SHORT PAPER

International trade and letters of credit: A double-edged sword in times of crises

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December 8, 2020

Abstract

This study argues that the ability to mitigate risks associated with international trade is particularly important at times of heightened uncertainty, such as economic crises. Risk mitigation can be achieved through letters of credit (LCs), trade finance instruments providing guarantees to trading partners. As their use varies across products, exports of some products are more resilient than others during economic crises. This situation reverses in times of financial crises when distressed banks may limit the supply of LCs. Our analysis using data on US exports during the COVID crisis and the Global Financial Crisis provides empirical support for these hypotheses. [100 WORDS]

Keywords: International trade, Trade finance, Letter of credit, Risk, Financial crisis, COVID-19

JEL codes: G01; F14; F23.

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1 Introduction

Trading goods across international borders is more risky than trading within national borders. The trading partners are located in different countries that may be separated by a large distance which results in long shipping times, are subject to different laws and may speak different languages. Deciding on whether the risk should be borne by one of the trading partners or shifted onto a bank by paying a fee to purchase a so called letter of credit (LC) is one of the key decisions that needs to be made.[1]

This paper argues that the ability of the trading partners to mitigate risks associated with international trade transactions is particularly important at times of heightened uncertainty, such as economic crises, which often hit unexpectedly. And because the use of LCs varies across products, exports of some products are more resilient than exports of other products during economic crises. This situation reverses in times of financial crises when purchasing LCs becomes difficult, if not impossible, due to the financial system being in distress. Then the goods that require guarantees and protection provided by LCs experience a more severe decline in exports than other products.

The first contribution of this paper lies in providing empirical evidence documenting the differential impact of economic and financial crises on products relying to a different extent on LCs. This is a novel finding, not documented in the exiting literature so far. The ability to distinguish between different causes of crisis-related drops in international trade may be important for forecasting future recoveries.

The second contribution of the paper lies in creating a new index of product-specific intensity of LC use, which is made possible by the availability of unique data detailing financial terms of international trade transactions.

The paper proceeds in several steps. First, we demonstrate differences across products in their reliance on LCs. We do so using international trade data from Turkey disaggregated by firm, 8-digit HS product code, country, year and payment method. We construct an LC-intensity index (*LC-Int* hereafter) removing variation due to different partner countries and different trading firms in particular years. *LC-Int* is available for 1,196 4-digit HS products.

[1]There exist three primary ways of structuring financing in international trade. Under *open account*, the importer pays after the arrival of the goods in the destination and the exporter is exposed to the risk of non-payment. Alternatively, under *cash in advance* the importer pays before the exporter ships the goods to the destination, and thus the importer faces the risk of not receiving the pre-paid goods. Finally, the trading partners may shift the risk onto their banks by purchasing an LC. In an LC-financed transaction, the importer's bank promises to pay for the goods on behalf of the importer provided the exporter meets all requirements specified in the contract. In this way, the risk of non-payment or non-delivery of pre-paid goods is eliminated. A substantial fee is typically charged by a bank issuing an LC. The exporter may further eliminate the risk of the importer's bank defaulting by using services of a domestic bank to confirm an LC.

The index reveals considerable variation across products, including within the same industry. For instance, “Silk-worm cocoons suitable for reeling" (HS5001) are among the products with the highest value of *LC-Int*, while another product belonging to the same 2-digit HS heading “Silk waste (including cocoons unsuitable for reeling, yarn waste and gametted stock)" (HS5003), is among products with the lowest *LC-int* value. Similarly, the index value for “Live bovine animals” (HS0102) is in the top decile, while the one for “Meat of bovine animals; fresh or chilled” (HS0201) is only in the 3rd decile only.

The *LC-Int* measure exhibits intuitive correlations with several product characteristics, such as, the value per weight, durability, average shipping time, transaction size, etc. Since LCs are expensive and incur a non-negligible fixed cost, if a given product tends to be shipped in bulk, due to its inherent characteristics, the large transaction value gives the trading partners a greater impetus to eliminate the risk. Durable products, which are more easily collateralized, are easier to insure. A longer delay due to the shipping time increases the risk of an adverse exchange rate or price movement, and thus may prompt one of the trading partners to try to renegotiate the contract.[2]

Second, we focus on the trade collapse which took place in April and May of 2020 as a result of the economic crisis induced by COVID-19. The economic downturn caused by widespread lockdowns and uncertainty about the trajectory and duration of the pandemic created a period of heightened uncertainty for business. Exporters faced an increased risk of non-payment, while importers worried about not receiving prepaid goods as a result of their trading partners facing financial difficulties or going bankrupt. Global trade flows fell by 16 percent and 18 percent year-on-year in April and May, respectively. And the US exports saw a decline of 30 and 35 percent during the same period.

Using monthly US export data for the 2017-2020 period, we show that products that are typically traded on LC terms proved to be more resilient during the pandemic. More specifically, comparing year-over-year growth rates, we found that products at the 90*th* percentile of *LC-Int* experienced a 5-7 log points smaller decline in exports in April-May 2020 compared to products at the 10*th* percentile of *LC-Int*. These findings are robust to allowing for a differential impact of the pandemic on, for instance, consumer durables, as well as several other characteristics such as average shipping time, average shipment size, income elasticity, and reliance on external financing.

The third part of the paper considers the Great Trade Collapse of 2008-09. Between the third quarter of 2008 and the second quarter of 2009, the world witnessed the steepest fall of world trade in recorded history and the deepest fall since the Great Depression

[2]Hummels and Schaur (2010) show theoretically and empirically that transit lags act as significant trade barriers.

(Baldwin, 2009). The Great Trade Collapse was caused by the Global Financial Crisis, a shock very different in nature to the COVID-induced economic downturn when it comes to its impact on the composition of trade flows. As the financial crisis made it difficult, if not impossible, to purchase LCs, it had a particularly strong impact on products heavily reliant on protection offered by LCs. Using data on US exports for 2003-2009, we demonstrate that products relying more heavily on LCs experienced a more severe decline in exports to countries affected by the financial crisis.

We then do a horse race between the impact of financial crises and economic crises in the destination country on trade in goods with different levels of reliance on LCs. During an economic crisis in the destination country, LC-intensive exports tend to be more resilient than other exports due to protection offered by trade finance instruments, while during a financial crisis, which limits supply of trade finance instruments, LC-intensive trade experiences a deeper decline than other exports. Again, the results are robust to allowing for a differential impact of a plethora of product characteristics mentioned earlier.

Our paper is related to three strands of the economic literature. First, it is related to the literature on economic impacts of uncertainty. A large body of research shows that uncertainty affects investment, growth, employment and trade (see e.g. Bernanke (1983); Hassler (1996); Bloom (2009); Handley and Limão (2015); Handley and Limão (2017)). Our contribution to this literature lies in pointing out that different types of exports products are differentially affected by uncertainty caused by economic crises.

The second strand of related literature encompasses studies aiming to explain the Great Trade Collapse. The existing literature has investigated several factors which contributed to this phenomenon, namely the shift away from demand for durable goods (Levchenko et al., 2009; Eaton et al., 2016), increased protectionism (Evenett, 2009), the lack of access to financing (Amiti and Weinstein, 2011; Paravisini et al., 2015; Chor and Manova, 2012) and the interplay of uncertainty and higher ordering costs for foreign (relative to domestic) inputs (Novy and Taylor, 2020). We contribute to this literature by providing systematic evidence that confirms the importance and clarifies the nature of the role of insurance offered by the financial system in international trade.

Finally, our paper is related to the new but growing literature on financing terms in international trade transactions (Schmidt-Eisenlohr (2013); Antràs and Foley (2015); Hoefele et al. (2016); Ahn (2014); Niepmann and Schmidt-Eisenlohr (2017); Demir and Javorcik (2018); Ahn and Sarmiento (2019); Demir and Javorcik (2020)). We contribute to this literature by drawing attention to the interplay between the type of financing terms used and performance of exports during economic and financial crises. Our other contribution lies in compiling a new index of product reliance on LCs.

2 Letter-of-Credit Intensity Measure: *LC-Int*

The purpose of this section is to introduce the *LC-Int* index, which will serve as the key variable in our analysis. We start with background information on the standard ways of structuring financing terms in international trade transactions. We then explain why it makes sense to create a product-specific measure of reliance on LCs. We introduce the data source and the methodology. And finally we discuss the properties of the index.

2.1 Financing terms in international trade transactions

There exist three main methods of structuring financing terms in an international trade transaction: *open account, cash in advance*, and *letter of credit*.

Under *open account* terms, goods are delivered before a payment is made by the importer. This is the safest method for the importer and the riskiest one for the exporter. Under *cash-in-advance* terms, the exporter receives the payment before ownership of the goods is transferred. This method eliminates the payment risk on the part of the exporter, and all the risk is borne by the importer.

The final method, *letter of credit*, eliminates the risk to both parties. An LC is a guarantee issued by the importer's local bank (issuing bank) that a payment will be made to the exporter, provided that the conditions stated in the LC have been fulfilled. The importer's bank charges (often a substantial) fee for issuing an LC. The exporter can also request its local bank to confirm the LC. If confirmed, the exporter‘s bank (the confirming bank) takes on the responsibility for making payments if the importer's bank fails to transfer the payment by the due date. The LC is the most secure instrument available to international traders.[3]

LCs protect the seller against the buyer (i) refusing to accept the shipment and the associated payment obligations; (ii) refusing to pay for the goods received (fraud); (iii) intentionally delaying the payment; (iv) disputing the terms of the contract (e.g., whether the goods are of specified quality) in order to reduce the payment obligation.

The fundamental principle of an LC is that it deals with documents and not with goods. The payment obligation is independent from the underlying contract of sale or any other contract in the transaction. The bank's obligation is defined by the terms of the LC alone, and the contract of sale is not considered. Thus the bank is obliged to pay, regardless of

[3]Another widely-used payment method is *documentary collection*, in which transactions are settled by banks through an exchange of documents. While this method does not involve a payment guarantee,it may partially eliminate the transaction risks as the importer does not pay prior to shipment and the exporter retains ownership of the goods until the importer pays for the goods or accepts to pay at a later date.

whether the contract between the buyer and the seller is subject to contractual issues. The LC does not permit of any dispute with the buyer as to the performance of the contract of sale being used as a ground for non-payment or reduction or deferment of payment.[4] Whilst the bank is under an obligation to identify that the correct documents exist, the bank is not responsible for investigating the underlying facts of each transaction, whether the goods are of the sufficient – and specified – quality or quantity. Because the transaction operates on a negotiable instrument, it is the document itself which holds the value – not the goods to which it refers. This means that the bank need only be concerned with whether the document fulfils the requirements stipulated in the letter of credit.

2.2 Why a product-specific measure is informative

The nature of the product traded matters for how desirable it is to use an LC. For instance, under the Basel framework, a lower credit conversion factor applies when the traded good can serve as a collateral (Demir et al., 2017). Therefore, firms trading product which can be collateralized more easily, because they are more durable or less differentiated, would rely of on LCs. In the same vein, sellers of heavy products, which tend to be shipped by sea and have longer transport times, face a higher risk of the buyer changing her mind and attempting to cancel the order. They are more likely to accept a trade deal only if they can guarantee the transaction with a letter of credit. The risk of default also depends on specific features of the market on which the products are traded. Exporters primarily need LCs to protect themselves against importers intentionally delaying payment or attempting to pay less by questioning product quality or specifications. This is more likely to occur in markets where purchasing firms have relatively thin margins, more difficult access to credit or a high bargaining power vis-a-vis the exporter. Exporters of perishable goods are particularly vulnerable as perishability means that there is little time to call off the transaction and find an alternative buyer.[5]

In summary, there is not one particular product characteristic that makes LCs more desirable. Rather it is an array of factors that determine product-specific demand for trade insurance. We will come back to this issue later in this section when we examine the link between *LC-Int* and product characteristics.

[4]The only exception to this may be fraud. For example, a dishonest seller may present documents which seem to comply with the LC and receive payment, only for it to be later discovered that the documents are fraudulent. This would place the risk on the buyer, but it also means that the issuing bank must be stringent in assessing whether the presented documents are legitimate.

[5]Obviously, factors specific to the partner country and the trading firms matter, but these will be purged from our index, as explained later.

2.3 Why constructing *LC-Int* using Turkish data is appropriate

While constructing our *LC-int* indicator on observations based solely on Turkish trade might reflect some specificities of the country's productive and financial systems, we believe that this does not detract from the fact that the index contains general and useful information on patterns pertaining to products traded around the world.

There are several considerations in choosing the data to be used for constructing the *LC-int* measure. First, one would like to use information from a country with a large trading portfolio in order to maximize the product coverage of the index. Second, one would like to focus on a country with a reasonably well developed banking sector that is capable of both issuing and confirming LCs. At the same time, it is useful to choose an emerging market rather than a G7 country, as less than perfect contract enforcement increases the need for using LCs on the import side, thus increasing prevalence of LCs and amplifying variation across products. Finally, one needs to choose a country where data on trade financing terms are available.

Turkey fulfills all of the criteria listed above. With its population of over 80 million, Turkey is one of the most important emerging markets. It is a large open economy trading more than 1,000 4-digit HS products with more than 200 countries. Although its institutions have been improving, they are still at the level representative of an emerging market.

During the sample period that we use to construct *LC-Int* (2003-2006), Turkish banking system was healthy, with strong balance sheets, low levels of non-performing loans, and capital levels above regulatory minima. This was possible thanks to a comprehensive reform program in the financial sector backed by the International Monetary Fund in the aftermath of the 2001 crisis and strong commitment by the Turkish authorities to harmonization with the EU acquis. The period is also characterized by high growth rates and rising incomes, with real per capita income growth averaging at about 6% per annum. Such strong economic performance and successful economic reforms, accompanied by ample global liquidity, led to a significant surge in foreign direct investment into Turkey. The banking sector benefited from such inflows, and as a result, the share of total banking sector assets held by foreigners reached 25%.

During the sample period, about 20% of the total value of Turkish imports and 15% of exports used LCs. These figures are very close to the use of LCs by importers located in middle income countries – which include Turkey– as reported by Niepmann and Schmidt-Eisenlohr (2017) based on SWIFT data.

Most importantly for our purposes, Turkey is unique among emerging markets and developed countries in mandating reporting of financing terms in all international trade

transactions. To the best of our knowledge no other country collects such information for both imports and exports. Moreover, reporting of financing terms in Turkey has to be backed by documentation, which mean that the data collected are highly reliable.

Our index will be constructed using data on both import and export flows, which means it will capture demand for LCs from exporters in a large number of countries around the world selling to Turkey and as well as Turkish exporters supplying a variety of countries. Thus we would expect it to be fairly representative of the global demand for LCs. Focusing on Turkish exports to a variety of markets (where LCs are issued) will also mean that we should not be concerned about specificity of the Turkish financial sector affecting the index.

Finally, the econometric results presented in the following sections show that our indicator has strong explanatory power for the patterns and trends in international trade flows that do not involve Turkey.

2.4 Constructing the *LC-Int* index

We construct our *LC-Int* measure using confidential micro-level international trade data from Turkey. The data set is provided by the Turkish Statistical Institute and covers the universe of Turkey's imports and exports. It includes information on the monthly value of imports (including freight and insurance costs) and exports (reported on f.o.b. basis) as well as the breakdown of financing disaggregated by the importing/exporting firm, 8-digit HS product code, country of origin/destination. Most importantly for our purposes the dataset distinguishes between the four main financing terms: open account, cash in advance, documentary collection, and letter of credit.

Our *LC-Int* index is constructed based on the intensity of the LC use in both import and export transactions. To avoid the period of the recent financial crisis, we construct our measure based on figures for 2003-2006. We pool exports and imports transactions together to eliminate the possibility that particularities of the Turkish financial sector affect availability of LCs across products.

During the period under consideration, transactions relying on LCs were found in 92% of the 4-digit HS products, with the average share of LC-backed trade across all 4-digit HS product categories reaching 9%. There exists, however, considerable heterogeneity in the use of LCs across products/industries, which we exploit to construct our *LC-Int* measure.

To construct *LC-Int*, we first estimate the following regression using monthly data for the

2003-2006 period:

$$\mathbb{1}\{p = LC\}_{fikcm} = \alpha_{ct} + \sum_{y=1}^{12} \mathbb{1}\{month = y\} + \alpha_{k4} + \epsilon_{fikcm}, \quad (1)$$

where the dependent variable is a binary variable that takes on the value one when the payment method (p) is LC, and zero otherwise for trade flow $f = \{import, export\}$ by Turkish firm i, 8-digit HS product k with a trade partner located in country c in month-year m. We add country-year fixed effects (α_{ct}), 4-digit HS product fixed effects (α_{k4}) and dummies for calendar months to capture seasonal effects. The estimated product fixed effects capture trade insurance intensity of each 4-digit HS product.[6] By construction, $\hat{\alpha}_{k4}$ is orthogonal to country-level factors.

2.5 *LC-Int* versus other product characteristics

Our *LC-Int* index is available for 1,196 goods, of which 188 are agricultural and agri-food products. In Figure 1, we graph *LC-Int* against six other product characteristics.

As mentioned earlier, capital goods and durable consumer goods tend to rely more on LCs.[7] Products that tend to be shipped by sea also use LCs more intensively.[8] This could be explained by the fact that maritime transport is slow and the probability of default increases with shipping time (Berman et al., 2013). A longer shipping time also increases the risk of an adverse exchange rate or price movement and thus may prompt one of the trading partners to try to renegotiate the contract.

Products that tend to be shipped in larger volumes use LCs more intensively.[9] This pattern is consistent with the findings of Niepmann and Schmidt-Eisenlohr (2017) based on SWIFT data. Trading partners may have a greater incentive to insure larger shipments. Moreover, as bank LC fees include a fixed component when issuing or confirming LCs, purchasing an LC is relatively cheaper for products that tend to be traded in larger volumes.

In contrast, relationship stickiness, defined as the average duration of a trading relationship observed in a given product (a measure developed by Martin et al. (2020)) is negatively correlated with the LC use. This is intuitive, as long-term trading relationships

[6] We drop cases where the the number observations per 4-digit HS product code is less than 10.

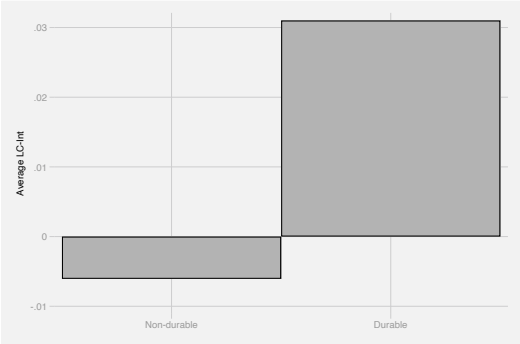
[7] Durability and product types are given by the classification by broad economic categories (BEC) provided by the United Nations Statistics Division.

[8] We use the 4-digit HS product-specific share of ocean transport in total exports from the EU-27 to the US in 2005 based on Comext (Eurostat) data.

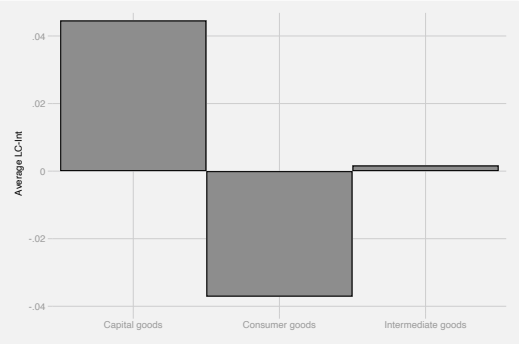
[9] The indicator of shipment size by 4-digit HS product is based on French monthly custom declarations for 2008. It is defined as the logarithm of the median value of monthly French firm-level export values, after controlling for destination and firm fixed effects.

Figure 1: Average *LC-Int* and other product characteristics

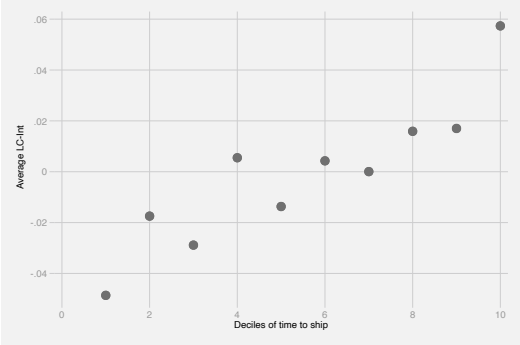
(a) Durable goods



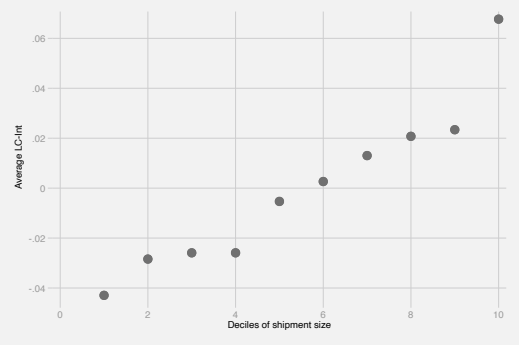
(b) Product types



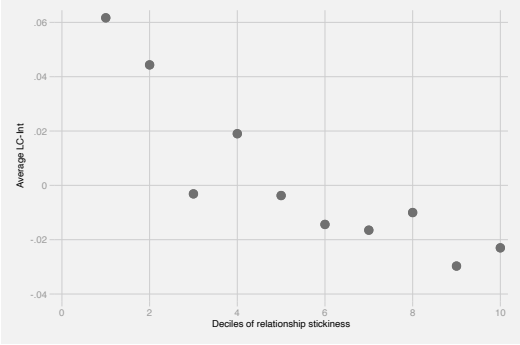
(c) Share of maritime shipment



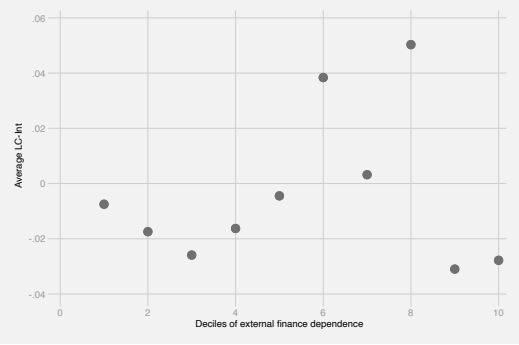
(d) Shipment size



(e) Relationship stickiness



(f) External finance dependence

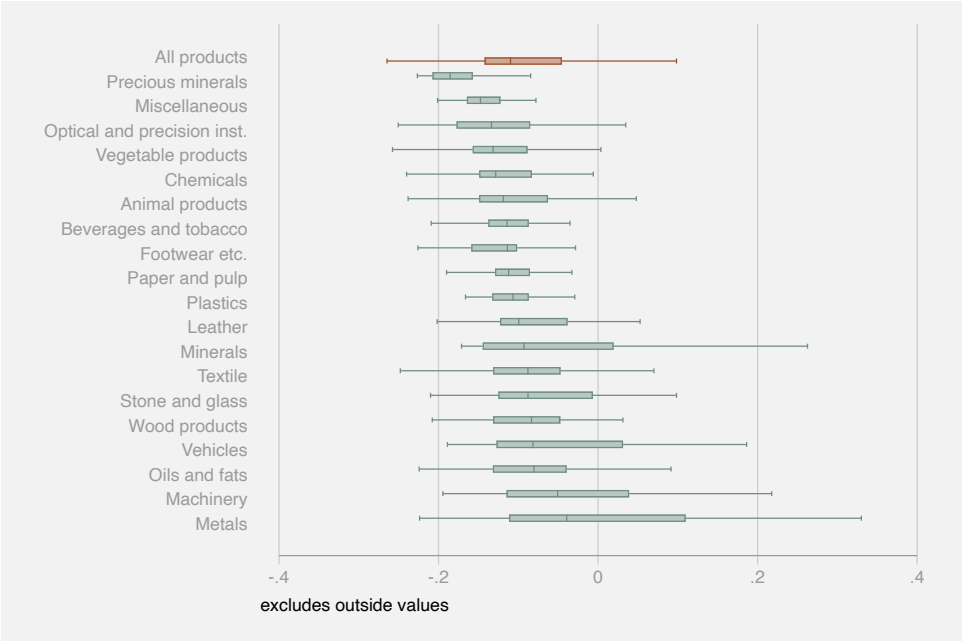


Notes: The figure shows the average value of *LC-Int* for each category or decile as stated on the x-axis. *LC-Int* is demeaned in the full sample to have a zero mean.

are associated with greater trust between the trading parties.

Finally, *LC-Int* exhibits no correlation with the widely used industry-level measure of dependence on external financing constructed by Rajan and Zingales (1998). This is not surprising, as *LC-Int* is designed to capture something very different. The external finance dependence measure captures the amount of desired investment that cannot be financed through internal cash flows generated by the same business, while *LC-Int* captures the need to insure sales against non-payment and is not directly related to the firm's or industry's financing needs.

Figure 2: Median, 25th and 75th percentiles of *LC-Int*, by industry



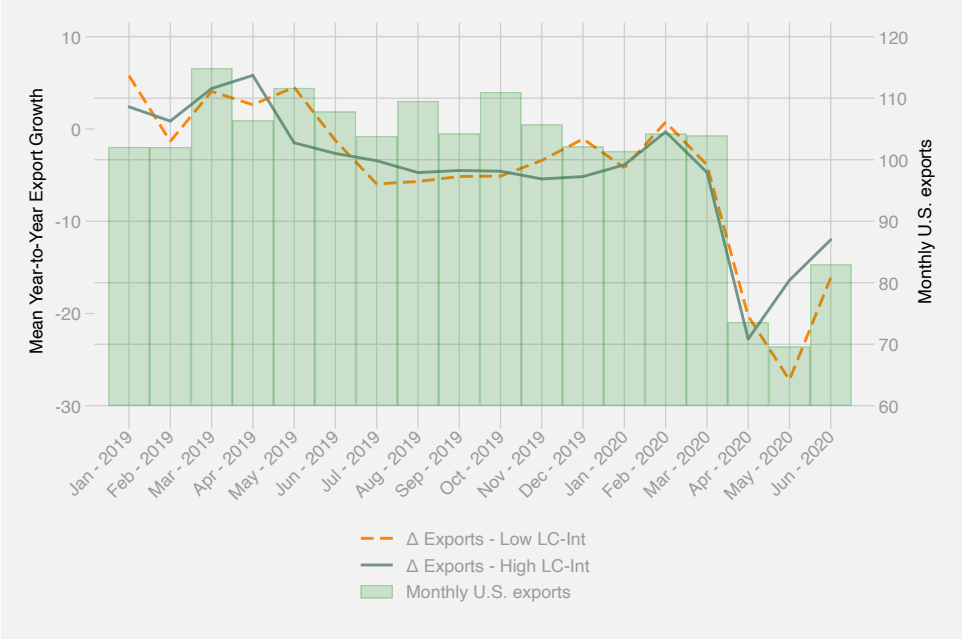
Notes: The figure shows the median value of *LC-Int* for each industry. The box sizes show the range from the 25th to the 75th percentile. Whiskers show the higher (lower) adjacent value, i.e. upper (lower) quartile +(-) 1.5 $\times$ interquartile range.

Figure 2 shows the median value of LC-int for all products as well as by broad product category. The products with the highest values of *LC-Int* include metals and minerals (such as ferrous products, tar, crude petroleum oils, pitch coke, etc.), as well as machinery and transport vehicles (such as, rail locomotives). The former group of products often involves bulk shipments going by sea. The latter products tend to be customized. As visible in the figure, values of LC-Int varies widely from one HS4 product to another, even within the same broad product category.

3 The Covid-19 Pandemic and Trade

The economic downturn induced by the COVID-19 pandemic has led to a large decline in global trade in April and May of 2020 (see Figure 3). The pandemic was a time of heightened uncertainty increasing the risk of non-payment for shipped exports and non-delivery of pre-paid imports. However, there were no reported shortages of the supply of bank financing. Therefore, we expect that products that traditionally rely more on LCs exhibited greater resilience relative other products during that time.

Figure 3: The collapse of U.S. exports during the Covid-19 pandemic



3.1 Data and empirical specification

We use monthly data on US exports, provided by the International Trade Centre, for the period April 2017 to June 2020. The dataset reports the value of monthly export flows from the US to 70 destination countries, disaggregated at the 4-digit HS product level.[10] Using these detailed data, we examine whether exports of products relying heavily on LCs exhibited more resilience than other flows at the height of the first wave of the pandemic.

[10]These are the largest world importers, for which detailed monthly data are available. The sample excludes Turkey.

We estimate the following specification:

$$\Delta \ln(\text{Exports}_{dpym}) = \sum_{l=2}^{6} \beta_l \text{ LC-Int}_p \times Y2020M_{ym}^{l} + \delta_{dym} + \delta_{py} + \delta_{pm} + \varepsilon_{dpym}. \quad (2)$$

where the dependent variable is the change in the logarithm of US exports of product p to country d in month m of year y with respect to the same month of the previous year. Our coefficients of interest (β_l) capture the influence of product LC-intensity on export performance during the COVID crisis. A positive coefficient on β_l would suggest greater resilience of products typically relying on LCs, thus providing support for our hypothesis.[11]

We include an extensive set of fixed effects. First, we allow δ_{dym} to absorb any variation in the year-on-year growth of exports in a given country in a given time period (year-month), such as slowdown in the national economy and lockdowns. Second, we control for product-specific changes in US exports in a given year with δ_{py} fixed effects. Finally, we account for product-specific seasonality with the inclusion of δ_{pm} fixed effects. We cluster standard errors by product to allow for possible correlation between disturbances of trade flows within particular products.

3.2 Estimation results

The estimation results are reported in Table 1. In the first column, we use a single indicator variable $Post_{ym}$ which pools together all months after the start of the pandemic (i.e. February 2020). The coefficient estimate on the interaction between the post-Covid-19 dummy and our *LC-Int* measure is positive and statistically significant. This result is in line with our prior that exports of products that traditionally rely more on LCs were more resilient to heightened uncertainty relative to other products during the pandemic.

Column 2 reports the results from estimating equation (2). During the post-Covid-19 period, a positive and statistically significant coefficient on the interaction term is observed in April and May of 2020, the period when the number of cases peaked globally and the global and US exports collapsed (see Figure 3). The estimates suggest that a 1-standard deviation increase in *LC-Int* was associated with 3.2 and 4 log-points larger increase in exports in April and May 2020, respectively.

In column 3, we add interactions between indicators for February through June 2020 and other product characteristics, such as indicator variables for consumer goods, non-differentiated goods, and consumer durables, as well as continuous variables capturing

[11] We include interactions with indicators for February through June. June is the last data point available. January is the month used as the base period.

Table 1: Trade in *LC-Int* Products during the Covid-19 Pandemic

Dep. Var.: $\Delta \ln(Exports_{dpym})$	(1)	(2)	(3)	(4)	(5)
LC-Int$_p\times$	**0.182c**				
Post$_{ym}$	(0.100)				
LC-Int$_p\times$		0.148	0.095	0.109	
Y2020M2$_{ym}$		(0.116)	(0.135)	(0.138)	
LC-Int$_p\times$		0.048	0.027	0.035	
Y2020M3$_{ym}$		(0.118)	(0.144)	(0.147)	
LC-Int$_p\times$		**0.243c**	0.240	0.257	
Y2020M4$_{ym}$		(0.136)	(0.160)	(0.164)	
LC-Int$_p\times$		**0.304b**	**0.277c**	**0.314b**	
Y2020M5$_{ym}$		(0.131)	(0.150)	(0.150)	
LC-Int$_p\times$		0.156	0.081	0.115	
Y2020M6$_{ym}$		(0.123)	(0.141)	(0.141)	
LC-Int$_p\times$					**0.200c**
HighCOVID$_{dym}$					(0.103)
LC-Int$_p\times$					0.037
LowCOVID$_{dym}$					(0.119)
No. Obs.	634136	634136	610005	607597	634136
R^2	0.044	0.044	0.043	0.043	0.044
Fixed effects	dym	dym	dym	dym	dym
	py,pm	py,pm	py,pm	py,pm	py,pm
Interactions w/ product charact.	No	No	Yes	Yes	No
Interactions w/ external finance dep.	No	No	No	Yes	No

Notes: Other product characteristics are dummy variables for consumer goods, non-differentiated goods, and consumer durables, as well as contract intensity, share of ocean shipping, average shipment size, relationship stickiness and income elasticity. HighCOVID (LowCOVID) denotes countries with Covid-19 cases above (below) the median in a given month of 2020. Significance levels: c: p$<$ 0.1, b: p $<$ 0.05, a : p $<$ 0.01. Standard errors, clustered by 4-digit HS codes, are shown in parentheses.

share of maritime shipping, average shipment size, relationship stickiness, income elasticity and contract intensity.[12] We do so to ensure that the effect we capture is really related to product reliance on LCs rather than other product characteristics that may influence differential demand for a given product or a differential ability of producers to ship a given product during the pandemic. The size of the coefficient estimates on the variables of interest are very close to the baseline estimates. However, they are less precisely estimated due to the large number of variables added to the specification (8 variables $\times$ 5 monthly dummies).

In the next column, we additionally include interactions between the monthly dummies and the external finance dependence measure. The coefficient estimates on the variables of

[12]Contract intensity index, built by Nunn (2007), measures proportion of differentiated products among an industry inputs. We use income elasticities as estimated by Caron et al. (2012).

interest are more sizeable in this specification. Finally, the last column exploits the intensity of the pandemic at the level of a destination country. We split countries into $LowCOVID$ and $HighCOVID$ groups according to whether the number of reported COVID-19 cases in a given month was below or above the sample median. The results imply that our results are driven by exports to countries with a large number of reported COVID-19 cases. This test increases our confidence that our findings are driven by the pandemic rather than some other factors.

4 Validation Exercise: The Great Trade Collapse

To validate whether our *LC-Int* index really captures product reliance on LCs, we focus on another episode of a rapid decline in global trade flows, namely the Great Trade Collapse, which took place during the Global Financial Crisis of 2008-09. This setting is particularly suitable as a validation exercise because (i) the financial crisis caused severe disruption to the supply of LCs in many countries and thus we expect LC-intensive products to register a greater decline in trade to the affected destinations; (ii) in many, but not all, countries it was associated with recessions, which will allow us to run a horse-race between the impact of the LC supply shock and heightened uncertainty caused by the economic downturn.

The reasons for the severe crunch in the supply of LCs are summarized well by the industry report (ICC Banking Commission (2009), page 20, emphasis added):

> *As the financial crisis unfolded,* ***the availability of trade finance declined*** *and* ***its cost increased*** *because of* ***growing liquidity pressure*** *in mature markets, the* ***general scarcity of capital****, unprecedented* ***increases in the cost of funding*** *and a perception of* ***heightened country and counterparty risks****. The contraction in trade finance was also fueled by the* ***loss of critical market participants, such as Lehman Brothers****, a* ***drying up of the secondary market*** *for short-term exposure (as banks and other financial institutions deleveraged) and the volatility of commodity prices. Banks in developed countries are also required to* ***hold more capital at home*** *and are* ***providing less liquidity to banks in emerging economies****. In addition,* ***the implementation of the Basel II Accord*** *on banking laws and regulations, with its increased risk sensitivity of capital requirements in an environment of global recession, has added pressure on banks to hold back on trade finance.*

Not surprisingly, where trade insurance remained available, its costs increased. Over

half of respondents surveyed by ICC Banking Commission (2009) indicated an increase in issuance fees for LCs. 58% reported an increase in confirmation fees.

4.1 Data and empirical specification

Our analysis is based on bilateral US exports data for the 2003-2009 period available from BACI (see Gaulier and Zignago (2010) for more details). The dataset covers about 100 importers and more than a thousand 4-digit HS product codes. As before, we exclude Turkey from the analysis. We merge the bilateral trade data with data on bank crises obtained from Laeven and Valencia (2013).

Our econometric specification examines whether exports of products that rely more heavily on LCs reacted differentially to bank crises and economic crises in importing countries. We estimate the following equation:

$$\begin{aligned} \Delta \ln(\text{Exports}_{dpy}) &= \beta\ \text{LC-Int}_p \times \text{Econ\_Crisis}_{dy} + \gamma\ \text{LC-Int}_p \times \text{Fin\_Crisis}_{dy} \\ &\quad + \delta_{py} + \delta_{dy} + \varepsilon_{dpy}. \end{aligned} \tag{3}$$

where $\Delta \ln \text{Exports}_{dpy}$ is the annual change in the logarithm of exports of 4-digit HS product p from the US to the destination country d in year y. Econ_Crisis$_{dy}$ is an indicator variable taking on the value of one if the destination country's GDP growth was negative in year t, and zero otherwise. Fin_Crisis$_{dy}$ is an indicator variable equal to 1 if the destination country experienced a bank crisis in year y, and 0 otherwise. First differencing eliminates time-invariant product and destination specific factors that affect the level of bilateral export flows. We control for a large number of possible confounding factors with product-year and destination-year fixed effects. We cluster standard errors by product to allow for possible correlation between disturbances of trade flows within particular products.

As before, we expect to obtain a positive coefficient on the interaction term between *LC-Int* and the indicator for an economic crisis in the destination country, which in line with the view that products insured by LCs are more resilient to heightened uncertainty about the economic situation. In contrast, we expect a negative coefficient on the interaction term between *LC-Int* and an indicator for a bank crisis in the destination country. Bank crises make it difficult, if not impossible, to purchase LCs and thus adversely affect exports of products that typically rely heavily on LCs. As we do not know precisely when the 2007-2008 financial crisis ended in each country, we drop all years after 2009.[13]

[13]We eliminate Nigeria from the sample as a bank crisis started there in 2009.

4.2 Estimation results

Table 2: Trade in *LC-Int* Products during the Great Trade Collapse

Dep. Var.: $\Delta \ln(Exports_{dpy})$	(1)	(2)	(3)	(4)	(5)
LC-Int$_p\times$	**0.117b**		**0.142b**	**0.180a**	**0.187a**
Economic Crisis$_{dy}$	(0.059)		(0.058)	(0.061)	(0.062)
LC-Int$_p\times$		**-0.145a**	**-0.163a**	**-0.135b**	**-0.127b**
Financial Crisis$_{dy}$		(0.049)	(0.049)	(0.055)	(0.056)
Observations	331338	331338	331338	331338	330316
R^2	0.069	0.069	0.069	0.069	0.069
Fixed effects	dy,py	dy,py	dy,py	dy,py	dy,py
Interactions of Economic Crisis dummy w/ other product charact.	No	No	No	Yes	Yes
Interactions of Financial Crisis dummy w/ other product charact.	No	No	No	Yes	Yes
Interactions of Economic Crisis dummy w/ external finance dependence	No	No	No	No	Yes
Interactions of Financial Crises dummy w/ external finance dependence	No	No	No	No	Yes

Notes: See the notes for Table 1.

The estimation results provide support for our hypotheses. Column 1 in Table 2 suggests that exports of products with higher *LC-Int* tend to be more resilient to economic crises, which is in line with our earlier findings. Column 2 provides support to our hypothesis that banking crises make it difficult for importers to purchase an LC and thus exports of products relying heavily on LCs decline relative to other exports when destined for countries experiencing a banking crisis. In column 3, both interaction terms enter the same regression and retain their significance levels. The coefficients increase in magnitude relative to the previous two columns. These results suggest that financial and economic crises have distinct effects on exports of products relying heavily on LCs.

The estimated effects are statistically and economically meaningful. When the two types of crises are considered in isolation, a one-standard-deviation increase in the *LC-Int* measure (i.e., 0.13) is associated with a 2.1 log-points larger decline in trade when a financial crisis hits the importing country and 1.9 log-points smaller decline when the importing country is experiencing an economic crisis.

Since the two types of crises may have distinct effects on products with different characteristics, we allow both types of crises to have a differential effect on other product characteristics such as durability, contract intensity, product reliance on maritime transport, average shipment size, contract intensity, and relationship stickiness as well as being a consumer good or a differentiated product. As visible in column 4, our results are robust to including these additional interaction terms.

In the last column, we additionally allow for interaction terms between our crisis indicators and dependence on external financing. Again our results remain robust to these additional controls.

5 Conclusions

Times of crises, be it economic or financial, are often associated with a collapse in international trade flows. This paper draws attention to the fact that product reliance on LCs has a direct impact on resilience of trade flows. In particular, during economic crises, which are periods of increased uncertainty, exports of products insured through LCs are more resilient. In contrast, financial crises, which negatively affect supply of LCs, are associated with a greater decline in trade of LC-intensive goods. These patterns are demonstrated using detailed data on US exports around the time of the COVID-19 pandemic and the Global Financial Crisis.

At the core of our analysis is a newly created measure of product-level reliance on LCs in international trade. This index, available for 1,196 HS4 products, is correlated in intuitive ways with some product characteristics, such as, shipment size, time to ship, relationship stickiness, and others. But the reliance on LCs is due to an array of factors rather than a single product characteristic. This index can be useful in research going beyond international trade, for instance in applications related to finance and economic growth.

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