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The Nexus between Financial Development and Exports Performance: A Re-Assessment with the Structural Gravity Model

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ABSTRACT

The aim of this paper is to re-examine the relationship between financial development and international trade within the structural gravity model. Unlike the previous literature, we implement an identification strategy that considers intra-national trade flows in addition to international trade data in order to deal with the issues of perfect collinearity and the multilateral resistances terms (MRTs). Using a sample of 64 countries and two data frameworks (cross-sectional and panel) and applying the OLS/2SLS estimator and the PPMLHDFE estimator, our findings support the promoting effect of financial indicators on exports of all manufacturing goods relative to domestic trade. This performance is disproportionately higher for final goods than intermediate inputs. Importantly, this research demonstrates the existence of the heterogeneous direct impact of financial development on international trade depending on the level of economic development and across industries.

Keywords: international trade, domestic trade, financial development, structural gravity model

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1. Introduction

Based on the influential theoretical papers of Kletzer and Bardhan (1987) and also Baldwin (1989), it has been empirically well established by the dominant trend that financial development affects significantly and positively international trade[1]. To get this result, most authors rely on the one-sided data of trade, only few scholars use bilateral trade data in the gravity model. In this study, we focus on the second group for two reasons.

First, the gravitational equation is widely accepted as the suitable framework to examine determinants of bilateral trade flows. In this regard, Becker et al. (2013) inspect the influence of financial sector on bilateral exports in presence of fixed costs of trade. Similarly, Manova (2013) examines the impact of credit constraints on bilateral exports by sector. Recently, Ma and Xie (2019) prove that the destination country's financial development also matters in financially vulnerable sectors to promote bilateral trade flows. The common point of these above papers is the implementation of the standard gravity model. However, while the structural gravity equation is becoming increasingly popular in the literature, it is simply overlooked in the finance-trade nexus[2].

[1] A limited number of papers has found no significant effect (Sare et al., 2018; Menyah et al., 2014)
[2] Unlike the standard gravity model, the structural gravity model has solid micro-foundations and delivers a tractable framework for a wide class of trade models. In addition, the structural gravity model assumes that the value of production in origin country and its total sales to abroad are equivalent; and domestic expenditure in

Second, the control for the multilateral resistance terms (MRTs) in the trade-related gravity model is crucial in order to provide unbiased results[3]. The standard practice among empirical re- searchers to deal with MRTs consists of resorting to country fixed effects. To this end, different approaches have been employed. For instance, Becker et al. (2013) in a cross-sectional setting consider at first exporter fixed effects and importer fixed effects. Next, they include country-pair fixed effects and importer-industry fixed effects when the dependent variable is about bilateral exports by industry. In panel data setting, Manova (2013) inserts different combinations between exporter fixed effects and year fixed effects, importer fixed effects and sector fixed effects, and finally exporter-sector fixed effects. The work of Ma and Xie (2019) controls for MRTs with exporter fixed effects, importer fixed effects, sector fixed effects and year fixed effects. Although the approach of using country (including industry and year) fixed effects to control for MRTs is effective, 'it precludes direct estimation of the partial effects of country-specific explanatory variables' (UNCTAD and WTO, 2012, p. 109). This argument is also approved by Head and Mayer (2014, p. 157). The explanation suggests that this identification problem is due to the perfect collinearity between country-specific explanatory variables and fixed effects. In other words, previous authors are unable to disentangle the direct effect of financial development on international trade from the effects of MRTs.

In two recent papers, a solution to the problem of identification in the gravity model has been proposed. On the one hand, Heid et al. (2021, hereafter HLY) study the effect of unilateral and non- discriminatory trade policies on bilateral trade[4]. On the other hand, Beverelli et al. (2018, hereafter BKLY) put the emphasis on the impact of domestic institutions on bilateral trade. Both articles rely on the structural gravity equation and include intra-national trade data in addition to international trade data. Most importantly, they argue that the introduction of internal trade flows is conducive to identify respectively the direct impact of unilateral non-discriminatory trade policies and institutions[5]. To make sure that the influence of their respective country-specific variable does not apply to internal trade data, the authors interact it with a dummy that takes 1 for international trade flows and 0 for domestic trade flows. Yet, the distinctive point between HLY and BKLY is described as follows: for the former, the estimation of unilateral and non-discriminatory trade policies is obtained because exporter and importer fixed effects are only defined for internal trade; by contrast for the latter, the identification of the impact of domestic institutions is possible on international trade relative intra-national trade since exporter and importer fixed effects are defined for both types of data.

As far as we know, the methods suggested by HLY and BKLY have not yet been explored in the literature dealing with finance and trade. Accordingly, the aim of this paper is to re-examine the impact of financial development on bilateral exports by addressing the drawbacks in the previous papers. By doing so, our contribution to the existing literature is threefold. First, we use the structural gravity model which is more consistent with all trade

destination country is similar to the sum over all imports. Refer to Arkolakis et al. (2012), Costinot and Rodriguez-Clare (2014) and Yotov et al. (2016) for further details.

[3] Early papers in the trade-related gravity literature only considered trade costs that are directly observable, but Anderson and Van Wincoop (2003) explicitly highlighted the importance of taking into account the unobservable information costs or MRTs which affect significantly the reliability of estimates. For the rationale to include and address MRTs, consult UNCTAD and WTO (2012, p.103-111), and Head and Mayer (2014).

[4] HLY focus on two representative unilateral and non-discriminatory trade policies: (i) Most favoured nation tariffs on the importer side and (ii) time to export on the exporter side.

[5] Yotov (2012), Brochert and Yotov (2017) and Larch et al. (2018), among others, strongly advise to take into consideration intra-national trade data not only to improve the performance of the structural gravity model, but also to identify the effects of unilateral trade policies or country-specific variables.

models and expected to provide reliable estimates. Second, since financial development is also a country-specific variable like institutional quality, we implement the BKLY's method to tackle the identification's issue. Finally, we regress the structural gravity model by considering trade data on both final goods and intermediate inputs, including intra- national trade data.

Since we get the coefficients of the variable of interest in all regressions, it means that our identification strategy perfectly works. In overall, our results show that financial development stimulates bilateral exports of all manufacturing goods. This promoting performance is more observable on final goods than intermediate inputs. Importantly, our paper proves the existence of the heterogeneous direct impact of financial development on international trade depending on the level of economic development and across industries.

The remainder is organized as follows: section 2 is about the review of empirical papers; section 3 describes the identification strategy, data and the model specification; section 4 presents empirical results; section 5 is about robustness checks and section 6 concludes.

2. Literature review of empirical papers

From the perspective of the empirical model, the literature examining the impact of financial development and international trade can be divided into two groups.

The first one relies on the model specification that uses unilateral trade flows and Beck (2002) is viewed as the leading paper. The author studies the impact of financial development on two manufacturing sectors: one is credit-intensive due to increasing returns to scale and the other does not require external finance because of constant returns to scale. His results show a positive sign and suggest that countries with high level of financial development perform better in trade of manufacturing goods. A year later, the same author, Beck (2003), proves that industries relying more on external finance exhibit higher exports shares and trade balances in countries with a better-developed financial inter- mediation. In the same vein, Svaleryd and Vlachos (2005) examine in which extent financial sector shapes industrial specialization among OECD countries. Their estimations display in overall positive and significant coefficients. This implies that sectors depending heavily on external financing tend to specialize in industrial production in presence of a developed financial system. The paper of Hur et al. (2006) sheds some light on the relationship between financial development and trade by taking into account firms' asset tangibility. Using a sample of 37 industries in 42 countries, the authors reveal that the well-developed financial sectors promote more trade in industries that depend on external finance and with a higher level of intangible assets. Demir and Dahi (2011) contribute to the literature by investigating the role of financial development in trade performance of countries with similar (South- South) and different (South-North) technology and labor-skill. Their regressions based on dynamic panel show that South-South trade in total and technology-and-skill-intensive manufacturing sectors is positively affected when financial system is well-developed. Using a panel causality approach in African countries, Menyah et al. (2014) find a weak causality from financial development to trade openness. Another evidence in Africa by Sare et al. (2018) based on the pooled mean group estimator reveals that financial development has no significant effect on international trade in the short-run. By contrast, in the long-run, the authors show that the impact is economically significant but the signs of the coefficients depend on the proxy used: private credit has a positive effect on trade whereas domestic credit exhibits a detrimental effect on trade.

Other studies provide micro-level about the effect of financial development on trade. For instance, Berman and Héricourt (2010) use a sample of 5000 firms in 9 developing and

emerging countries. They find that firms' access to external finance strongly promotes trade at the extensive margin (exporting decision) and the intensive margin (amount exported by firm). They add that this influence is channelized by their productivity level. Similarly, Muûls (2015) constructs a unique database for Belgian manufacturing firms and reports that lower credit constraints are associated with firms' trading performance: higher exports (at the extensive and intensive margins) and higher imports (only at the extensive margin). Likewise, Kumarasamy and Singh (2018) rely on firm-level data from the World Bank Enterprises Survey and show that higher financial development translates into greater firms' ability to export. A recent evidence from Chinese private-firms by Chen et al. (2019) reveals that the development of city commercial banks mitigates financial constraints and improves access to credit. Importantly, the authors find that domestic private-firms in financially-dependent sectors exhibit a higher share of exports.

Using a sample of 21 manufacturing sectors in 80 countries over the period 2000–2009, Cezar (2014) provides evidence of the heterogeneous effect of financial development on international trade. In particularly, the author proves that industries financially dependent on external resources in countries with well-developed financial sector exhibit a higher share of exports, whereas the volume of exports shrinks for sectors that less reliant on external finance.

The second one emphasizes the gravity model by using bilateral trade data. Becker et al. (2013) provides the first empirical evidence by showing that developed financial sector in exporting countries promote bilateral exports in industries with significant fixed costs. The same positive effect is also observed for imports although the size of the coefficients is lower. Manova (2013) examines how credit constraints affect trading behaviour by describing the firm-level mechanisms affecting that relation- ship. The author finds that countries with better-developed financial sectors tend to promote exports disproportionately more in financially dependent industries by (i) entering more markets, (ii) shipping more products to each destination and (iii) selling more of each product. The theoretical framework of the previous study is extended by Ma and Xie (2019). The two scholars introduce financial development in origin and destination countries and investigate in which extent their bilateral trade pattern is impacted. Their findings suggest that financial development in the destination country also contributes to stimulate bilateral trade flows at the extensive and intensive margins.

3. Identification strategy, data and model specification

3.1. Identification strategy

Assume a structural gravity model using the cross-sectional data framework with only bilateral international trade as the dependent variable, financial development in the origin country as the main explanatory variable and standard control variables. To run that equation, the control for MRTs is crucial by including fixed effects of exporting and importing countries in order to get unbiased coefficients. Since financial development and the fixed effects both apply to international trade, they are perfectly collinear. In such a situation, it is not possible to get the estimate of financial development.

To overcome that issue, we follow the method of BKLY in order to identify the direct impact of financial development. As recommended by the authors, we include domestic trade data in our model setting. Thus, the dependent variable consists of international trade flows and also intra-national trade flows. In addition, we set up an indicator which equals 1 for international trade and 0 for internal trade. This indicator interacts with financial development. When we estimate the gravity equation, countries fixed effects apply to international trade and domestic

trade while the interaction term applies only to international trade relative to intra-national trade. Thus, the regression identifies the direct impact of financial development on international trade flows.

It is worthwhile to underline that the logic behind this identification strategy based on the cross- sectional data is similar to panel data when the time dimension is added. We use rather exporter-year fixed effects and importer-year fixed effects with the possibility to introduce country-pair fixed effects.

3.2. Data

Data used in this study are collected from various sources. We begin with the dependent variable, i.e, bilateral exports, which comes from the OECD's TiVA database[6]. This latter provides only international trade data for final goods and intermediate goods. Given the requirement to identify the direct impact of financial development, we compute intra-national trade data following Greaney and Kiyota (2020). With regard final goods, internal data is obtained as the difference between value-added and exports of final goods. When it comes to intermediate inputs, it needed to get first gross output of intermediate inputs as the difference between gross output and value-added. Next, intra-national trade data of intermediate inputs is calculated as the difference between gross output of intermediate inputs and exports of intermediate inputs.

In this study, we use five proxies of financial development from two different sources: (i) domestic credit to private sector (%) comes from World Development Indicators; (ii) liquid liabilities (% GDP), (iii) stock market capitalization (% GDP), (iv) private credit by deposit money banks (% GDP) and (v) stock market total value traded (% GDP) are all from 'A New Database on Financial Development and Structure' and provided by Beck et al. (2000).

Standard control variables in the gravity model such as distance, border, official language and colonial link are from the CEPII's GeoDist database (refer to Mayer and Zignago, 2011). We add regional trade agreements data which are from the Mario Larch's database (refer to Egger and Larch, 2008).

3.3. Model specification

Our model specification is in line with BKLY. But instead of institutions as the main explanatory variable, we replace with financial development. The implementation of the identification strategy is performed on the cross-sectional data and panel data as displayed respectively by equations (1) and (2):

(1): $\ln X_{ij} = \alpha_1 \ln DIST_{ij} + \alpha_2 BORD_{ij} + \alpha_3 LANG_{ij} + \alpha_4 COL_{ij} + \alpha_5 RTA_{ij} + \beta_1 INTER_{ij} + \beta_2 (INTER_{ij} \times FDV_i) + \eta_i + \mu_j + \varepsilon_{ij}$

(2): $X_{ij,t} = \gamma_1 \ln DIST_{ij} + \gamma_2 BORD_{ij} + \gamma_3 LANG_{ij} + \gamma_4 COL_{ij} + \gamma_5 RTA_{ij,t} + \delta_1 INTER_{ij,t} + \delta_2 (INTER_{ij,t} \times FDV_{i,t}) + \eta_{i,t} + \mu_{j,t} + \varepsilon_{ij,t}$

where i, j and t stand for exporter, importer and year. $X_{ij,(t)}$ represents exports flows including domestic trade data from i to j, (at year t). $DIST_{ij}$ is the distance between the main cities of i and j. $BORD_{ij}$ is 1 if i and j share a contiguous border and 0 otherwise. $LANG_{ij}$ is

[6] The use of that database is mainly justified by the wide coverage of countries (64) versus 43 of World Input-Output Database (WIOD), even though our time period (2005-2015) is smaller than the 2016 WIOD release (2000-2015).

1 if i and j speak the same official language and 0 otherwise. COL_{ij} is 1 if i and j have any colonial link and 0 otherwise. $RTA_{ij,(t)}$ is 1 if i and j have an RTA in force and 0 otherwise, (at year t). $INTER_{ij,(t)}$ is 1 for international trade flows between i and j and 0 otherwise, (at year t). This indicator, also known as international border dummy, captures border effects, (at year t). $INTER_{ij,(t)} \times FDV_{i,(t)}$ is the interaction term between $INTER_{ij}$ and financial development in i noted FDV_i, (at year t). This interactive variable allows to identify direct impact of domestic financial development on international trade. $\eta_{i,(t)}$ and $\mu_{j,(t)}$ indicate respectively exporter (exporter-year) fixed effects and importer (importer-year) fixed effects. $\varepsilon_{ij,(t)}$ denotes the error term, (at year t). The logarithm is symbolized by *ln*.

4. Empirical analysis

4.1. Cross-sectional results

Our empirical results are presented in two steps. First, Table 1 exhibits the impact of financial development and bilateral exports based on the cross-sectional framework in 2015. Second, Table 2 reports estimates of the same relationship using panel data over the period 2005–2015. For the two Tables, the dependent variable considers final goods and intermediate inputs together in columns 1–3, and later on separately in columns 4–6 and columns 7–9 respectively.

We begin the analysis with Table 1 where the explanatory power of all model specifications is very high as proved by the value of R^2. OLS regressions in column (1) show that the coefficients associated with standard control variables are all significant and have the expected signs according to the literature. The negative sign of distance (DIST) as proxy of trade costs confirms its detrimental effect on bilateral exports. By contrast, the positive sign of sharing border (BORD), speaking the same official language (LANG) and having a colonial link (COL) suggest that these variables strongly enhance bilateral exports. Likewise, regional trade agreements (RTA) have a stimulating effect on international trade flows. The results also reveal that international border (INTER) has a depressing impact on bilateral exports since its coefficient is negative and statistically significant.

In column (2), in addition to the previous variables, we add our variable of interest representing the interaction between international border and financial development (INTER×FDV). This inter- active term indicates the differential effect of financial development on international trade relative to intra-national trade. In the presence of the full set of exporting and importing countries fixed effects, OLS provides the estimate of INTER × FDV without any collinearity problems. This confirms the validity of our identification strategy. It means that we able to identify the direct impact of financial development in the gravity model and dealing with the issue of MRTs. As we observe, the positive sign and significance of the related coefficient implies that higher domestic credit to private sector promotes bilateral exports. In other words, when exporters' financial development improves the volume of exports flows increases by 1.48% greater than domestic trade, ceteris paribus. This finding is consistent with the bulk of the existing literature (e.g. Beck, 2002; Hur et al., 2006; Becker et al., 2013; Ma and Xie, 2019). With regard to standard control variables including regional trade agreements, the coefficients are quite similar with those of column (1). But the point estimate of international border (in absolute value) is much higher than the previous one. The explanation of this magnitude that international border becomes a significant obstacle to international trade by taking into account other unobservable trade impediments related to financial sector.

Table 1.
Cross-sectional data setting – financial development and bilateral exports

	all goods			**final goods**			**intermediate inputs**		
	OLS	**OLS**	**2SLS**	**OLS**	**OLS**	**2SLS**	**OLS**	**OLS**	**2SLS**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
DIST	−0.99***	−1.01***	−1.001***	−0.914***	−0.928***	−0.922***	−1.043***	−1.056***	−1.051***
	(0.032)	(0.031)	(0.026)	(0.032)	(0.032)	(0.026)	(0.034)	(0.033)	(0.026)
BORD	0.295***	0.290***	0.299***	0.301***	0.290***	0.299***	0.313***	0.310***	0.316***
	(0.105)	(0.106)	(0.086)	(0.104)	(0.105)	(0.088)	(0.108)	(109)	(0.089)
LANG	0.495***	0.469***	0.473***	0.528***	0.509***	0.512***	0.501***	0.474***	0.475***
	(0.069)	(0.071)	(0.064)	(0.066)	(0.068)	(0.065)	(0.074)	(0.077)	(0.066)
COL	0.393***	0.407***	0.409***	0.369***	0.382***	0.391***	0.403***	0.416***	0.414***
	(0.104)	(0.106)	(0.094)	(0.101)	(0.104)	(0.096)	(0.112)	(0.114)	(0.098)
RTA	0.432***	0.426***	0.434***	0.414***	0.409***	0.415***	0.434***	0.430***	0.446***
	(0.050)	(0.049)	(0.044)	(0.052)	(0.051)	(0.044)	(0.052)	(0.052)	(0.046)
INTER	−3.566***	−10.01***	−11.17***	−3.337***	−9.748***	−9.718***	−3.717***	−10.25***	−11.60***
	(0.222)	(1.386)	(1.827)	(0.241)	(1.491)	(1.856)	(0.227)	(1.480)	(1.893)
INTER x FDV		1.479***	1.750***		1.474***	1.471***		1.498***	1.817***
		(0.313)	(0.418)		(0.329)	(0.425)		(0.335)	(0.434)
observations	4,017	3,889	3,868	4,007	3,879	3,858	3,998	3,870	3,852
R^2	0.903	0.904	0.903	0.896	0.897	0.896	0.899	0.901	0.9
F-statistic (first stage)			372.087			371.064			370.426

Note: This Table displays cross-sectional regressions based on the structural gravity model for 64 countries in 2015. OLS and 2SLS are the estimators. The dependent variable (in logarithm) is bilateral exports of total manufacturing goods (final goods and intermediate inputs), including internal trade data. The proxy of financial development is domestic credit to private sector (% GDP). Legal origin is used as the instrumental variable for financial development. All regressions include exporter fixed effects and importer fixed effects. For brevity, estimates of country-specific fixed effects and intercepts are not reported. Robust standard errors in parentheses are clustered by country-pair. ***, ** and * denote the statistical significance level respectively at 1%, 5% and 10%.

Although the previous results are satisfactory, they are nevertheless unreliable due to the problem of endogeneity. Indeed, there is another trend of the literature proving that international trade also affects financial development (e.g. Do and Levchenko, 2007; Kim et al., 2010; Zhang et al., 2015). In that situation, we need an instrumental variable (IV) that meets the criteria of relevance and exogeneity to be valid. Following La Porta et al. (1997, 1998) and Beck et al. (2003), it is theoretically and empirically demonstrated that legal origin is the source of the efficiency of financial system through legal treatment of creditors and shareholders, accounting standards and the efficiency of contract enforcement. This shows that legal origin is both relevant and exogenous to financial development. Moreover, scholars agree that legal origin does not directly impact international trade. In that regard, we use legal origin as IV and implement the two stage least square (2SLS) to extract the exogenous component of financial development.

By applying the same logic of our identification strategy, the results of 2SLS estimates are presented in column (3). Since the value of F-statistic (372.087) from the first stage regression is larger than 10, this validates our IV. We notice that the coefficient of the variable of interest remains positively significant but its size has increased from 1.48 to 1.75. This means that the OLS estimator underestimates the impact of financial development on bilateral exports of manufacturing goods. The empirical results also shows that the coefficient of international border (in absolute value) has improved. The remaining variables are almost unchanged in terms of sign and magnitude.

After focusing on the dependent variable as all manufacturing goods, our cross-sectional analysis explores separately final goods (columns 4–6) and intermediate inputs (columns 7–9). When we intro- duce INTER×FDV in columns (5) and (8) and we compare the results to columns (4) and (7), the observation is similar with columns (1)–(2). For both kind of goods, the coefficient of international border has dramatically augmented and the sign of standard control variables and regional trade agreements are in line with the gravity literature and the size is nearly identical. The 2SLS regressions. However, the 2SLS analysis reveals how financial development affects differently both goods. While the coefficient's magnitude of the variable of interest in column (6) for final goods has not changed in comparison to column (5), the coefficient of intermediate inputs has substantially increased in (9) versus column (8). This suggests that financial development impacts positively and significantly bilateral exports of both final goods and intermediate inputs but its promoting effect is more beneficial for the latter.

4.2. Panel data results

We carry on the empirical analysis by investigating the results based on the panel data setting. There are four reasons that motivate the use of this data framework. First, we aim to explore the time-varying of the direct impact of financial development on international trade. Second, we plan to properly control for the MRTs as suggested by Head and Mayer (2014) by including the exporter- time and importer-time fixed effects. Third, we follow the recommendation of Baier and Bergstrand (2007) by considering the country-pair fixed effects. The purpose is to not only control for potential endogeneity of any time-varying bilateral trade policy variable but also control for any time-invariant unobservable factors correlated to trade policy variables[7]. Finally, we include time-varying of international border to capture general globalization trends in the spirit of Bergstrand et al. (2015).

To get the results based on the panel gravity equation, we implement the Poisson pseudo-maximum likelihood with multiple levels of fixed effects (PPMLHDFE) estimator developed by Correia et al. (2019). As shown in Table 2, we present the estimates without country-pair fixed effects in columns (1), (3) and (5), and with country-pair fixed effects in columns (2), (4) and (6). In all specifications, the coefficients of our variable of interest (INTER×FDV) are statistically significant and positive. It implies that domestic credit to private sector stimulates bilateral manufacturing exports. However, we note that the coefficients' magnitude is much higher for estimates without country-pair fixed effects. When these latter are controlled, the coefficients' size shrinks. Unlike the cross-sectional results, we find that the direct positive impact of financial development on bilateral exports is dis- proportionately larger for final goods (column 4) than intermediate inputs (column 6). Moreover, despite the negative and significant impact of most coefficients related to general globalization trends on bilateral exports, it is worthwhile to indicate that these harmful effects are decreasing over time as demonstrated by the coefficients of INTER_2005 and INTER_2014 in columns (2), (4) and (6).

[7] Since the country-pair fixed effects are added in the panel model specification, standard control variables (distance, common border, same official language and colonial link), will be absorbed and therefore no coefficients are going to be displayed.

Table 2.
Panel data setting – financial development and bilateral exports

	all goods		**final goods**		**intermediate inputs**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
DIST	– 0.648***		– 0.565***		–0.690***	
	(0.011)		(0.012)		(0.012)	
BORD	0.480***		0.552***		0.441***	
	(0.042)		(0.046)		(0.041)	
LANG	0.111***		0.094**		0.117***	
	(0.035)		(0.038)		(0.036)	
COL	0.119***		0.092***		0.139***	
	(0.034)		(0.036)		(0.036)	
RTA	0.313***	0.056***	0.406***	0.043**	0.313***	0.070***
	(0.019)	(0.016)	(0.022)	(0.022)	(0.020)	(0.016)
INTER	–7.589***		–7.753***		–7.601***	
	(0.140)		(0.155)		(0.138)	
INTER x FDV	0.970***	0.126***	1.042***	0.373***	0.947***	0.051*
	(0.031)	(0.027)	(0.032)	(0.056)	(0.031)	(0.027)
INTER_2005	0.033	–0.088***	0.042	–0.032	0.011	–0.109***
	(0.076)	(0.016)	(0.092)	(0.024)	(0.072)	(0.016)
INTER_2006	0.03	–0.051***	0.054	0.012	0.008	–0.071***
	(0.077)	(0.014)	(0.093)	(0.022)	(0.073)	(0.015)
INTER_2007	–0.004	–0.055***	0.019	0.008	–0.022	–0.076***
	(0.072)	(0.013)	(0.088)	(0.021)	(0.068)	(0.014)
INTER_2008	0.014	–0.029**	0.118	0.105***	–0.032	–0.076***
	(0.069)	(0.012)	(0.084)	(0.020)	(0.066)	(0.014)
INTER_2009	–0.115*	–0.162***	–0.064	–0.098***	–0.154**	–0.201***
	(0.065)	(0.012)	(0.078)	(0.019)	(0.062)	(0.013)
INTER_2010	0.0006	0.051***	0.079	0.051***	–0.044	–0.096***
	(0.068)	(0.012)	(0.082)	(0.019)	(0.063)	(0.012)
INTER_2011	0.05	–0.002	0.173**	0.149***	–0.002	–0.058***
	(0.066)	(0.012)	(0.082)	(0.020)	(0.063)	(0.012)
INTER_2012	0.019	–0.021*	0.137*	0.125***	–0.028	–0.074***
	(0.068)	(0.012)	(0.082)	(0.018)	(0.064)	(0.013)
INTER_2013	–0.0002	–0.022*	0.112	0.117***	–0.047	–0.074***
	(0.068)	(0.012)	(0.083)	(0.019)	(0.065)	(0.013)
INTER_2014	0.018	0.0002	0.129	0.133***	–0.030	–0.051***
	(0.069)	(0.012)	(0.086)	(0.020)	(0.065)	(0.013)
observations	41,024	40,594	41,024	40,583	41,024	40,455
Pseudo R^2	0.98	0.99	0.98	0.99	0.99	0.99
country-pair FE	No	Yes	No	Yes	No	Yes

Note: This table displays panel data estimates based on the structural gravity model for 64 countries over the period 2005–2015. PPMLHDFE is the estimator. The dependent variable (in level) is bilateral exports of total manufacturing goods (final goods and intermediate inputs), including internal trade data. The proxy of financial development is domestic credit to private sector (% GDP). All regressions include exporter-year fixed effects and importer-year fixed effects. Columns (2), (4) and (6) add country-pair fixed effects. Intercepts are not reported. Standard errors in parentheses are clustered by country-pair. ***, ** and * denote the statistical significance level respectively at 1%, 5% and 10%.

5. Robustness checks

In order to support our empirical results, we perform three robustness checks. First, the sampled countries are divided into three groups based on their level of economic development (lower-middle income or LMI; upper-middle income or UMI and high income

or HHI)[8]. Second, instead of using total manufacturing exports as the dependent variable, we rather consider industry-level data for final goods and intermediate inputs. In addition, we employ alternative measures of financial development. Lastly, we examine the effects of these alternative measures on industry-level data by taking into account the level of economic development. All the coefficients are obtained by using the PPMLHDFE estimator including exporter-time fixed effects, importer-time fixed effects and country-pair fixed effects.

The first robustness analysis begins with Table 3. From columns (1) to (3), we focus on all goods. As we can see, results in columns (2), (5) and (8) are all positive and statistically significant. This means that domestic credit to private sector strongly promotes bilateral exports of upper-middle income economies. On the other hand, while there is no significant effect on.

bilateral exports of lower- middle income countries (column 1), the results show that the variable of interest has a depressing impact on bilateral exports of high income countries (column 3). To better understand the sign of that coefficient, we split the dependent variable into final goods and intermediate inputs. It is shown that the detrimental effect of financial development is only noticeable on bilateral exports of intermediate inputs among high income countries (column 9) given that the coefficient in column (6) is not statistically significant. The possible explanation is that most countries with high income are not or weakly involved in intermediate inputs trade. Similarly, as the impact of financial development on bilateral exports of lower-middle income economies is also negative (column 7), we argue that countries belonging to that income group do not participate actively in intermediate inputs trade. By comparison, this robustness check confirms the results of Table 2 by showing that the magnitude of the positive coefficient is larger for final goods than intermediate inputs.

Table 3.
Robustness check 1 – financial development and bilateral exports: role of economic development

	all goods			**final goods**			**intermediate inputs**		
	LMI	**UMI**	**HHI**	**LMI**	**UMI**	**HHI**	**LMI**	**UMI**	**HHI**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
INTER x FDV	– 0.255	0.427***	– 0.179***	0.246	0.615***	0.008	– 0.623**	0.328**	– 0.156***
	(0.235)	(0.129)	(0.037)	(0.274)	(0.135)	(0.119)	(0.242)	(0.132)	(0.032)
RTA	0.074	– 0.004	0.078***	0.014	– 0.013	0.068***	0.112*	– 0.002	0.084***
	(0.049)	(0.034)	(0.018)	(0.051)	(0.034)	(0.026)	(0.062)	(0.041)	(0.018)
INTER_2005	– 0.172	0.131	– 0.068***	– 0.062	– 0.114	– 0.001	– 0.192	0.184**	– 0.092***
	(0.134)	(0.089)	(0.014)	(0.161)	(0.125)	(0.026)	(0.139)	(0.089)	(0.015)
INTER_2006	0.173	0.220***	– 0.034**	0.082	0.124	0.056**	0.23	0.247***	– 0.067***
	(0.133)	(0.074)	(0.014)	(0.139)	(0.089)	(0.025)	(0.142)	(0.078)	(0.014)
INTER_2007	0.058	0.184***	– 0.035***	0.067	0.203***	0.047**	0.062	0.203***	– 0.064***
	(0.125)	(0.062)	(0.012)	(0.119)	(0.061)	(0.023)	(0.143)	(0.064)	(0.014)
INTER_2008	0.115	0.255***	– 0.029**	0.266**	0.142***	0.142***	0.067	0.259***	– 0.094***
	(0.123)	(0.052)	(0.012)	(0.112)	(0.023)	(0.023)	(0.143)	(0.056)	(0.014)
INTER_2009	– 0.219***	0.022	– 0.132***	– 0.094	– 0.0005	– 0.058**	– 0.242**	0.012	– 0.179***
	(0.084)	(0.048)	(0.014)	(0.066)	(0.058)	(0.026)	(0.105)	(0.051)	(0.015)
INTER_2010	0.105*	0.057	– 0.056***	0.228***	0.058	0.039	0.046	0.049	– 0.093***
	(0.056)	(0.042)	(0.013)	(0.064)	(0.049)	(0.024)	(0.071)	(0.046)	(0.013)
INTER_2011	0.048	0.118***	– 0.034**	0.249***	0.144***	0.118***	– 0.042	0.091**	– 0.077***
	(0.064)	(0.039)	(0.013)	(0.078)	(0.044)	(0.025)	(0.066)	(0.041)	(0.013)

[8] Refer to 'New World Bank country classification by income level: 2021-2022'.

INTER_2012	0.082	0.071**	– 0.046***	0.347***	0.091**	0.100***	– 0.096	0.051	– 0.084***
	(0.059)	(0.035)	(0.012)	(0.060)	(0.042)	(0.022)	(0.064)	(0.036)	(0.013)
INTER_2013	0.012	0.067**	– 0.037***	0.195**	0.098**	0.113***	– 0.094	0.034	– 0.081***
	(0.062)	(0.034)	(0.012)	(0.076)	(0.041)	(0.023)	(0.062)	(0.034)	(0.014)
INTER_2014	0.032	0.056	– 0.026**	0.106**	0.076*	0.121***	0.009	0.032	– 0.071***
	(0.045)	(0.034)	(0.012)	(0.051)	(0.04)	(0.024)	(0.054)	(0.034)	(0.013)
Observations	3,696	9,629	25,389	3,689	9,625	25,389	3,686	9,625	25,267
Pseudo R^2	0.999	0.999	0.999	0.999	0.999	0.998	0.999	0.999	0.999

Note: This table displays panel data estimates based on the structural gravity model for 64 countries over the period 2005–2015. PPMLHDFE is the estimator. The dependent variable (in level) is bilateral exports of total manufacturing goods (final goods and intermediate inputs), including internal trade data. The proxy of financial development is domestic credit to private sector (% GDP). Sampled countries are divided into groups following their income level: (i) lower-middle income (LMI), (ii) upper-middle income (UMI) and (iii) high income (HHI). All regressions include exporter-year fixed effects, importer-year fixed effects and country-pair fixed effects. Intercepts are not reported. Standard errors in parentheses are clustered by country-pair. ***, ** and * denote the statistical significance level respectively at 1%, 5% and 10%.

The results for the second robustness analysis are disclosed in Table 4 for final goods and Table 5 for intermediate inputs. We present only the estimates of the variable of interest (INTER×FDV). The dependent variable is no longer bilateral exports of all manufacturing industries, rather we consider bilateral exports for each manufacturing industry. Five proxies of financial development are also used: (i) FDV_1: domestic credit to private sector (% GDP), (ii) FDV_2: liquid liabilities (% GDP), (iii) FDV_3: stock market capitalization (% GDP), (iv) FDV_4: private credit by deposit money banks (% GDP), (v) FDV_5: stock market total value added traded (% GDP).

When we focus on final goods (Panel A, Table 4), the estimates of our variable of interest are in overall significant but display different signs across industries. Among the 35 obtained coefficients, 17 are positive and statistically significant, 9 are significantly negative and the remaining is insignificant. The highest stimulating and significant effect (+1.42) is observed in transport equipment (D29T30) with domestic credit to private sector as proxy of financial development (column 1). The lowest significant and positive impact (+0.052) is discovered in wood and paper products, printing (D16T 18) when stock market total value traded is used as proxy of financial development (column 5). In contrast, the greatest significant and depressing effect (–0.48) is found in basic metals and fabricated metal products (D24T25) when we use domestic credit to private sector (column 1). The smallest detrimental and significant influence (–0.122) is identified in textiles, wearing apparel, leather and related products (D13T15) with stock market total value traded as measure of financial development (column 5). These findings reveal that financial development exerts a dominant beneficial effect on bilateral exports of manufacturing final goods.

In panel B (Table 5), we use intermediate inputs as the dependent variable. Over the 35 estimated coefficients, 19 are significantly positive, 4 are negative and significant and 12 are not statistically significant. After this general observation, we find the largest positive and significant effect (+0.41) in wood and paper products, printing (D16T18) with liquid liabilities as proxy of financial development (column 2). The smallest positive and significant impact (+0.026) is noticeable in chemicals and non- metallic mineral products (D19T23) when stock market total value traded is the measure of financial development (column 5). Conversely, the highest harmful and significant effect (–0.46) is detected in basic metals and fabricated metal products (D24T25) when we use liquid liabilities as proxy of financial development (column 2). The lowest negative and significant effect (– 0.15) is observed in computers, electronic and electric equipment (D26T27) with the use of private credit by deposit money banks as proxy of financial development (column 4).

Table 4.
Robustness check 2 – financial development and bilateral exports by industry

	final goods				
Panel A	**INTERxFDV1**	**INTERxFDV2**	**INTERxFDV3**	**INTERxFDV4**	**INTERxFDV5**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
industry 1: D10T12	0.245***	0.347***	– 0.0024	0.191***	– 0.026
	(0.065)	(0.086)	(0.036)	(0.056)	(0.019)
observations	39,706	42,335	39,539	41,690	39,745
Pseudo R2	0.997	0.997	0.997	0.997	0.997
industry 2: D13T15	– 0.131*	0.024	–0.125***	– 0.176***	– 0.122***
	(0.070)	(0.105)	(0.046)	(0.059)	(0.032)
observations	38,241	40,688	37,751	40,263	38,096
Pseudo R2	0.995	0.994	0.995	0.994	0.005
industry 3: D16T18	0.197***	0.379***	– 0.032	0.197***	0.052***
	(0.035)	(0.052)	(0.022)	(0.031)	(0.014)
observations	35,188	37,282	35,071	36,857	35,430
Pseudo R2	0.998	0.998	0.998	0.998	0.998
industry 4: D19T23	– 0.286***	– 0.307**	– 0.022	– 0.235***	0.016
	(0.081)	(0.121)	(0.041)	(0.071)	(0.029)
observations	39,467	42,137	39,422	41,534	39,789
Pseudo R2	0.996	0.996	0.996	0.996	0.996
industry 5: D26T27	0.320***	0.173***	0.251***	0.193***	0.118***
	(0.038)	(0.058)	(0.024)	(0.033)	(0.014)
observations	35,954	38,173	35,971	37,730	36,324
Pseudo R2	0.999	0.999	0.999	0.999	0.999
industry 6: D24T25	– 0.479***	0.12	– 0.153	– 0.213	– 230***
	(0.223)	(0.151)	(0.100)	(0.154)	(0.058)
observations	38,135	40,550	37,999	40,070	38,372
Pseudo R2	0.994	0.994	0.994	0.994	0.994
industry 7: D29T30	1.417***	1.259***	0.360***	1.053***	0.497***
	(0.398)	(0.422)	(0.077)	(0.320)	(0.085)
observations	37,003	39,537	36,866	39,196	37,236
Pseudo R2	0.987	0.987	0.988	0.987	0.988

Note: This table displays panel data estimates based on the structural gravity model for 64 countries over the period 2005- 2015. PPIIILHDFE is the estimator. The dependent variable (in level} is bilateral manufacturing exports or final goods, including internal trade data. Five (5) proxies or financial development are used and respectively presented: (i) FD\/, : domestic credit to private sector (% GDP), (ii) FD\/2: liquid liabilities (% GDP), (iii) F Dl,1: : stock market capitalization (% GDP), (iv) FDV4 : private credit by deposit money banks (% GDP), (v) F DV5 : stock market total value traded (% GDP). Bilateral manufacturing exports is divided into seven (7) manufacturing industries: (i) D10T12: rood products, beverages and tobacco; (ii) D13T15: textiles, wearing apparel, leather and related products; (iii) D16T18: wood and paper products, printing; (iv) D19T23: chemicals and non- metallic mineral products; (v) D24T25: basic metals and fabricated metal products: (vi) D26T27: computers, electronic and electric equipment; (vii) D29T30: transport equipment. AH regressions include exporter-year fixed effects. importer-year fixed effects and country-pair fixed effects. Intercepts are not reported. Standard errors in parentheses are clustered by country- pair. ***, ** and * denote the statistical significance level respectively at 1%, 5% and 10%.

As a whole, the analysis of Panel B shows that financial development enhances bilateral exports of manufacturing intermediate inputs. For the purpose of comparison, the highest positive impact of financial development is found on bilateral exports of final goods. This is line with our benchmark result presented in Table 2.

The third robustness analysis investigates the impact of five proxies of financial development on bilateral exports by industry and by the level of economic development. The results are exhibited in Table 6 for final goods and Table 7 for intermediate inputs. We begin our assessment with lower-middle income countries as shown in Panel A of Table 6. For the 35

estimated coefficients, 9 are positive and significant, 8 are significantly negative and 18 are not statistically significant. The highest significant and positive impact (+2.99) is observed in wood and paper products, printing (D16T18) when private credit by deposit money banks is the proxy of financial development (column 4). The lowest stimulating effect (+1.24) is found in chemicals and non-metallic mineral products (D19T 23) with domestic credit to private sector as measure of financial development (column 1).

On the contrary, the greatest detrimental and significant effect (–3.56) is identified in computers, electronic and electric equipment (D26T27) when domestic credit to private sector is considered as the proxy of financial development (column 1). The smallest negative and significant effect (–0.64) is detected in food products, beverages and tobacco (D10T12) with stock market capitalization as proxy of financial development (column 3). These findings show that in lower-middle income countries, financial development is likely to affect positively bilateral exports of final goods as much as negatively.

In Panel B, we focus on upper-middle income economies. Among the 35 obtained coefficients, 15 are positively significant, 8 are negative and significant and the remaining is insignificant. The largest positive and significant effect (+1.16) is found in textiles, wearing apparel, leather and related products (D13T15) with liquid liabilities as the measure of financial development (column 2). The smallest promoting and significant impact (+0.083) is noticeable in in food products, beverages and tobacco (D10T12) when stock market total value traded are used as proxy of financial development (column (5)). On the other hand, the highest adverse and significant effect (–2.39) is identified in computers, electronic and electric equipment (D26T27) with liquid liabilities as the measure of financial development (column 2). The lowest depressing and significant (–0.28) is disclosed in computers, electronic and electric equipment (D26T 27) when stock market total value traded is used as the proxy of financial development (column 5). The results demonstrate that the positive effect of financial development exceeds the harmful influence in upper-middle income countries.

Table 5.
Robustness check 3 – financial development and bilateral exports by industry

	intermediate inputs				
Panel B	**INTERxFDV1**	**INTERxFDV2**	**INTERxFDV3**	**INTERxFDV4**	**INTERxFDV5**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
industry 1: D10T12	0.049	0.056	0.139***	– 0.008	0.095***
	(0.033)	(0.051)	(0.019)	(0.031)	(0.012)
Observations	38,733	41,279	38,409	40,687	38,799
Pseudo R2	0.999	0.999	0.999	0.999	0.999
industry 2: D13T15	0.286***	0.086	0.272***	0.214***	0.159***
	(0.071)	(0.102)	(0.034)	(0.056)	(0.024)
Observations	37,111	39,525	36,836	39,283	37,171
Pseudo R2	0.999	0.999	0.999	0.999	0.999
industry 3: D16T18	0.222***	0.412***	0.079**	0.195***	0.138***
	(0.047)	(0.073)	(0.039)	(0.042)	(0.018)
Observations	36,849	39,197	36,766	38,691	37,145
Pseudo R2	0.998	0.998	0.998	0.998	0.998
industry 4: D19T23	0.022	– 0.005	0.099***	– 0.034	0.026**
	(0.035)	(0.062)	(0.018)	(0.034)	(0.011)
Observations	39,817	42,531	39,605	41,906	39,968
Pseudo R2	0.998	0.998	0.998	0.998	0.998

industry 5: D26T27	– 0.250***	– 0.459***	0.086**	– 0.188***	0.028
	(0.052)	(0.076)	(0.039)	(0.048)	(0.024)
Observations	38,696	41,313	38,684	40,744	39,088
Pseudo R2	0.997	0.997	0.997	0.997	0.997
industry 6: D24T25	0.177***	– 0.078	0.204***	– 0.151**	0.078***
	(0.074)	(0.072)	(0.031)	(0.061)	(0.019)
Observations	37,849	40,286	37,792	39,811	38,153
Pseudo R2	0.998	0.997	0.998	0.997	0.998
industry 7: D29T30	0.130*	0.02	0.098**	0.07	0.008
	(0.066)	(0.112)	(0.041)	(0.061)	(0.024)
Observations	35,094	37,373	34,992	37,121	35,339
Pseudo R2	0.998	0.998	0.998	0.998	0.998

Note: This table displays panel data estimates based on the structural gravity model for 64 countries over the period 2005- 2015. PPIIILHDFE is the estimator. The dependent variable (in level} is bilateral manufacturing exports or final goods, including internal trade data. Five (5) proxies or financial development are used and respectively presented: (i) FD\/,: domestic credit to private sector (% GDP), (ii) FD\/2: liquid liabilities (% GDP), (iii) F Dl,1: : stock market capitalization (% GDP), (iv) FDV4 : private credit by deposit money banks (% GDP), (v) F DV5 : stock market total value traded (% GDP). Bilateral manufacturing exports is divided into seven (7) manufacturing industries: (i) D10T12: rood products, beverages and tobacco; (ii) D13T15: textiles, wearing apparel, leather and related products; (iii) D16T18: wood and paper products, printing; (iv) D19T23: chemicals and non- metallic mineral products; (v) D24T25: basic metals and fabricated metal products: (vi) D26T27: computers, electronic and electric equipment; (vii) D29T30: transport equipment. AH regressions include exporter-year fixed effects. importer-year fixed effects and country-pair fixed effects. Intercepts are not reported. Standard errors in parentheses are clustered by country- pair. ***, ** and * denote the statistical significance level respectively at 1%, 5% and 10%.

For high income economies in Panel C, over the 35 estimated coefficients, we note 13 are significantly positive and as much that are negative and significant, 9 are not statistically negative. The highest enhancing and significant impact (+2.41) is disclosed in transport equipment (D29T 30) with domestic credit to private sector as proxy of financial development (column 1). The lowest promoting and significant effect (+0.076) is found in chemicals and non-metallic mineral products (D19T23) when stock market total value traded is used as the measure of financial development (column 5). By contrast, the largest detrimental and significant effect (–0.43) is observed in chemicals and non-metallic mineral products (D19T23) with private credit by deposit money banks as proxy of financial development (column 4). The smallest depressing and significant impact (–0.041) is displayed in food products, beverages and tobacco (D10T12) when stock market total value traded is considered as proxy of financial development (column 5). These estimates indicate that financial development in high income economies affect positively bilateral exports of final goods as much as their adverse impact does so.

When it comes to intermediate inputs in Table 7, we observe that over the 35 obtained coefficients within lower-middle income countries (Panel D), 7 are positive and significant, 12 are significantly negative and 16 are insignificant. The highest promoting and significant effect (+2.44) is detected in food products, beverages and tobacco (D10T12) with liquid liabilities as proxy of financial development (column (2)). The lowest stimulating and significant impact (+0.157) is found in computers, electronic and electric equipment (D26T27) when stock market total value traded is used as proxy of financial development (column 5). The greatest negative and significant effect (–2.29) is observed in computers, electronic and electric equipment (D26T27) with domestic credit to private credit as proxy of financial development (column 1).

Table 6.
Robustness check 4 – financial development and bilateral exports by industry role of economic development – final goods

Panel A	**LMI (lower-middle income)**				
	INTERxFDV1	**INTERxFDV2**	**INTERxFDV3**	**INTERxFDV4**	**INTERxFDV5**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
industry 1: D10T12	– 2.299***	0.511	– 0.643***	– 1.508*	– 0.536***
	(0.875)	(0.785)	(0.199)	(0.857)	(0.167)
industry 2: D13T15	2.040***	0.423	0.374*	1.696***	0.056
	(0.571)	(1.099)	(0.194)	(0.616)	(0.108)
industry 3: D16T18	2.205***	2.072***	– 0.185	2.999***	– 0.099
	(0.546)	(0.671)	(0.167)	(0.570)	(0.099)
industry 4: D19T23	1.236**	2.541***	0.422	1.989**	0.114
	(0.629)	(0.951)	(0.318)	(0.855)	(0.222)
industry 5: D26T27	0.598	0.317	0.038	0.645	0.024
	(0.494)	(0.503)	(0.150)	(0.435)	(0.086)
industry 6: D24T25	– 3.557***	– 2.576	0.223	1.058	– 0.301
	(1.191)	(1.880)	(0.376)	(779)	(0.234)
industry 7: D29T30	– 1.350	– 2.837***	– 0.244	– 2.207***	– 0.291*
	(0.861)	(0.866)	(0.273)	(0.776)	(0.150)
Panel B	**UMI (upper-middle income)**				
	INTERxFDV1	**INTERxFDV2**	**INTERxFDV3**	**INTERxFDV4**	**INTERxFDV5**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
industry 1: D10T12	0.507**	0.311	0.104	0.645***	0.083*
	(0.211)	(2.38)	(0.083)	(0.194)	(0.047)
industry 2: D13T15	– 0.643***	1.164***	0.500***	– 1.114***	0.167***
	(0.229)	(0.183)	(0.098)	(0.176)	(0.053)
industry 3: D16T18	0.924***	0.195	0.171**	0.519***	0.124***
	(0.188)	(0.247)	(0.074)	(0.150)	(0.044)
industry 4: D19T23	– 0.003	– 0.634**	– 0.024	0.006	0.082
	(0.287)	(0.309)	(0.134)	(0.233)	(0.074)
industry 5: D26T27	0.424**	– 0.107	0.320***	0.023	0.0207***
	(0.174)	(0.250)	(0.078)	(0.153)	(0.049)
industry 6: D24T25	0.084	– 2.391***	– 0.673***	– 0.003	– 0.281***
	(0.347)	(0.766)	(0.130)	(0.278)	(0.073)
industry 7: D29T30	– 0.995**	– 0.359	0.392*	– 1.238***	0.183**
	(0.481)	(0.480)	(0.222)	(0.396)	(0.088)
Panel C	**HHI (high income)**				
	INTERxFDV1	**INTERxFDV2**	**INTERxFDV3**	**INTERxFDV4**	**INTERxFDV5**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
industry 1: D10T12	0.414***	0.420***	0.003	0.210**	– 0.0405*
	(0.106)	(0.125)	(0.041)	(0.097)	(0.024)
industry 2: D13T15	– 0.0006	0.054	– 0.194***	0.008	– 0.199***
	(0.086)	(0.091)	(0.048)	(0.078)	(0.036)
industry 3: D16T18	– 0.086*	0.150**	– 0.157***	0.016	– 0.096***
	(0.044)	(0.065)	(0.028)	(0.042)	(0.012)
industry 4: D19T23	– 0.510***	– 0.392**	0.111*	– 0.431***	0.076*
	(0.127)	(0.158)	(0.067)	(0.113)	(0.046)
industry 5: D26T27	– 0.111***	– 0.088	0.480***	– 0.169***	0.090***
	(0.043)	(0.058)	(0.033)	(0.040)	(0.018)
industry 6: D24T25	– 0.197	0.362**	– 0.295***	– 0.275	– 0.101*
	(0.282)	(0.156)	(0.063)	(0.212)	(0.056)
industry 7: D29T30	2.141***	0.334	1.469***	1.643**	1.305***
	(0.833)	(0.958)	(0.336)	(0.660)	(0.195)

Note: This table displays panel data estimates based on the structural gravity model for 64 countries over the period 2005-2015. PPIIILHDFE is the estimator. The dependent variable (in level) is bilateral manufacturing exports or final goods, including internal trade data. All regressions include exporter-year fixed effects, importer-year fixed effects and country-pair fixed effects. Intercepts are not reported. Standard errors in parentheses are clustered by country-pair. ***, ** and * denote the statistical significance level respectively at 1%, 5% and 10%.

The smallest stimulating and significant impact (–0.167) is displayed in wood and paper products, printing (D16T18) when stock market total value traded is the measure of financial development (column 5) These results prove that the detrimental effect of financial development on bilateral exports of intermediate is more prominent among lower-middle income countries.

We continue our assessment by examining the finance-trade relationship within upper-middle income countries (Panel E). Over the 35 estimated coefficients, 16 are positively significant, 3 are negative and significant, and 16 are not statistically significant. The largest positive and significant effect (+2.72) is identified in computers, electronic and electric equipment (D26T 27) with domestic credit to private sector as proxy of financial development (column 1). The lowest promoting and significant effect (+0.143) is disclosed in textiles, wearing apparel, leather and related products (D13T15) when stock market total value traded is the measure of financial development (column 5). In contrast, the highest detrimental and significant impact (–1.27) is noticeable in basic metals and fabricated metal products (D24T25) with liquid liabilities as proxy of financial development (column 2). The smallest deleterious and significant effect (–0.391) is detected in food products, beverages and tobacco (D10T12) with liquid liabilities as proxy of financial development (column 2). In overall, the results suggest that the stimulating impact of financial development is more prominent on bilateral exports of intermediate inputs among upper-middle income countries.

The last step of our robustness analysis concerns the investigation on high income countries (Panel F). Among the 35 estimated coefficients, 6 are positive and significant, 16 are significantly negative and 13 are insignificant. The greatest enhancing and significant effect (+0.391) is detected in wood and paper products, printing (D16T18) with liquid liabilities as proxy of financial development (column 2). The smallest positive and significant impact (+0.094) is found in basic metals and fabricated metal products (D24T25) when stock market total value traded is used as proxy of financial development (column 5). Conversely, the highest negative and significant effect (–0.66) is identified in computers, electronic and electric equipment (D26T27) with private credit by deposit money banks as proxy of financial development (column 4). The weakest harmful and significant impact (–0.088) is observable in wood and paper products, printing (D16T18) when stock market total value traded is consider as proxy of financial development (column 5). These findings imply that financial development has a harmful impact on bilateral exports of intermediate inputs within high income economies.

Table 7.
Robustness check 5 – financial development and bilateral exports by industry
role of economic development – intermediate inputs

Panel D	**LMI (lower-middle income)**				
	INTERxFDV1	**INTERxFDV2**	**INTERxFDV3**	**INTERxFDV4**	**INTERxFDV5**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
industry 1: D10T12	– 0.971	2.447***	0.028	– 0.983	– 0.022
	(0.664)	(0.571)	(0.171)	(0.698)	(0.110)
industry 2: D13T15	0.255	– 1.192***	0.105	0.029	0.024
	(201)	(0.442)	(0.102)	(0.252)	(0.060)
industry 3: D16T18	0.038	1.930***	– 0.274***	1.380***	– 0.167***
	(0.410)	(0.536)	(0.092)	(0.506)	(0.056)
industry 4: D19T23	– 0.778***	1.803***	0.165*	– 0.906***	0.056
	(0.274)	(0.370)	(0.091)	(0.299)	(0.054)
industry 5: D26T27	– 1.041*	– 0.565	– 0.649***	– 1.970	– 0.307***
	(0.572)	(0.560)	(0.114)	(0.600)	(0.071)
industry 6: D24T25	– 2.296***	– 1.097*	0.309***	– 2.000***	0.157***
	(0.478)	(0.590)	(0.054)	(0.392)	(0.044)
industry 7: D29T30	0.691	0.602	0.304	– 0.596	0.116
	(0.937)	(0.680)	(0.207)	(0.642)	(0.110)

Panel E	UMI (upper-middle income)				
	INTERxFDV1	**INTERxFDV2**	**INTERxFDV3**	**INTERxFDV4**	**INTERxFDV5**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
industry 1: D10T12	0.452**	– 0.391*	0.094	0.458**	0.06
	(0.179)	(0.211)	(0.086)	(0.185)	(0.051)
industry 2: D13T15	– 0.155	– 0.227	0.317***	– 0.456***	0.143***
	(0.150)	(0.230)	(0.104)	(0.133)	(0.042)
industry 3: D16T18	0.819***	– 0.046	0.320***	0.685***	0.201***
	(0.189)	(0.301)	(0.088)	(0.179)	(0.051)
industry 4: D19T23	2.94e–05	0.154	0.202***	– 0.054	0.051
	(0.161)	(204)	(0.063)	(0.127)	(0.039)
industry 5: D26T27	0.178	– 1.273***	0.370***	0.663***	0.217***
	(0.190)	(0.397)	(0.131)	(0.244)	(0.076)
industry 6: D24T25	2.725***	0.553	0.149	1.422***	0.058
	(0.295)	(0.405)	(0.094)	(0.294)	(0.065)
industry 7: D29T30	0.530**	0.727**	0.143	0.345	0.112
	(0.248)	(0.356)	(0.135)	(0.245)	(0.069)
Panel F	**HHI (high income)**				
	INTERxFDV1	**INTERxFDV2**	**INTERxFDV3**	**INTERxFDV4**	**INTERxFDV5**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
industry 1: D10T12	– 0.111***	0.043	0.212***	– 0.173***	0.126***
	(0.039)	(0.055)	(0.025)	(0.038)	(0.014)
industry 2: D13T15	– 0.030	0.028	– 0.012	– 0.082	0.006
	(0.064)	(0.075)	(0.044)	(0.057)	(0.018)
industry 3: D16T18	– 0.053	0.391***	– 0.374***	0.056	– 0.088***
	(0.071)	(0.101)	(0.041)	(0.064)	(0.018)
industry 4: D19T23	– 0.170***	– 0.093	0.112***	– 0.173***	0.012
	(0.048)	(0.076)	(0.029)	(0.051)	(0.014)
industry 5: D26T27	– 0.120*	– 0.187**	0.038	– 0.124**	0.094***
	(0.065)	(0.085)	(0.039)	(0.062)	(0.021)
industry 6: D24T25	– 0.538***	– 0.174**	0.200***	– 0.660***	0.024
	0.092)	(0.071)	(0.051)	(0.075)	(0.019)
industry 7: D29T30	– 0.222**	– 0.028	– 0.321***	– 0.212**	– 0.262***
	(0.092)	(0.153)	(0.074)	(0.092)	(0.039)

Note: This table displays panel data estimates based on the structural gravity model for 64 countries over the period 2005-2015. PPIIILHDFE is the estimator. The dependent variable (in level) is bilateral manufacturing exports or final goods, including internal trade data. All regressions include exporter-year fixed effects. importer-year fixed effects and country-pair fixed effects. Intercepts are not reported. Standard errors in parentheses are clustered by country-pair. ***, ** and * denote the statistical significance level respectively at 1%, 5% and 10%.

6. Conclusion

While the existing papers have failed to estimate the direct and unbiased impact of financial development on international trade using the gravity model, our research work overcomes that challenge. To do so, we employ the structural gravity model that includes international trade data and intra- national trade data. In addition, following Beverelli et al. (2018), an identification strategy has been developed that allows to capture the effect of financial indicators on international trade flows without facing any collinearity problem and properly controlling for the multilateral resistance terms (MRTs). In order to explore the soundness of that methodology within the time-invariant and time-varying framework, we use both cross-sectional (2015) and panel regressions (2005–2015) on 64 sampled countries. The empirical validation has been performed through the OLS/2SLS estimator and the Poisson pseudo-maximum likelihood with multiple levels of fixed effects (PPMLHDFE) estimator. Since we have obtained our coefficient of interest in all regressions in presence of different specifications of fixed effects, this implies that our identification strategy works and is effective.

As a whole, we find that financial development enhances significantly and positively bilateral exports of all manufacturing goods. The promoting effect is disproportionately higher for final goods than intermediate inputs. However, when countries in the sample are grouped based on their economic development, the dependent variable is considered for each single manufacturing industry and different proxies of financial development are used, the results provide a new insight. It consists of showing off the heterogeneous effect of the direct impact of financial development on international trade flows relative to internal trade data [9]. Specifically, our findings suggest that the impact of financial development on final goods and intermediate inputs is either significantly positive or significantly negative depending on the level of country income and across industries.

Appendix

Table A1.
Descriptive statistics

	obs.	**mean**	**std.dev.**	**min.**	**max.**
domestic credit to private sector (% GDP)	41,024	4.34	0.64	2.19	5.72
liquid liabilities (% GDP)	43,776	4.26	0.64	2.78	6.84
stock market capitalization (% GDP)	40,256	3.88	0.96	– 0.48	6.99
private credit by deposit money banks (% GDP)	43,136	4.2	0.63	2.11	5.56
stock market total value traded (% GDP)	40,640	2.66	1.96	– 3.59	6.71
international border (INTER)	45,056	0.98	0.12	0	1
distance (DIST)	45,056	8.42	1.09	1.9	9.89
border (BORD)	45,056	0.034	0.18	0	1
official language (LANG)	45,056	0.071	0.26	0	1
colonial link (COL)	45,056	0.026	0.16	0	1
regional trade agreements (RTA)	45,056	0.46	0.49	0	1
total manufacturing goods	44,018	4.99	2.78	– 2.30	16.24
manufacturing final goods	43,896	4.12	2.72	– 2.30	14.72
manufacturing intermediate inputs	43,710	4.39	2.82	– 2.30	15.99

Note: All variables are in the logarithmic form except border, language, colonial link, regional trade agreements.

Table A2.
Description of manufacturing industry

industry code	**industry name**
D10T12	food products, beverages and tobacco
D13T15	textiles, wearing apparel, leather and related products
D16T18	wood and paper products, printing
D19T23	chemicals and non-metallic mineral products
D24T25	basic metals and fabricated metal products
D26T27	computers, electronic and electric equipment
D29T30	transport equipment

Note: industry classification based on OECD statistics

[9] Although Cesar (2014) has already pointed out that aspect in the literature, his result did not identify solely the influence of financial indicators on trade using the gravity model.

Table A3.
List of 64 sampled countries (exporters and importers)

Argentina	Australia	Austria	Belgium	Bulgaria	Brazil
Brunei	Canada	Switzerland	Chile	China	Colombia
Costa Rica	Cyprus	Czech Rep.	Germany	Denmark	Spain
Estonia	Finland	France	United Kingdom	Greece	Hong Kong
Croatia	Hungary	Indonesia	India	Ireland	Israel
Iceland	Italy	Japan	Kazakhstan	Cambodia	Korea
Lithuania	Luxembourg	Latvia	Morocco	Mexico	Malta
Malaysia	Netherlands	Norway	New Zealand	Peru	Philippines
Poland	Portugal	Roumania	Russia	Saudi Arabia	Singapore
Slovakia	Slovenia	Sweden	Thailand	Tunisia	Turkey
Taiwan	United States	Viet Nam	South Africa		

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