1.74)					
$Crisis_t \times Exposure_f Index 2$		-0.0137 ^b (-2.52)				
$Crisis_t \times Exposure_f Index 3$			-0.0363 ^b (-2.52)			
$Crisis_t \times Exposure_f Index 4$				-0.0204 ^b (-2.52)		
$Crisis_t \times Exposure_f Index 5$					-0.0113 ^a (-2.60)	
$Crisis_t \times Exposure_f Index 6$						-0.0168 ^b (-2.56)
$Crisis_t \times Trade Cred_f \times Exposure_f Index 1$	49.41 ^b (1.98)					
$Crisis_t \times Trade Cred_f \times Exposure_f Index 2$		44.15 ^a (2.85)				
$Crisis_t \times Trade Cred_f \times Exposure_f Index 3$			116.1 ^a (2.80)			
$Crisis_t \times Trade Cred_f \times Exposure_f Index 4$				64.66 ^a (2.79)		
$Crisis_t \times Trade Cred_f \times Exposure_f Index 5$					35.83 ^a (2.86)	
$Crisis_t \times Trade Cred_f \times Exposure_f Index 6$						53.14 ^a (2.82)
Observations	66398	66398	66398	66398	66398	66398
R ²	0.296	0.296	0.296	0.296	0.296	0.296
Adjusted R ²	0.095	0.095	0.095	0.095	0.095	0.095
F	4.138	4.511	4.517	4.422	4.487	4.446

t statistics in parentheses

All regressions include time-varying firm controls, firm and 2 digits industry-time F.E., errors clustered at firm level.

^c $p < 0.10$, ^b $p < 0.05$, ^a $p < 0.01$