Destination trade credit and exports: Evidence from cross-country panel data

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ABSTRACT

We examine the impact of destination trade credit (DTC) on exports, using cross-country panel data for 2000–2018 and focusing on financing by foreign trade partners. We find DTC promotes a country's exports disproportionately more in liquidity-dependent industries, a consistent result after addressing endogeneity and various robustness tests. DTC mainly promotes trade by increasing export quantity, while lowering export prices and export varieties. Further, the effect is greater if the level of financial development of the source country is lower, but smaller if the product complexity of industries is higher. During the 2008 global financial crisis, DTC also contributes to export expansion, but the effect is relatively small.

1. Introduction

Financial development is an important determinant of a country's comparative advantage. While the existing literature mainly focuses on the linkage between formal finance and exports (Beck, 2002, 2003; Manova, 2013), informal finance as an alternative source of financing is also important. According to IMF (2009), about 60% of international transactions is settled through informal finance, including *deferred payment* and *cash in advance*. However, little is known about its impact on export activities. This paper aims to partially fill the gap, from the side of *export destinations*.

An export firm may be financed via *destination trade credit* (DTC), i.e., financing by its trading partners in the destination countries, in particular, by *cash in advance* and *deferred payment*. The route of cash in advance is clear, which is provided by the importer to the exporter where partial payment is made before delivery. A typical example is that, in the wake of chip supply shortage, chip buyers such as Apple and Qualcomm, were expected to pay TSMC (Taiwan Semiconductor Manufacturing Co., Ltd.) NT$150 billion in advance in 2022 (about 9% of TSMC's revenue in 2021).[1]

A more indirect way is deferred payment, which is reflected in the production process of exporters, who may need to import intermediates or capital goods. If such imports are purchased from the suppliers located in the export destination

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[1] https://money.udn.com/money/story/12950/6021414?from=edn_next_story. TSMC is one of the largest semiconductor foundries in the world. According to TSMC's annual report, the revenue in 2021 is about NT$1.59 trillion.

country, the suppliers may allow the exporters to defer payment. In this case, exporters are financed by their upstream trading partners in the destination country. SMIC (Semiconductor Manufacturing International Corporation) is a semiconductor foundry in China, with a quarter of its customers located in the US.[2] It often imports equipment from the US to produce chips. According to transaction information disclosed by SMIC in February 2020, it purchased equipment in the form of deferred payment from Lam Research Corporation (US), in the amount of $601 million.[3]

Given the above cases, in the present paper, we employ the identification strategy proposed by Rajan and Zingales (1998) to explore the causal effects of DTC on exports. The Rajan-Zingales approach, which combines the cross-country variation with the cross-industry variation, is similar to difference-in-differences (DID) method. The first difference comes from the level of DTC across countries. As detailed transaction-level data are not available for most countries in our sample, we use the Balance of Payments (BOP) which contains information on cross-border deferred payment and cash in advance to construct the measure of DTC. The second difference stems from the financial vulnerability across industries, measured by the industry's dependence on short-term external liquidity.

Using the bilateral trade data provided by CEPII-BACI, we find that DTC promotes a country's exports disproportionately more in liquidity-dependent industries, and this result passes a number of robustness checks, including placebo and instrumental variable tests. We also find that DTC lowers the export prices and narrows the range of export products, and thus, the promotion effect is mainly attributed to the increase of export quantity. Further investigation reveals that the promotion effect exhibits heterogeneity. The lower the level of financial development in the source country, the greater the trade promotion effect, and the higher the product complexity, the smaller the trade promotion effect. Finally, during the 2008 global financial crisis, DTC also contributes to export expansion, but the effect appears to be relatively weak.

The paper is related to two strands of literature. The first strand of literature studies the role of informal finance. Existing studies show that informal finance can make up for deficiencies in formal financial development and have important effects on firm behavior (Fisman and Love, 2003; Allen et al., 2019). Long and Zhang (2011) reveal that domestic trade credit helps to promote exports by alleviating firms' financial constraints, while taking no account of the role of international trade credit. However, trade credit is widely used in international trade (IMF, 2009). The payment contracts used by firms in international trade are usually classified into exporter finance (deferred payment or open account), importer finance (cash in advance) and bank finance (letter of credit). The former two are related to international trade credit. Schmidt-Eisenlohr (2013) studies the choice of optimal export payment contracts. Antràs and Foley (2015) and Demir and Javorcik (2018) show that the choice of payment contracts is related to the enforcement of contract and market competition, respectively. They focus on the determinants of the choice of payment contracts, while we are interested in how DTC affects firms' export behavior. Although Chor and Manova (2012) point out that informal financing obtained from destination countries is important for exports, they have not provided direct empirical evidence. The present paper thus complements the previous studies by investigating the role played by informal finance in *international* transactions.

The second strand examines the impact of financial development on exports. Some studies have found that domestic financial development is an important source of comparative advantage (Beck, 2002, 2003). Manova (2013) finds that countries with more developed financial markets export more in financially vulnerable sectors. Moreover, financial development can affect the price and quality of export products (Fan et al., 2015). Minetti et al. (2021) argue that domestic financial structure also matters. In addition to domestic financial development, Ma and Xie (2019) find that the financial development of destination countries is also important in shaping bilateral trade patterns. Claessens and van Horen (2021) show that exports tend to be larger when banks from the destination country are present in the source country. Most of the existing literature focuses on the impact of formal financial development in source or destination countries, but little is known about the impact of the informal finance on export activities. Our paper attempts to fill this gap from the perspective of destination trade credit.

Perhaps our paper is the closest to Eck et al. (2015), who study the role of international trade credit in exports, but is different from them in two aspects. First, they suggest that cash in advance is helpful for exports by overcoming difficulties arising from information asymmetry. We consider not only cash in advance but also deferred payment in the theoretical discussion and explore the channel through which DTC eases financing constraints in the empirical studies.[4] Second, they treat the total cash in advance from domestic and foreign trading partners as a proxy variable of international trade credit using a single country's data. In contrast, we use information on the balance of payments from a large sample of countries over almost 20 years, which enables us to distinguish between trade credit related to international trade and that related to domestic business, and draw more general conclusions.

The contributions of this paper are reflected in three aspects. First, the existing literature on finance and trade pays less attention to the role of informal finance and the literature on informal finance takes less account of its role in international trade. We complement them by examining the effects of DTC on exports. Second, the present study uses information on the balance of payments to construct DTC indicators. The sample covers many countries and has a long time span, allowing for more general conclusions. Third, we show that DTC is more effective in promoting exports from countries with lower levels

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of financial development, which provides a new perspective to explain why countries with underdeveloped formal finance still achieve rapid export growth.

The remainder of this paper is organized as follows. Section 2 gives a theoretical discussion and introduces the identification strategy. Section 3 presents the baseline estimation results, the endogeneity discussion, and a series of robustness checks. Section 4 makes extended analyses, including the heterogeneous effects of DTC and the effects on other dimensions of export performance. Section 5 concludes.

2. Theoretical Discussion, data and identification strategy

In this section, we first have a theoretical discussion on how DTC affects exports and then introduce the data sources, variable construction and the identification strategy.

2.1. Theoretical discussion

The basic idea that DTC is helpful for export expansion is that trade credit, as an important source of financing, can alleviate the financing constraints faced by firms and thus help to promote export activities of them. Compared to domestic sales, export activities usually involve higher fixed and variable costs on the one hand, and on the other hand, the payment of international trade takes longer time and faces higher risks. Therefore, firms with sufficient liquidity have a better chance to become exporters (Chaney, 2016). However, firms often find it difficult to meet the requirements of export activities with their own funds, thus requiring the external financial support.

There are two types of external financing sources for firms, one is formal finance, such as bank loans, and the other is informal finance, such as trade credit. In the literature about finance and international trade, most researches concern the role of formal financial development, and the consensus is that formal financial development has a significant promoting effect on export, especially in industries with high dependence on external finance (Beck, 2002; Beck, 2003; Manova, 2013). However, informal finance, as another important source of financing, may also affect export activities (Iacovone et al., 2019). Unlike formal finance, informal finance mainly meets the short-term financing needs of firms. In addition to long-term financing, firms engaged in export activities also have short-term financing needs. Trade credit can play a role in this regard. When exporters face short-term liquidity constraints, trading partners of the destination country may provide financing support through trade credit, which is conducive to the export expansion (Chor and Manova, 2012; Foley and Manova, 2015).

DTC as a type of informal finance can make up for deficiencies in formal finance. As mentioned above, it can exhibit in two forms. One is cash in advance, and the other is deferred payment, as illustrated in Fig. 1.

Studies have found that buyers with sufficient liquidity often pay in advance to sellers to ensure the production and timely delivery of goods (Mateut, 2014). Similarly, as in Fig. 1, if the importer provides funds to the exporter in the form of cash in advance (Route 1), the exporter's financing constraints can be reduced, which helps to achieve a smooth transaction.

A different and indirect way (Route 2) is reflected in the production process of exporters, who need to purchase intermediate or capital goods from the destination country. Suppliers in the destination country may provide informal financing by allowing exporters to defer payment.

2.2. Data and variables
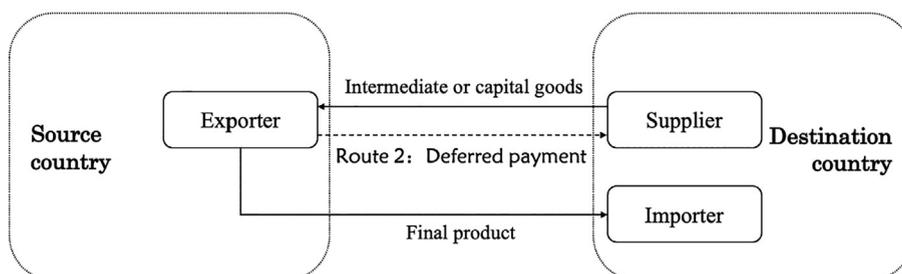
2.2.1. Destination trade credit

The measurement of destination trade credit is a key issue in our empirical analysis. Ideally, we would have detailed transaction-level data so that we could directly construct a proxy variable. However, such data are not available for most countries. Previous studies of trade finance are either based on the transaction information in a single country (Antràs and Foley, 2015), or have treated the total cash in advance that firms receive from domestic and foreign trading partners as a proxy variable of destination trade credit (Eck et al., 2015). In contrast, in the present paper, we use the balance of payments (BOP) data published by the IMF to construct the measurement of destination trade credit. The advantage of this approach lies in two aspects. First, BOP contains information on cross-border deferred payment and cash in advance, which could capture the scale of informal finance used in international trade more accurately. Second, the BOP data are publicly available for a large sample of countries, allowing us to draw more general conclusions.

Specifically, the trade credit and advances account of BOP is divided into asset and liability items, where the asset item records the cash in advance of the importer and the accounts receivable of the exporter. Since this study focuses on the informal financing provided by the destination country to the exporting country, we use the information on assets in the account of the destination country, which reflects the overall scale of destination trade credit. Referring to Imlau (2017) and Carroll

Figure 1: Routes of Destination Trade Credit
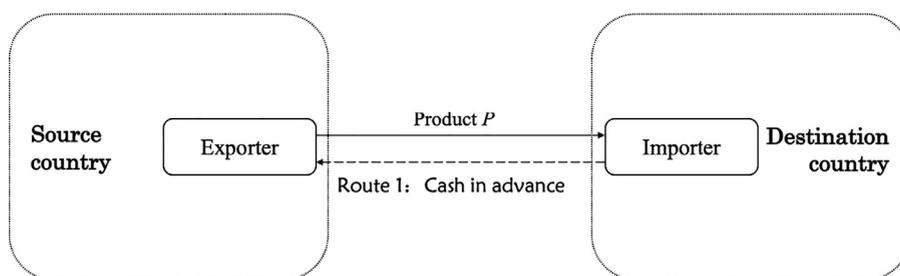
Route 1: Cash in advance

Route 2: Deferred payment

Fig. 1. Routes of Destination Trade Credit. Route 1: Cash in advance. Route 2: Deferred payment. *Notes*: Solid and dotted arrows indicate the moving direction of goods and informal financing, respectively.

and Neumann (2022), we use the ratio of asset to GDP to measure the level of DTC.[5] The advantage is that it is based on widely available data. It may have measurement errors, but such errors will underestimate the impacts of destination trade credit, just like the measurement of financial development and cost of external finance in Raddatz (2006) and Chor and Manova (2012), without exaggerating the impacts.

2.2.2. External liquidity dependence

Based on the literature, external liquidity dependence (*ELD*) is taken to measure industry financial vulnerability, which reflects the degree of short-term financing needs across industries (Levine et al., 2018). This indicator is equal to the percentage of total assets that are financed by trade credit. Its value comes from Fisman and Love (2003), who calculated this percentage using the data of American firms from 1980 to 1989. In the literature employing Rajan-Zingales approach, it is a common practice to obtain industry level indicators calculated using US data (Foley and Manova, 2015; Minetti et al., 2021; Li and Su, 2022). Firstly, firm-level data for calculating *ELD* are not available for many countries. Using US data provides convenience for empirical research (Manova, 2013). Secondly, the US financial markets are relatively developed and the measure based on US data could reflect the true external liquidity needs across industries (Fan et al., 2015; Minetti et al., 2021). Thirdly, choosing a variable constructed with historical firm data of the US helps to alleviate the endogeneity concern (Bilir et al., 2019). Finally, the Rajan-Zingales approach does not require industries across countries to have identical

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[5] Unfortunately, the available BOP data have not been broken down to the bilateral level or specific forms of informal finance. We only have information of DTC at the destination country level. Maskus et al. (2012) and Maskus et al. (2019) also use similar methods to measure the level of international financial development.

external liquidity dependence, but only requires that their rankings in terms of external liquidity dependence remain stable in each country (Manova, 2013; Manova et al., 2015). This indicator captures the technological dependence of the industry on external liquidity, and is therefore suitable for ranking industries in all countries.

2.2.3. Trade data

The trade data are from the CEPII-BACI database, which provides bilateral trade information at the HS 6-digit product level from 2000 to 2018. We aggregate the trade data to source–destination-ISIC industry-year level. The HS–ISIC correspondence table is sourced from the WITS database, and the product and industry standards are HS1996 and ISIC Rev. 2, respectively. The sample includes 36 ISIC industries with data of external liquidity dependence.[6]

Table 1 reports the summary statistics for a set of key variables used in the paper.

2.3. Identification strategy

We employ the identification strategy proposed by Rajan and Zingales (1998) to empirically test whether DTC affects international trade. This widely used approach makes use of the difference in the level of DTC across destination countries, as well as the difference in external liquidity dependence across industries. Compared to traditional cross-country regressions with country level explanatory variables, this approach combines the cross-country variation in financial development with the exogenous cross-industry variation in financial vulnerability, and is less exposed to endogeneity concerns caused by omitted variables and reverse causality (Foley and Manova, 2015; Bilir et al., 2019). This approach can also be helpful to identify the channels through which the effect takes place (Choi et al., 2018; Huang et al., 2020). In this paper, if DTC promotes export expansion by alleviating liquidity constraints, we expect DTC to have a greater export promotion effect in industries with higher dependence on external liquidity.

Specifically, we construct the following equation:

$$lnExport_{ijkt} = \alpha + \beta DTC_{jt} \times ELD_k + \theta' \boldsymbol{Control} + \gamma_{it} + \varphi_{jt} + \delta_k + \varepsilon_{ijkt} \tag{1}$$

where i and j are the source and destination countries respectively, k is the industry, and t is the year. $lnExport_{ijkt}$ is the natural logarithm of the export value of industry k in country i to country j in year t. We use the consumer price index (CPI) of the US to deflate exports to obtain the real value as in Li et al (2021).

The interaction term $DTC_{jt} \times ELD_k$ is the core explanatory variable. DTC_{jt} is the level of DTC in country j, equal to the asset item in the trade credit and advances account of the country over its GDP. ELD_k is the degree of external liquidity dependence of industry k. If the estimated coefficient β is significantly positive, it means that industries with higher external liquidity demand will benefit more, which is in line with our expectations.

$\boldsymbol{Control}$ represents a matrix of control variables commonly used in the gravity model. It includes the geographic distance between two countries (*lndist*, natural log value), whether the two countries share a common border (*contig*: 1 when bordering each other; 0 otherwise), share a common language (*com_lang*: 1 with a common language; 0 otherwise), have a common legal origin (*com_leg*: 1 with a common legal origin; 0 otherwise), and are in the same regional trade agreement (RTA) (*rta*: 1 in the same RTA; 0 otherwise). Data for the control variables are taken from the CEPII database.

γ_{it} is the source-year fixed effect, controlling for the influence of factors varying at the source-year level. φ_{jt} is the destination-year fixed effect, controlling for the influence of factors varying at the destination-year level and absorbing the effect of DTC_{jt}. δ_k is the industry fixed effect, and ELD_k does not change over time and is absorbed by δ_k. ε_{ijkt} is the error term. We cluster the standard error at the source–destination-industry level.

3. Estimation results and analysis

In this section, we report the baseline estimation results based on Eq. (1), followed by a discussion of endogeneity and robustness checks.

3.1. Baseline estimation results[7]

In Table 2, no control variables are included in column (1), bilateral geographical distance (*lndist*) is included in column (2), and all control variables are included in column (3). The estimated coefficients of the core explanatory variable $DTC \times ELD$ are significantly positive regardless if control variables are included, indicating that the higher the DTC, the more the exports of industries with higher external liquidity dependence, which confirms our prediction.

Regarding the control variables, the estimated coefficient of distance (*lndist*) is significantly negative. Geographical distance can be regarded as trade resistance. The greater the distance, the higher the trade cost. The coefficients for common

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[6] The 36 ISIC industries retained include 27 three-digit code industries and 9 four-digit code industries. See Kroszner et al. (2007) and Manova et al. (2015).

[7] We also aggregate the trade data of CEPII-BACI to the "source–destination-year" level, and conduct regressions using *DTC* as the core explanatory variable. The estimated coefficient of *DTC* is significantly positive, indicating that DTC is beneficial for export expansion. The estimation results are shown in the Appendix A1.

Table 1
Summary statistics.

Variables	Obs	Mean	Std. Dev.	P25	Median	P75
Panel A: Dependent variable						
lnExport	4,197,833	1.256	3.282	−1.312	1.088	3.621
Panel B: Regressor of interest						
DTC × ELD	4,197,833	0.332	1.105	0.047	0.158	0.334
DTC	4,197,833	4.427	12.916	0.738	2.495	4.644
ELD	4,197,833	0.075	0.036	0.060	0.070	0.080
Panel C: Control variables						
lndist	4,197,833	8.431	0.968	7.779	8.698	9.161
contig	4,197,833	0.044	0.206	0	0	0
com_lang	4,197,833	0.140	0.347	0	0	0
com_leg	4,197,833	0.358	0.479	0	0	1
rta	4,197,833	0.326	0.469	0	0	1

Notes: Panel A displays the key dependent variable in the estimations. *Export* (log) are measured in 100,000 USD. Panel B displays the regressors of interest, including *DTC*, *ELD* and the interaction between *DTC* and *ELD*. Panel C displays the control variables.

Table 2
Baseline estimation results.

	(1)	(2)	(3)
DTC × ELD	0.016[**]	0.018[***]	0.017[***]
	(0.007)	(0.007)	(0.007)
lndist		−1.484[***]	−1.168[***]
		(0.005)	(0.006)
contig			0.804[***]
			(0.020)
com_lang			0.541[***]
			(0.013)
com_leg			0.190[***]
			(0.008)
rta			0.503[***]
			(0.009)
Constant	1.250[***]	13.759[***]	10.754[***]
	(0.004)	(0.038)	(0.050)
Source-Year FE	Yes	Yes	Yes
Destination-Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
N	4,197,833	4,197,833	4,197,833
Adj.R²	0.447	0.562	0.570

Notes: Dependent variable is export value (logarithm). Robust standard errors in parentheses, clustered at the source–destination-industry level. ∗∗∗, ∗∗, and ∗ represent significance level at 0.01, 0.05, and 0.1, respectively.

border (*contig*), common language (*com_lang*), common legal origin (*com_leg*) and common RTA (*rta*) are all significantly positive. That is, trade resistance will be reduced if the two countries border each other, share a common language or common legal origin, or are in the same RTA.

The Rajan-Zingales approach focuses on examining the heterogeneous effects of DTC at different levels of external liquidity dependence, which to some extent alleviates the potential endogeneity bias. However, the interaction term as the core explanatory variable could still be endogenous if the external liquidity dependence were picking up other industry characteristics or the level of DTC were picking up other destination features.

We start by examining whether external liquidity dependence (*ELD*) captures other industry characteristics. In Eq. (1), we interact a set of other industry characteristics with *DTC*, and include these interaction terms as additional controls. The first is long-term external finance dependence (*FD*), which is the fraction of capital expenditure not financed with cash flow from operations, capturing the external funding that firms need for long-term investment projects (Manova et al., 2015). If DTC also helps to ease the long-term needs for external finance and *ELD* is correlated with *FD*, the coefficient of the interaction term *DTC* × *ELD* in Eq. (1) will be misestimated. Second, we add the interaction between industry growth opportunity (*Gro*) and *DTC*. It is possible that *ELD* captures information about the growth opportunities of the industry (Fisman and Love, 2007). Also, Raddatz (2006) points out that industries with high liquidity needs might be human capital or R&D intensive. Therefore, the interaction between human capital intensity (*Hum*) and *DTC*, and the interaction between R&D intensity (*RD*) and *DTC*, are included. Finally, referring to Manova (2013) and Ma and Xie (2019), we add the interaction terms of physical capital intensity (*Cap*) and natural resource intensity (*Na*) with *DTC*. In Table 3, whether the interactions are included one by one (columns (1)-(6)), or simultaneously (column (7)), the estimated coefficients of the core explanatory variable *DTC* × *ELD*

Table 3
Controlling for other industry characteristics.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$DTC \times ELD$	0.018***	0.031***	0.045***	0.021***	0.059***	0.069***	0.074***
	(0.007)	(0.007)	(0.008)	(0.007)	(0.008)	(0.008)	(0.009)
$DTC \times FD$	0.002***						−0.001
	(0.000)						(0.001)
$DTC \times Gro$		0.035***					0.057***
		(0.006)					(0.011)
$DTC \times Hum$			0.005***				0.009***
			(0.001)				(0.001)
$DTC \times RD$				0.006***			−0.034**
				(0.002)			(0.015)
$DTC \times Cap$					0.000		−0.031***
					(0.007)		(0.010)
$DTC \times Na$						−0.002***	−0.000
						(0.001)	(0.001)
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Source-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Destination-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4,197,833	4,197,833	3,172,173	4,197,833	3,172,173	3,172,173	3,172,173
Adj.R^2	0.570	0.570	0.579	0.570	0.579	0.579	0.579

Notes: Dependent variable is export value (logarithm). Columns (1)-(5) include respectively the interaction terms $DTC \times FD$, $DTC \times Gro$, $DTC \times Hum$, $DTC \times RD$, $DTC \times Cap$, and $DTC \times Na$. Column (7) includes all the six interaction terms. Robust standard errors in parentheses, clustered at the source–destination-industry level. ***, **, and * represent significance levels at 0.01, 0.05, and 0.1, respectively.

remain significantly positive, and the coefficients are bigger than those in the baseline estimation, indicating that external liquidity dependence is not likely to capture the effects of other industry characteristics.[8]

Next, we examine whether the level of DTC captures other features of the destination country. Referring to the literature, we first include the interaction term between the level of financial development in the destination country (*Fin*, the ratio of private credit to GDP) and *ELD*. In addition, we include the interaction terms between the openness level (*Open*, the proportion of import and export volume in GDP) and institutional environment level (*Rule*, the level of rule of law) of the destination country and *ELD*. In Table 4, the estimated coefficients of the core explanatory variable $DTC \times ELD$ are still significantly positive.[9] Column (5) reports the results when the six interaction terms of *DTC* and the three interaction terms of *ELD* are all included. The coefficients of $DTC \times ELD$ are still significantly positive, and the coefficients are bigger than those in the baseline estimation. Thus from Tables 3 and 4, we can conclude that the problem of omitted variables may not be serious in our model specification.

For newly added interaction terms, only the estimated coefficients of $DTC \times Gro$, $DTC \times Hum$ and $Rule \times ELD$ remain stable in different settings. In Tables 3 and 4, the estimated coefficients of $DTC \times Gro$ are significantly positive, indicating that DTC has a greater effect on exports in industries with more growth opportunities. One possible reason is that industries with more growth opportunities have a greater demand for external funds, leading to a greater impact of DTC on these industries (Fisman and Love, 2007; Ciccone and Papaioannou, 2009). In Tables 3 and 4, the estimated coefficients of $DTC \times Hum$ are significantly positive, indicating that DTC has a greater effect on exports in industries with higher human capital density. The reason may be that industries with high human capital intensity also rely more on external funds, and DTC has a greater impact on these industries (Raddatz, 2006; Ciccone and Papaioannou, 2009). In Table 4, the estimated coefficients of $Rule \times ELD$ are significantly negative. This may be because, in countries with better institutional environment, informal finance and the potential for it to produce positive effects are more limited.

3.2. Endogeneity

To further address endogeneity concerns, we conduct a series of tests in this subsection. Firstly, we use instrumental variables to check the robustness of the estimation results. Secondly, we conduct a placebo test by using Chinese export data. Lastly, we turn to other types of robustness checks.

3.2.1. Instrumental variables

Existing studies have shown that the level of trust is closely related to the development of informal finance (Levine et al., 2018; Iacovone et al., 2019). The willingness of a firm to provide trade credit largely depends on whether it trusts its trading

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[8] The data for external long-term finance dependence and R&D intensity are from Krosner et al. (2007). The data for growth opportunity are from Fisman and Love (2007). The data for human capital intensity, physical capital intensity and natural resource intensity are from Manova (2013).

[9] Data for formal financial development and openness of export destination countries are from the WDI database. Data for institutional environment are from the WGI database.

Table 4
Controlling for other destination characteristics.

	(1)	(2)	(3)	(4)	(5)
$DTC \times ELD$	0.025***	0.035***	0.027***	0.037***	0.087***
	(0.007)	(0.006)	(0.007)	(0.006)	(0.009)
$Fin \times ELD$	−0.019***			−0.007**	−0.001
	(0.002)			(0.003)	(0.004)
$Open \times ELD$		−0.899***		−0.470**	−0.429
		(0.199)		(0.211)	(0.281)
$Rule \times ELD$			−1.009***	−0.789***	−0.574***
			(0.104)	(0.150)	(0.196)
$DTC \times FD$					−0.001
					(0.001)
$DTC \times Gro$					0.052***
					(0.011)
$DTC \times Hum$					0.009***
					(0.001)
$DTC \times RD$					−0.034**
					(0.015)
$DTC \times Cap$					−0.028***
					(0.010)
$DTC \times Na$					−0.001
					(0.001)
Control	Yes	Yes	Yes	Yes	Yes
Source-Year FE	Yes	Yes	Yes	Yes	Yes
Destination-Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
N	3,717,475	4,190,239	4,197,833	3,714,198	2,806,996
Adj.R^2	0.576	0.570	0.570	0.576	0.585

Notes: Dependent variable is export value (logarithm). Columns (1)-(3) include respectively the interaction terms *Fin × ELD*, *Open × ELD*, and *Rule × ELD*. Column (5) includes all the three interaction terms. Column (5) includes all the interaction terms between the six industry-level variables and *DTC* and the interaction terms between the three destination-level variables and *ELD*. Robust standard errors in parentheses, clustered at the source–destination-industry level. ***, **, and * represent significance at 0.01, 0.05, and 0.1, respectively.

partners. Since the present paper concerns the impact of *DTC*, its instrumental variables should reflect the level of trust in the destination country. The World Value Survey (WVS) provides information about the level of trust in different countries. We use the "degree of trusting neighbors" in the questionnaire as the instrumental variable of *DTC*.[10] Generally speaking, if the residents of a country have low trust in their neighbors, they are less likely to provide credit to trading partners in foreign countries. Moreover, the level of trust in neighbors does not directly affect bilateral trade.

Specifically, referring to Levine et al. (2018), we use the proportion of respondents who answered "completely trust" on whether they trust their neighbors as a measure of the level of trust in the destination country (*Trust*).[11] We use *Trust* in WVS Wave 5 (2005–2009) to measure the level of trust for 2000–2009, *Trust* in WVS Wave 6 (2010–2014) for 2010–2016 and *Trust* in WVS Wave 7 (2017–2022) for 2017–2018. This approach is based on the view that trust changes slowly over time and exhibits a high degree of persistence (Levine et al., 2018).

Then, we multiply *Trust* and *ELD* as the instrumental variable of *DTC × ELD*. Column (1) of Table 5 reports the estimation results for 2000–2018. The first stage shows that the instrumental variable is positively correlated with *DTC × ELD*, and the *Kleibergen-Paap F-stats* also suggests that the regression passes the weak identification tests. The second stage shows that, the estimated coefficient of our interested interaction term remains significantly positive.

The level of trust in the destination country may also affect export through other factors, such as formal financial development and institutional environment. In this case, using the level of trust as the instrumental variable of *DTC* may not satisfy the exclusion restriction. In response to this consideration, we turn to the heteroskedasticity-based identification approach proposed by Lewbel (2012).[12] This approach has also been widely used in the literature, such as Emran and Hou (2013), Dang and Rogers (2016), and O'Connor and Graham (2019).

According to Lewbel (2012), if the residual obtained by regressing the endogenous variable *DTC × ELD* on *Trust × ELD* and control variables has heteroskedasticity, the product of the residual and centered *Trust × ELD* is an ideal instrumental variable. We use the Breusch-Pagan test of heteroskedasticity as in Lewbel (2012), and the result shows that the null hypothesis of homoscedastic error is rejected with a *p*-value equal to 0.00, indicating the applicability of this approach. Column (2) of Table 5 reports the estimation results using the newly constructed instrumental variable. The first-stage results are significantly positive, and *Kleibergen-Paap F-stats* also rejects the weak identification hypothesis. The second-stage results are also

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[10] This question was asked after the WVS Wave 5.

[11] In the WVS questionnaire, there are four choices for the question "trust in neighbors": trust completely, trust somewhat, do not trust very much, and do not trust at all.

[12] See Lewbel (2012) and Dang and Rogers (2016) for the rationale and detailed application steps of this method.

Table 5
Instrumental variable tests.

	(1) Degree of trusting neighbors	(2) Lewbel	(3)
Panel A: Second stage	Dependent variable: *lnExport*		
DTC × ELD	3.327***	0.072*	0.096**
	(1.544)	(0.039)	(0.038)
Panel B: First stage	Dependent variable: *DTC × ELD*		
IV	0.952***	28.885***	33.459***
	(0.183)	(0.462)	(0.467)
Control	Yes	Yes	Yes
Fin × ELD, Rule × ELD			Yes
Source-Year FE	Yes	Yes	Yes
Destination-Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Kleibergen-Paap F-stats	26.925	3908.522	5126.518
N	2,049,757	2,049,757	1,831,027

Notes: Robust standard errors in parentheses, clustered at the source–destination-industry level. ***, **, and * represent significance at 0.01, 0.05, and 0.1, respectively.

significantly positive, which further demonstrates the reliability of the baseline estimation results. In column (3), we include the interaction between the formal financial development level of the destination country (*Fin*, the ratio of private credit to GDP) and *ELD*, as well as the interaction between the institutional environment level of the destination country (*Rule*, the level of rule of law) and *ELD*, as control variables. The estimated coefficient of *DTC × ELD* is still significantly positive, confirming the robustness of the estimation results.

3.2.2. Placebo test

To further check the robustness of the estimation results, we conduct a placebo test here using Chinese customs data. There are two main trade modes in China, namely ordinary trade (OT) and processing trade (PT). The latter category includes two sub-categories, namely processing with imports (PI) and pure assembly (PA). As Manova and Yu (2016) point out, when conducting processing trade, the exporter imports all or part of the raw materials and other intermediate goods, and re-exports final goods after processing. Under PA, foreign firms provide raw materials or intermediate goods to the exporter free of charge. Under PI, the exporter imports the materials or intermediate goods with its own money. Therefore, the exporter only pays for domestic inputs and processing under PA, but pays for domestic inputs, foreign inputs and processing under PI.

In contrast, an *ordinary trade* exporter bears the cost of design, domestic and foreign inputs, import duties on foreign inputs, the cost of assembly, and the cost of sales abroad. As a result, the liquidity needs are the lowest under PA, higher under PI, and the highest under OT. Hence, if DTC really helps to ease the liquidity constraints, we expect its positive impact on exports to be the greatest under OT, smaller under PI and the smallest under PA. Otherwise, the baseline results may be caused by omitted factors rather than DTC.

In response to this consideration, we use Chinese customs data for 2000–2006 to conduct a placebo test. We only retain samples of exports (including ordinary and processing trade), and aggregate the data to the level of "firm-destination-product-trade regime-year" while excluding the samples of trade intermediaries.[13] Products are classified at the six-digit HS1996 level. Using the correspondence table provided by the WITS database, we obtain the ISIC industry corresponding to the HS product and the corresponding external liquidity dependence. The core explanatory variable is still the interaction term *DTC × ELD*. The explained variable is the natural logarithm of export value which is deflated by the consumer price index (CPI) of the US. We add the firm-year fixed effect to control for the firm level factors that change over time, like productivity and leverage ratio, as well as a series of macro-level variables, such as the development level of formal and informal finance in the region where the firm is located. We also add the destination-year fixed effect and ISIC industry fixed effects.

Columns (1)-(4) of Table 6 report the estimation results for ordinary trade (OT), processing trade (PT), processing with imports (PI) and pure assembly (PA), respectively. The estimated coefficient of *DTC × ELD* is significantly positive in column (1), indicating that DTC promotes ordinary exports in China. The coefficient of *DTC × ELD* is positive but insignificant in column (3), and that of *DTC × ELD* is negative and insignificant in columns (2) and (4). These results are all in line with our expectations.[14]

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[13] Referring to Ahn et al. (2011), we delete the firms containing the Chinese characters of "jin chu kou", "jing mao", "mao yi", "ke mao" and "wai jing" in their names.

[14] Manova et al. (2015) point out that the Chinese state-owned enterprises (SOEs) should be dropped when examining firms' export decisions in a financially constrained environment, because SOEs are not necessarily profit-maximizing entities. Our results remain unchanged after dropping SOEs from our sample.

Table 6
Placebo test.

	(1)	(2)	(3)	(4)
	OT	PT	PI	PA
DTC × Dep	0.046***	−0.008	0.031	−0.023
	(0.016)	(0.028)	(0.050)	(0.028)
Firm-year FE	Yes	Yes	Yes	Yes
Destination-year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	6,618,158	2,152,388	602,765	1,585,195
Adj.R²	0.304	0.286	0.223	0.309

Notes: Dependent variable is export value (logarithm). Robust standard errors in parentheses, clustered at the province-industry-destination level. ***, **, and * represent significance at 0.01, 0.05, and 0.1, respectively.

3.3. Additional robustness checks

Firstly, Pseudo-Poisson maximum likelihood estimation (PPML) is applied. Silva and Tenreyro (2006) note that consistent estimation results can be obtained using the PPML method in the case of zero-valued trade. In column (1) of Table 7, the coefficient of $DTC \times ELD$ is still significantly positive.

Secondly, we adopt alternative measures for external liquidity needs.[15]Specifically, we consider two other indicators that reflect the industry's dependence on external liquidity. The first is the ratio of inventories to sales (*Invent*). A higher ratio means that a smaller fraction of inventory investment can be financed by current revenue and represents a higher external liquidity dependence in the short run (Raddatz, 2006). The second is the ratio of short-term debt to sales (*Debt*), which captures both the actual use of external liquidity and the ability of a firm to pay its current liabilities. A higher value of *Debt* also represents a higher external liquidity dependence. *Invent* is sourced from Kroszner et al. (2007) and *Debt* from Raddatz (2006). They calculated these two indicators based on US firms for 1980–1989 and take the median ratio of firms with the same ISIC code as the indicator for this industry.[16] In columns (2)-(3) of Table 7, the results indicate that DTC is more helpful in promoting exports of industries with high dependence on external liquidity.

Thirdly, we control for additional fixed effects. In column (4) of Table 7, we replace the industry fixed effects with industry-year fixed effects to control for the impact of potential unobserved time-varying industry characteristics, such as the inherent volatility of the industry. In column (5), we add the source-industry fixed effects to control for the potential heterogeneous impact of source country characteristics across industries. In column (6), we replace the source-industry fixed effects with source-industry-year fixed effects to control for the potential heterogeneous impact of unobserved time-varying source country characteristics across industries. We find that the estimation results remain almost the same.

Fourthly, we cluster standard errors at different levels. In the baseline estimation, standard errors are clustered at the exporter-destination-industry level. Here, we cluster standard errors at source–destination level in column (7), and at destination-year level in column (8). The results still confirm the causal relationship between DTC and exports.

Finally, we examine the impact of DTC on other dimensions of export performance. In the baseline estimation, the explained variable is the natural logarithm of export value. Here, we decompose the value of export into export quantity (*lnquantity)* and export price (*lnprice*) to further investigate the effects of DTC, and Table 8 reports the estimation results. In column (1), the coefficient of $DTC \times ELD$ is significantly positive, indicating that DTC promotes export quantity. In column (2), the coefficient of $DTC \times ELD$ is significantly negative, implying that the higher the DTC, the lower the export prices of industries with higher liquidity dependence. This result may seem unexpected, but it is not difficult to understand. When a trading partner in the destination country provides financial support to its counterpart in the exporting country, it may have the bargaining power to ask for a lower price. Next, we further investigate the effect of DTC on the extensive margin of trade. We take the (log) number of HS six-digit products at source–destination-industry-year level as the explained variable (*lncount*). In column (3) of Table 8, the coefficient of $DTC \times ELD$ is significantly negative, suggesting that the higher the DTC, the fewer the export product varieties of industries with higher liquidity dependence.

4. The heterogeneity of the effect of destination trade credit

In this section, several extended analyses are conducted. First, we check if DTC has heterogeneous impacts on exports across source countries with different levels of financial development. Then, we examine the impact of DTC during the global financial crisis. Finally, we attempt to explore the different effects across industries from the perspective of product complexity.

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[15] In previous estimation, we use US data to construct the measure of the *ELD*. Referring to Fan et al. (2015), we also use the annual survey data of Chinese industrial firms (ASIF) to calculate the *ELD* in China, and then run regressions based on Chinese customs data. The results in Appendix A2 find that DTC still contributes to the export expansion.

[16] Raddatz (2006) calculates the measures based on four-digit ISIC industries. To obtain the values for three-digit ISIC industries, we take the mean ratio across four-digit ISIC codes in the same three-digit ISIC codes as the proxy for that industry.

Table 7
Additional robustness checks.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	PPML	Alternative measures for *ELD*		Additional fixed effect			Clustering at different levels	
		Invent	Debt	Industry-Year	Source-Industry	Source-Industry-year	Source-Destination	Destination - Year
DTC × ELD	0.108***	0.007*	0.092***	0.016**	0.013**	0.012**	0.017***	0.017***
	(0.030)	(0.004)	(0.016)	(0.007)	(0.006)	(0.006)	(0.006)	(0.005)
Control	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Source-Year FE	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Destination-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes				Yes	Yes
N	14,341,824	4,197,833	4,197,833	4,197,833	4,197,806	4,188,506	4,197,833	4,197,833
Adj.R² or Pseudo-R²	0.833	0.570	0.570	0.571	0.669	0.675	0.570	0.570

Notes: Dependent variable is export value in Column (1), and is the logarithm of export value in Columns (2)-(8). Robust standard errors in parentheses, clustered at the source–destination-industry level in Columns (1)-(6), at the source–destination level in Column (7), and at the destination-year level in Column (8). ***, **, and * represent significance at 0.01, 0.05, and 0.1, respectively.

Table 8
Other dimensions of export performance.

	(1)	(2)	(3)
	lnquantity	*lnprice*	*lncount*
DTC × ELD	0.029***	−0.011***	−0.007***
	(0.008)	(0.002)	(0.002)
Control	Yes	Yes	Yes
Source-Year FE	Yes	Yes	Yes
Destination-Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
N	4,197,833	4,197,833	4,197,833
Adj.R²	0.562	0.531	0.679

Note: Robust standard errors in parentheses, clustered at the source–destination-industry level. ***, **, and * represent significance at 0.01, 0.05, and 0.1, respectively.

4.1. Financial development across source countries

We start with the level of financial development in the source countries. If DTC helps to relax liquidity constraints, the effect will be greater for the exporters who are unable to raise enough funds in the formal financial market. Therefore, the difference in the financial development across source countries can be used as another exogenous variation to provide further causal evidence. To test this hypothesis, we include an interaction term between $DTC \times ELD$ and a dummy variable in the model specification. This dummy is equal to 1 for source countries with financial development above the median in the initial year of our sample period (*Formal_source*), and equal to 0 otherwise. The measure of financial development is the ratio of private credit to the source country's GDP.

The results are reported in Table 9. In column (1), the coefficient of $DTC \times ELD \times Formal\_source$ is significantly negative and the coefficient of $DTC \times ELD$ is significantly positive. In column (2), more control variables are included and the results remain almost the same, indicating that the export promotion effect of DTC is smaller among source countries with better financial development.

4.2. DTC and exports in the global financial crisis

International trade has suffered a sharp decline during the 2008–2009 crisis. The lack of timely and sufficient financial support is a reason (Chor and Manova, 2012). To study the role played by DTC during the financial crisis, we create a dummy for the years 2008–2009 (*Crisis*), and run the regression with an interaction term between this dummy and $DTC \times ELD$ for 2000–2009. The results are reported in Table 10. In both columns, the coefficients of $DTC \times ELD \times Crisis$ are significantly negative, while those of $DTC \times ELD$ are significantly positive. It indicates that *DTC* helps to promote export during the crisis, but the effect is weaker compared to the pre-crisis period. It should be pointed out that the financial crisis may affect both exports and DTC, resulting in biased estimated coefficient of $DTC \times ELD \times Crisis$. If the financial crisis causes the level of DTC to rise, the negative impact of the financial crisis on exports may be underestimated. We have calculated the sample

Table 9

Financial development across source countries.

	(1)	(2)
DTC × ELD × Formal_source	−0.059***	−0.061***
	(0.021)	(0.020)
DTC × ELD	0.065***	0.066***
	(0.019)	(0.018)
Control		Yes
Source-Year FE	Yes	Yes
Destination-Year FE	Yes	Yes
Industry FE	Yes	Yes
N	2,388,400	2,369,495
Adj.R²	0.442	0.558

Notes: Dependent variable is export value (logarithm). Robust standard errors in parentheses, clustered at the source–destination-industry level. ***, **, and * represent significance at 0.01, 0.05, and 0.1, respectively.

Table 10

DTC and exports in the global financial crisis.

	(1)	(2)
DTC × ELD × Crisis	−0.056**	−0.064**
	(0.026)	(0.025)
DTC × ELD	0.065**	0.074***
	(0.027)	(0.025)
Control		Yes
Source-Year FE	Yes	Yes
Destination-Year FE	Yes	Yes
Industry FE	Yes	Yes
N	1,858,277	1,808,156
Adj.R²	0.456	0.575

Notes: Dependent variable is export value (logarithm). Robust standard errors in parentheses, clustered at the source–destination-industry level. ***, **, and * represent significance at 0.01, 0.05, and 0.1, respectively.

mean of DTC year by year and found that it was higher during the financial crisis,[17] suggesting that the estimated coefficient of *DTC × ELD × Crisis* is more likely to be underestimated.

To gain a better understanding of the results above, we look into how the effect of DTC changes over time, by setting a model as in Chor and Manova (2012):

$$lnExport_{ijkt} = \alpha + \sum_{m=2000}^{2009} \beta_m ITC_{jt} \times ELD_k + \theta' \textbf{Control} + \gamma_{it} + \varphi_{jt} + \delta_k + \varepsilon_{ijkt} \tag{2}$$

The coefficients of β_m capture the dynamic effect. In Fig. 2, the gray area indicates the 95% confidence intervals. Most of the β_m coefficients are positive and significant, confirming our main findings. The values of β_m in 2008–2009 are obviously smaller than those before the crisis. The possible explanation is that DTC might not be sufficient to meet firms' long-term financing needs or overcome the difficulties caused by the crisis, even though it could help to meet firms' short-term needs. Nevertheless, international trade should have shrunk more if without DTC during the crisis.

4.3. Product complexity

Garcia-Marin et al. (2020) argue that the contract enforcement is more difficult for more complex products. The more complex the product, the more likely the exporter is to default. As such, we expect the export promotion effect of DTC to be weaker when the product complexity is higher.

Here we construct a measure of product complexity (*Comp*) using the indicator proposed by Rauch (1999), where the products are classified into three categories: differentiated products, reference price products and homogeneous products. We convert Rauch's original product classification from SITC Rev.2 to ISIC Rev.2, and aggregate the data to ISIC level by calculating the share of SITC differentiated products (Minetti et al., 2021).[18] A higher share means that the industry is more com-

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[17] This may be because informal finance made up for the shortage of formal finance during the financial crisis (Chor and Manova, 2012).

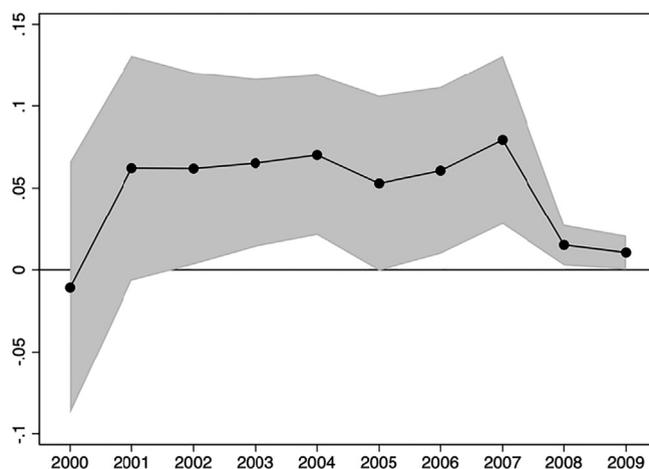[18] The concordance between SITC and ISIC comes from Muendler's website: https://econweb.ucsd.edu/muendler/html/resource.html.

Fig. 2. Effect of DTC on exports over time. *Notes*: Time-varying β_m coefficients of $DTC \times DLD$ are obtained by estimating Eq. (2). Gray area indicates the 95% confidence interval of each β_m.

Table 11
Product complexity (1).

	(1)	(2)
	Conservative	Liberal
$DTC \times ELD \times Comp$	−0.199***	−0.200***
	(0.019)	(0.019)
$DTC \times ELD$	0.104***	0.103***
	(0.013)	(0.012)
Control	Yes	Yes
Source-Year FE	Yes	Yes
Destination-Year FE	Yes	Yes
Industry FE	Yes	Yes
N	4,197,833	4,197,833
Adj.R²	0.570	0.570

Notes: Dependent variable is export value (logarithm). Robust standard errors in parentheses, clustered at the source–destination-industry level. ***, **, and * represent significance at 0.01, 0.05, and 0.1, respectively.

Table 12
Product complexity (2).

	(1)	(2)	(3)	(4)
	Conservative		Liberal	
	Law = 1	Law = 0	Law = 1	Law = 0
$DTC \times ELD \times Comp$	−0.164***	−0.273***	−0.165***	−0.278***
	(0.021)	(0.036)	(0.021)	(0.036)
$DTC \times ELD$	0.074***	0.168***	0.073***	0.168***
	(0.014)	(0.022)	(0.014)	(0.022)
Control	Yes	Yes	Yes	Yes
Source-Year FE	Yes	Yes	Yes	Yes
Destination-Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
p-value for statistical difference tests	0.000		0.000	
N	2,713,865	1,433,167	2,713,865	1,433,167
Adj.R²	0.619	0.473	0.619	0.474

plex. Then, we include an interaction term between product complexity (*Comp*) and $DTC \times ELD$ in the model specification. The results are reported in columns (1)-(2) of Table 11. Column (1) uses the conservative classification of Rauch (1999) and column (2) uses the liberal classification. The coefficients of the triple interaction terms are negative and significant at 1% level, consistent with our expectation.

To provide further evidence, we also consider using differences in institutional quality across different source countries. If the protection of legal rights is weaker, firms are more likely to default. We divide the sample into two subsamples according to the median of the institutional environment level of source countries in 2000. As in columns (1)-(4) of Table 12, the absolute value of coefficients of $DTC \times ELD \times Comp$ are bigger in source countries with unfavorable institutional environment ($Law = 0$). The p-value indicates that the difference of the triple interaction terms is significant.

5. Concluding remarks

Financial development is an important factor affecting international trade. From the perspective of DTC, this study examines the impact of informal finance on exports. Specifically, using bilateral trade data for multiple countries and industries for 2000–2018, we find that DTC promotes a country's exports disproportionately more in short-term liquidity-dependent industries. The result remains consistent after addressing endogeneity and various robustness checks. Further analyses show that the effect is greater when the level of financial development of the source country is lower. DTC mainly promotes trade by increasing export quantity, while it causes a decline in export prices and a reduction of export varieties. The export promotion effect of DTC is limited when the product complexity becomes larger. During the 2008 global financial crisis, the effect of DTC still exists, but is relatively weak.

The present paper extends and supplements the literature on the nexus between finance and international trade. Due to data limitation, this study cannot accurately distinguish between cash in advance and deferred payment. As data availability improves in the future, the different roles played by these two settlement approaches can be further investigated. In addition, the role of DTC in global value chains (GVCs) also warrants further research.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. 1: Estimation results using DTC as the core explanatory variable

We also aggregate the trade data of CEPII-BACI to the "source–destination-year" level, and conduct regression analysis using *DTC* as the core explanatory variable. The estimation results are shown in Table A1. In column (1), in addition to the core explanatory variable *DTC* and the control variables commonly used in the gravity equation, we also add a group of control variables at the destination country level, including the natural logarithm of the GDP (*lnGDP*), the natural logarithm of the per capita GDP (*lnGDP_p*), the formal financial development level (*Fin*) and the institutional environment level (*Rule*). We also include the source country fixed effect, destination country fixed effect and year fixed effect.

It can be seen that the estimated coefficient of *DTC* is significantly positive at the 5% level, indicating that DTC has a significant promoting effect on exports. In column (2), we add the source-year fixed effect to control the influence of factors varying at the source-year level. The estimated coefficient of *DTC* is also significantly positive, which means that DTC is beneficial for export expansion.

Appendix A. 2: Estimation results using *ELD* based on the Chinese data

In order to further test the robustness of the baseline estimation results, referring to Fan et al. (2015), we also use the annual survey data of Chinese industrial firms (ASIF) to calculate the *ELD* in China, and then perform regressions based on Chinese customs data.[19]

Firstly, referring to Fisman and Love (2003), we calculate the ratio of accounts payable to total assets of Chinese firms from 2004 to 2006, and then take sample median of each 2-digit industry as the *ELD* indicator of the industry.[20] Secondly, based on the correspondence table between Chinese Industrial Classification (CIC) and ISIC provided by Huang et al. (2020), the values of Chinese *ELD* (denoted as ELD^{CHN}) are mapped to the ISIC industry classification. Finally, we use $DTC \times ELD^{CHN}$ as the core explanatory variable to perform regressions based on Chinese customs data. We only retain the sample of ordinary trade exporters, not including the sample of trade intermediaries.

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[19] Due to data limitations, we only have firm level data that can be used to calculate *ELD* in China.

[20] The data of ASIF after 2004 only include information on accounts payable. In addition, the Chinese customs data used in the regression is up to 2006.

Table A1
DTC and exports.

	(1)	(2)
DTC	0.376**	0.309*
	(0.177)	(0.172)
lnGDP	0.530***	0.506***
	(0.035)	(0.034)
lnGDP_p	0.463***	0.476***
	(0.083)	(0.079)
Fin	0.001***	0.001***
	(0.000)	(0.000)
Rule	−0.055	−0.052
	(0.036)	(0.034)
lndist	−1.285***	−1.287***
	(0.020)	(0.020)
contig	0.790***	0.787***
	(0.100)	(0.101)
com_lang	0.830***	0.834***
	(0.042)	(0.042)
com_leg	0.036	0.036
	(0.027)	(0.027)
rta	0.519***	0.521***
	(0.032)	(0.033)
Constant	−3.095***	−2.584***
	(0.757)	(0.728)
Source FE	Yes	
Source-Year FE		Yes
Destination FE	Yes	Yes
Year FE	Yes	Yes
N	250,474	250,473
Adj.R²	0.768	0.772

Notes: The dependent variable is the natural logarithm of the export value of country *i* to country *j* in year *t*. Robust standard errors in parentheses, clustered at the source–destination level. ∗∗∗, ∗∗, and ∗ represent significance levels at 0.01, 0.05, and 0.1, respectively.

Table A2
External liquidity dependence based on Chinese data.

	(1)	(2)	(3)
	2000–2006	2000–2006	2004–2006
$DTC \times ELD^{CHN}$	0.057*	0.067**	0.056*
	(0.031)	(0.032)	(0.034)
$Fin \times ELD^{CHN}$		Yes	Yes
Firm-year FE	Yes	Yes	Yes
Destination-year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
N	5,347,385	4,809,776	3,043,641
Adj.R²	0.316	0.316	0.323

Notes: Dependent variable is export value (logarithm). Robust standard errors in parentheses, clustered at the province-industry-destination level. ∗∗∗, ∗∗, and ∗ represent significance at 0.01, 0.05, and 0.1, respectively.

The estimation results are shown in Table A2. The regression of column (1) uses Chinese customs data from 2000 to 2006. In column (2), the interaction term between the formal financial development in the destination country (*Fin*) and ELD^{CHN} is added to control the impact of the formal financial development. Column (3) shortens the time period of the sample to 2004–2006 to match the time period of the data used to calculate ELD^{CHN}. The estimated coefficients of $DTC \times ELD^{CHN}$ in columns (1)-(3) are significantly positive. This means that when using *ELD* based on Chinese data, DTC is proven to contribute to China's export expansion.

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