

Impacts of Regional Trade Agreements on the Trade Effects of Financial Development

Juan Zhang^{*+}

Jiahui Chen^{**}

Zuanshi Liu^{***}

Abstract: *Regional trade agreements (RTAs) significantly reduce tariff and non-tariff barriers, facilitate capital flow and improve financing conditions, which can help exporters ease financing constraints and promote export. This paper studies the impacts of RTAs signed by member countries of Regional Comprehensive Economic Partnership Agreement (RCEP) on the trade effects of financial development, using the gravity model with industry level bilateral trade data from 2000 to 2021. The results show that with RTAs, exporters' dependence on financial development of home countries has decreased, and there is a similar mechanism in importing countries. However, exporters' decreasing dependence on financial development is different, i.e., the decreasing dependence of exporters in industries rely heavily on external financing is smaller than that in other industries.*

Keywords: regional trade agreements (RTAs); financial development; trade; financial constraints

JEL Classification: F13, G32

Introduction

According to the definition of World Bank, a regional trade agreement (RTA) is a treaty between two or more governments that define the rules of trade for all signatories. Examples of RTAs include the North American Free Trade Agreement (NAFTA),

* Shanghai University of International Business and Economics, Gubei Road 620, Shanghai, China.

+ Juan Zhang is corresponding author. E-mail: madeline.zhang@hotmail.com

** Shanghai University of International Business and Economics, Gubei Road 620, Shanghai, China.

*** East China University of Science and Technology, Meilong Road 130, Shanghai, China.

the European Union (EU) and Asia-Pacific Economic Cooperation (APEC). RTAs promote the flow of goods, services and capital among members, and facilitate their industrial upgrading and currency internationalization. According to the RTA database of the World Trade Organization (WTO), as of February 11th, 2024, there are 364 RTAs in effect worldwide, including 166 ones covering only trade in goods, 2 covering only trade in services, and 196 covering trade in goods and services. In addition, there are 318 free trade agreements (FTAs), accounting for the vast majority of all RTAs. Among these RTAs, European economies contribute to the largest number, followed by East Asian economies and South American economies. In recent years, economic globalization has slowed down due to trade protectionism and COVID-19, while regional economic integration has developed rapidly, which has had significant impacts on international trade relationships. Many studies (e.g., Anderson & van Wincoop, 2003; Baier & Bergstrand, 2007; Magee, 2017) have showed that RTAs effectively promote trade among member states.

Financing constraint reflects the level of financial development (Beck, 2002, 2003). Financing constraint is one of the important factors restricting exporters to expand their production scale, increase export and improve the quality of exports. Companies need to invest in production, procedure compliance, advertising, customer relationship and other aspects when engaging in export. However, their own capital is usually not enough to cover all the above costs and they have to finance externally. Therefore, there is a strong correlation between exports and financial development. The global financial crisis broke out in 2008 and the global trade value in 2009 fell sharply by 12%. According to the survey of 2012-2015 in developing countries by World Bank, there were 65.26% of companies' exports affected by financing constraints, among which 37.42% believed that financing constraints seriously affected their exports. RTAs' preferential investment provisions and the corresponding market access conditions promote capital flows. The number of RTAs increases, so does the total value of foreign investment. From 1990 to 2021, the number of global RTAs increased at an average annual rate of 10%, while the foreign direct investment (FDI) inflow went up annually at 7% over the same period.

Based on the heterogeneous trade theory of Melitz (2003), exporters usually have higher productivity and larger production scale, while those with lower productivity tend to sell in the domestic market. In other words, higher productivity means lower export costs. Export cost is a key factor affecting international trade. For the same product, countries with lower export cost are more inclined to export. In the case of high export costs, a high level of financial development can help exporters alleviate external financing constraints and promote trade. RTAs reduce tariff and non-tariff barriers with trade creation effects. Meanwhile, the trade facilitation provisions included in RTAs simplify the customs clearance process and shorten the time from production to export. The reduction of trade resistance helps companies export more easily, and the companies' demand for external financing decreases. Based on

existing researches, this paper empirically studies the impacts of RTAs on the trade promotion effects of financial development.

The remainder of this paper is structured as follows. Part 2 presents the literature review. Part 3 presents the model and data. Part 4 presents the baseline empirical results. Part 5 presents robustness checks and extensions. Part 6 offers some concluding remarks and addresses implications.

Literature review

The more developed finance a country has, the more active exports it experiences (Becker, Chen, & Greenberg, 2013; Chaney, 2016; Berman & Héricourt, 2010; Beck, 2002). Some scholars study from the perspective of export binary margin (intensive margin and wide extension margin). Manova, Wei, & Zhang (2015) find significant positive correlation between financial development and trade, especially in the industries with high external financing dependence. A FTA reduces trade cost by cutting tariff and non-tariff barriers among its members (Franco-Bedoya & Frohm, 2022; Hayakawa, Laksanapanyakul, & Yoshimi, 2023; Estrades, Maliszewska, Osorio-Rodarte, & Seara e Pereira, 2023).

The uncertainty of trade policy undoubtedly increases trade costs, and the RTAs help reduce the risk caused by uncertainty. Commitment and reliability are crucial for trade policy, which can significantly affect the decision-making of companies to participate in market competition. The more stable and inclusive are the policies of trading countries, the more possible are companies to enter the market. In fact, reducing tariff uncertainty is more important than reducing tariff rate. Giving tariff uncertainty indicators, a RTA must include preferential tariff clauses, which significantly reduces the uncertainty of trade policy (Handley & Limão, 2015; Limão & Maggi, 2015).

The RTA provisions on investment reduce investment barriers between contracting parties and relax constraints on foreign investors, facilitating cross-border capital flow and promoting trade. If there is a RTA member country whose production cost is much lower than that of the rest of the world, the capital flow into this country is a Pareto improvement. If the high-cost members import from low-cost members rather than the rest of the world, the overall welfare of RTA members is improved. Raff (2004) finds the signing of FTA and customs union helps form regional economic integration, making the regional market more stable and promoting the regional flow of FDI. Baltagi, Egger, & Pfaffermayr (2008) find that European RTAs have impacts on both trade and FDI. A RTA leads to investment creation effects and investment diversion effects. It provides commitment and guarantee for investors, which help investors manage investment risks. Neumayer & Spess (2005) believe that although foreign investors investing in developing countries usually hold reservations due to

the imperfect legal system and institutions, trade agreements can help offset the institutional defects of the host country and protect the rights and interests of foreign investors, thus promoting foreign capital inflow. Allee & Peinhardt (2011) find that signing trade agreements could attract more FDI, and the ability of bilateral investment (trade) treaties to attract FDI depends on the performance of the government after signing the treaties. Utilizing the generalized least squares (GLS) with 170 country-year panel data obtained from Association of South East Asian Nations (ASEAN) member countries and Republic of Korea from 2000 to 2016, Lim, Park, Nam, & Park (2020) find the trade volume between ASEAN countries and Republic of Korea had a positive impact on outward FDI originated from Republic of Korea. And there is a moderating effect of ASEAN-Republic of Korea FTA on the relationship between trade and FDI. MacDermott (2007) finds that trade integration encourages FDI.

With a gravity model of 69 developed and developing countries from 1986 to 2006, Nguyen & Vaubourg (2021) show that the trade promotion of financial intermediation in an exporting country is mitigated when there is a RTA between this country and the importing one. The same effects are found in the importing country. Turkson, Oduro, Baffour, & Quartey (2022) find RTAs within 43 Sub-Saharan Africa (SSA) countries, especially among Economic Community of West African States and Southern Africa Development Community members, have had a significant positive impact on bilateral trade. Financially integrated trading partners also traded more, while distance, landlockedness, common currency and colonial link have an impact on trade costs and bilateral trade flows within SSA.

Model and data

Model

This paper is based on the gravity model with bilateral trade value between countries as the dependent variable, because it can better reflect the trade relationships between countries. RTA_{ijt} is a dummy variable, it is denoted 1 when there is a RTA between country i and country j at year t , and 0 otherwise. The financial development of exporting country FI_{it} is an independent variable, and it is measured as the Financial system deposits to GDP (%) of the exporting country. Unlike the vast majority of studies, this paper adds the intersection of dummy variable RTA and financial development to study the moderating effects of this intersection on bilateral trade. In addition, the number of RTA signed $rtaquantity$ and the number of RTA member states $member$ are introduced to improve the significance of the model. The baseline model is shown in Equation (1):

$$\begin{aligned} \ln X_{kijt} = & \beta_0 CONTROL_{ij} + \beta_1 RTA_{ijt} + \beta_2 FI_{it} + \beta_3 FI_{it} \times RTA_{ijt} \\ & + \beta_4 rtaquantity + \beta_5 member + \pi_{kit} + \mu_{kjt} + \gamma_{kt} + \varepsilon_{kijt} \end{aligned} \quad (1)$$

On the one hand, there are multilateral trade resistances to trade between countries (Anderson & van Wincoop, 2003). On the one hand, the bilateral trade depends on the trading countries' economic scale and trade resistance from national specific trade policies. On the other hand, bilateral trade depends on countries' geographic location. Therefore, the multilateral trade resistance parameters must be introduced into the model. In this paper, the country and time fixed effects of importing and exporting countries are introduced, where π_{it} and μ_{jt} represent the time fixed effects of the exporting country and importing country respectively.

There are some potential endogenous problems in the model. On the one hand, the large trade value between countries prompts them to sign a RTA. On the other hand, international trade may have a significant positive impact on the financial development of trading countries. Manova (2008) believes that endogeneity has always been a common and serious problem in the study of finance and trade related literature, and it uses cross-industry variables to alleviate endogenous problems because the impact of RTA signing and financial development is different at the industry level, and RTA signing and financial development can be regarded as exogenous variables. Therefore, the industry level bilateral trade value data is chosen as the dependent variable, where X_{kijt} represents the export value from exporting country i to importing country j in industry k in year t . The industry fixed effect γ_{kt} is also introduced to the model.

Data

Bilateral trade value

The bilateral trade data used in this paper mainly comes from the UNComtrade database. Although the selected countries are 15 RCEP members, this paper collects international trade data from 2000 to 2021 for research because the available data since January 1st, 2022 is less. In order to ensure the availability and consistency, the SITC(-rev 2) 2 digit trade data is chosen. The SITC(-rev 2) 4 and 6 digit data are not very helpful to the industries affected by financing constraints, so they were not chosen.

RTA signed by RCEP members

is a dummy variable, and its value of 1 represents exporting country i and importing country j signed a RTA at year t and the RTA has been valid since year t . When its value is 0, it indicates that there is no RTA signed between the two countries at year t . The effectiveness of a RTA can help trading countries reduce trade costs and promote bilateral trade, so the expected symbol of the regression coefficient is positive. The RTA signed by RCEP members are mainly from the WTO RTA database, and the RTAs selected are those in effect at the end of 2021.

Gravity Variables

The variables gross domestic product (GDP), geographic distance (Distance), common language (Language) and common border (Contiguity) of the importing and exporting countries are taken as the standard gravity variables, and their data are all from the CEPII GeoDist database. The variable sources and expected signs are shown in Table 1. The population-weighted distance is used. When two countries have common language, it means they have less communication barriers and shorten cultural distance, which contributes to their cooperation. The variable common language is a dummy variable, and it is denoted 1 when the two countries have common language, and 0 otherwise. A common border between countries means less transportation costs, facilitating bilateral trade. The variable common border is a dummy variable, and it is denoted 1 when the two countries have common border, and 0 otherwise.

Table 1: Variable Sources and Expected Signs

Variable	Definition	Source	Expected Signs
X_{ijt}	bilateral trade value	UN Comtrade	/
RTA_{ijt}	RTA signing	WTO RTA dataset	+
FI_{it}	Financial development of exporting country	WDI	+
GDP_i	GDP of exporting country	WDI	+
GDP_j	GDP of importing country	WDI	+
$contig$	common border	GEPII GeoDist	+
$comlang$	common language	GEPII GeoDist	+
$distw$	geographic distance	GEPII GeoDist	-
$FI_{it} \times RTA_{ijt}$	intersection	-	-
$rtaquantity$	number of RTAs signed by RCEP members	WTO RTA dataset	+
$member$	number of RTA members	WTO RTA dataset	+

Financial Development

There are many indicators of financial development, e.g., Bank deposits to GDP (%), Domestic credits to private sector to GDP (%), Private credit by deposit money banks and other financial institutions to GDP (%). This paper uses the Financial system deposits to GDP (%) of the exporting countries' to measure the financial development in the baseline model because the data is relatively complete, and deposits in a financial system include those from banks and non-bank financial institutions, government and state-owned enterprises (SOEs). The higher the level of financial development, the higher the financing convenience faced by exporting companies, and the lower the corresponding financing cost, which alleviates the financing constraints of companies.

Intersection of RTA Signing and Financial Development

This variable is generated by RTA signing and financial development. The value of this intersection is the value of the financial development when there is a RTA between the two trading countries, it is 0 otherwise. This intersection reflects the collaborative effect of RTA signing and financial development. RTA signing can significantly reduce the trade cost between trading partner countries, reduce the external financing dependence of companies, and weaken the promotion effect of financial development on export.

Number of RTA Members

This paper counts the number of RTA member states as a variable, and its data are obtained from the WTO RTA database. The more the RTA members, the more likely there is trade creation. Trade creation means that under the premise of regional economic integration, member states replace goods produced at high cost with goods imported at lower production costs from other member states to promote trade and maximize consumer welfare. A RTA with more member states has a larger market and production scale than a RTA with less members, and produces more variety of goods.

Number of RTA

In addition to the RTAs among RCEP members, RCEP member states also sign RTAs with non-RCEP countries. The number of RTA signed by countries will be counted by year. The data source is the WTO RTA database. The more the RTA signed by a country indicates that the country holds an important position in international trade, its trade volume is large and its trade is active.

Baseline results

This paper uses the data from 2000 to 2021. Both bilateral trade value and GDP are denominated in US dollars, the geographic distance is in km. As these numbers are relatively large, and the exponential growth of GDP data is unfavorable to regression, these three variables are taken logarithmic to obtain stability. The number of RTA member states and the number of RTA are small and have no need to take logarithm. Baseline regression was made according to Equation (1) and the regression results are shown in Table 2.

The independent variables are only gravity variables in column (1) of Table 2, and their signs of coefficients are as expected. The RTA dummy variable is introduced in column (2) compared to column (1), and its coefficient is significantly positive at the level of 1%. Column (3) includes RTA dummy variable and financial development

level besides gravity variables, and the coefficients of RTA dummy variable and financial development are significantly positive, which is consistent with most studies on the influence of RTA and financial development. Column (4) introduces the intersection of RTA and financial development compared with column (3), the results show that the significance of variables in column (3) are not affected, and the coefficient of newly added intersection is significantly negative, which is consistent with expectation. The number of RTA signed and the number of RTA members are introduced in columns (5) and (6) respectively, and their coefficients are significantly positive, while the significance and coefficient of the other variables are still reliable. Although the sample size is large, the VIF value is less than 10 using the variance expansion factor test, so the model does not have a serious multicollinearity.

Table 2: Baseline regression results

Variable	(1)	(2)	(3)	(4)	(5)	(6)
lnexgdp	1.540***	1.510***	1.651***	1.622***	1.598***	1.610***
	(0.0331)	(0.0331)	(0.0357)	(0.0388)	(0.0393)	(0.0396)
lnimgdp	1.009***	0.982***	0.976***	0.977***	0.986***	0.991***
	(0.0299)	(0.0300)	(0.0306)	(0.0306)	(0.0307)	(0.0308)
lndistw	-1.197***	-1.225***	-1.217***	-1.215***	-1.216***	-1.224***
	(0.00973)	(0.00994)	(0.0101)	(0.0101)	(0.0102)	(0.0106)
comlang	0.453***	0.437***	0.433***	0.433***	0.431***	0.422***
	(0.0172)	(0.0172)	(0.0174)	(0.0174)	(0.0174)	(0.0177)
contig	0.679***	0.659***	0.643***	0.645***	0.643***	0.643***
	(0.0177)	(0.0178)	(0.0181)	(0.0181)	(0.0181)	(0.0181)
rta		0.226***	0.230***	0.267***	0.292***	0.242***
		(0.0166)	(0.0166)	(0.0258)	(0.0266)	(0.0322)
exfi			0.00400***	0.00429***	0.00411***	0.00409***
			(0.000417)	(0.000446)	(0.000448)	(0.000448)
rtaxexfi				-0.000406*	-0.000605***	-0.000559**
				(0.000220)	(0.000226)	(0.000227)
rtaquantity					0.00573***	0.00640***
					(0.00148)	(0.00150)
member						0.00665***
						(0.00243)
_cons	-0.123	0.641	-1.057**	-0.854*	-0.716	-0.786*
	(0.422)	(0.425)	(0.452)	(0.466)	(0.467)	(0.468)
Exporter FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	294,792	294,792	281,317	281,317	281,317	281,317
\hat{R}^2	0.571	0.572	0.577	0.577	0.577	0.577

Note: Standard errors are reported in parentheses and clustered by country-pair level. *, **, *** denote significance at the 10%, 5% and 1% level, respectively.

About the gravity variables, the regression results show that coefficients of GDP of importing and exporting countries are significantly positive, the economic scale of the trading partner countries is positively correlated with bilateral trade value. The coefficient of geographic distance is significantly negative, and those of common language and common border are significantly positive, which is in line with expectations. The changes of coefficients of GDP of importing and exporting countries in columns (1) and (2) show the missing promotion effect of RTA dummy variables in column (1) on export. The regression results in column (6) shows that the export value can increase 1.61% if GDP of exporting country increases 1%; it can increase 0.991% if GDP of importing country increases 1%. Obviously, the conclusion of traditional gravity model is verified by this paper, and the economic scale of exporting country has a greater impact on bilateral trade value than that of importing country. The bilateral trade value between member countries went down 1.224% if the population weighted distance increased 1%. Having a common language can increase bilateral trade by 0.422%. Common language will reduce the resistance to trade caused by communication barriers, and countries with a common language usually have a closer cultural distance, promoting trade negotiations and facilitating economic and trade cooperation, thus promoting bilateral trade. Having a common border could increase bilateral trade by 0.643%. Countries with common borders are usually more inclusive and have relatively small transportation costs. Therefore, the common border has a significant positive effect on bilateral trade.

The RTA signing and entry into force promotes trade between the contracting states. The regression results indicate a positive correlation between RTA signing and bilateral trade value of contracting states. First, a RTA contains trade facilitation clauses. The signing of RTA helps the trading parties significantly benefit from tariff barriers reduction, customs procedures simplification, reflecting the reduction of fixed export costs of companies. Second, a RTA will clearly explain the rules of origin and competition policies, and make specific statements on some key industries and products to reduce trade friction and further reduce trade resistance. Third, a RTA has a more precise definition of anti-dumping and countervailing policies, so that trade will proceed smoothly.

The coefficient of financial development is significantly positive at 1%, which is in line with expectation, indicating that the high level of financial development promotes exports. Financial development is of importance to evaluate the economic development of a country, which reflects a country's capital scale and efficiency of capital allocation. A high level of financial development can help companies complete capital accumulation faster, thus forming economies of scale and helping exporters reduce production costs. Financial development can help exporters increase R&D investment, improve human capital, help exporters improve their export structure, and give external financial support. High level of financial development can help companies manage risk resulted from information asymmetry, overcome R&D difficulties and promote their development.

The intersection of RTA signing and financial development has significantly negative effects on bilateral trade value at 5% level, which is consistent with expectation, indicating that the collaborative effect of RTA signing and financial development plays a restraining role on bilateral trade value, and the export promotion effect of financial development is weakened due to the existence of RTA. As the core independent variable of this paper, its significantly negative coefficient just confirms the view of this paper: a RTA helps exporters reduce export costs, and the restraining effect of financing constraints on exporters is weakened. First, a RTA uses the traditional tariff and non-tariff clauses to reduce export costs. Second, the trade facilitation clauses help exporters shorten the export time by simplifying customs procedures, where a shorter export time means lower export costs. Third, some RTAs have investment provisions to facilitate cross-border capital flow, ease the financing constraints of companies, and overlap with the promotion mechanism of financial development on exporters, so that exporters can reduce their dependence on external financing.

The number of RTA signed has significantly positive effects on bilateral trade value. The regression results show that bilateral trade value increases 0.0064% if the number of RTA signed increases 1. Signing more RTAs by a country means that the country can export its goods to more markets, it can benefit from more communication and cooperation to lower costs and share technology spillover effects.

The number of RTA members has significantly positive effects on bilateral trade at 1% level. The regression results show that bilateral trade value increases 0.0066% if the number of RTA members increases 1, indicating the more the RTA members, the more it can promote trade between contracting parties. The number of RTA members can be regarded as the size of a RTA. Bigger number generally means a larger RTA and more chances for a contracting country to import and export. Even a RTA is composed of many small economies, the RTA can form a larger market compared with individual national market. In addition, a RTA has advantages in negotiation with non-member countries on trade and investment facilitation and promotion measures.

Table 3: Robust test

Variable	(1)	(2)
	Domestic credit to private sector to GDP (%)	Private credit by deposit money banks to GDP (%)
lnexgdp	1.563***	1.558***
	(0.0380)	(0.0339)
lnimgdp	0.864***	0.817***
	(0.0393)	(0.0334)
lndistw	-1.156***	-1.214***
	(0.0115)	(0.0105)
comlang	0.413***	0.415***
	(0.0190)	(0.0177)

Variable	(1) Domestic credit to private sector to GDP (%)	(2) Private credit by deposit money banks to GDP (%)
contig	0.608***	0.575***
	(0.0193)	(0.0182)
rta	0.249***	0.253***
	(0.0377)	(0.0326)
exfi2	0.00646***	
	(0.000449)	
rtaxexfi2	-0.000733***	
	(0.000260)	
exfi3		0.00559***
		(0.000377)
rtaxexfi3		-0.000874***
		(0.000251)
rtaquantity	0.0204***	0.0145***
	(0.00174)	(0.00153)
member	0.00585**	0.00981***
	(0.00260)	(0.00240)
_cons	-0.369	0.852*
	(0.503)	(0.443)
Exporter FE	Yes	Yes
Importer FE	Yes	Yes
Industry FE	Yes	Yes
Year FE	Yes	Yes
N	250,021	285,222
\hat{R}^2	0.573	0.573

Note: Standard errors are reported in parentheses and clustered by country-pair level. *, **, *** denote significance at the 10%, 5% and 1% level, respectively.

Robust test and extended test

Robust Test

The core explanatory variables are replaced in this section to verify the robustness of the model. Since there are many indicators to measure financial development, it is more reasonable to change the explanatory variables of financial development. In this part, Domestic credit to private sector to GDP (%) and Private credit by deposit money banks to GDP (%) are chosen to replace the original variable. Other control variables remain unchanged. As shown in Table 3, column (1) shows the regression results with Domestic credit to private sector to GDP (%) as financial development, where the coefficient of financial development is significantly positive, the intersection of financial development and RTA signing is significantly negative, their signif-

ificance and sign of coefficient are consistent with the baseline results, and the significance and sign of other control variables are not affected. Column (2) shows the regression results with Private credit by deposit money banks to GDP (%) as financial development, and they are similar to the results in column (1). Therefore, this section confirms the robustness and reliability of the baseline results.

Impact of RTA on industries with different financing constraints

This paper further studies the impact of RTA signing and financial development on industries with different financing constraints. Industries are different in technical characteristics and technology thresholds, so they face different financing constraints (Rajan & Zingales, 1998). Generally speaking, industries with high technology threshold have greater demand for capital, and companies with long turnaround time have higher requirements for capital flow. Companies in these industries usually have greater demand for external financing than those with low threshold and short turnaround time. Therefore, the improvement of financial development will not have all industries benefited, companies in industries that are more vulnerable to financing constraints can obtain more external financing due to the improvement of financial development. The increased financial freedom can benefit exporters that are vulnerable to financing constraints, who are most dependent on external financing (Manova, 2008; Manova, 2013). Exporters depend most on external financing in the industry demand for external financing can be approximate as rigid demand, no matter how much export cost changes, their demand for external financing will not be affected. Therefore, for exporters in industries depend most on external financing, the impact of RTA signing on the export promotion effects of financial development is smaller.

To test this hypothesis, the key issue is to measure the degree of financing constraints in every industry. Based on the ISIC 3 digit data, Manova (2008) proposes two types of indicators to measure the industry financing constraints: external financing dependence and tangible asset rate. The external financing dependence is calculated by the ratio of the difference between capital expenditure minus operating expenses and capital expenditure, and the tangible asset rate is measured by the share of net assets, factory and equipment in the total book value of assets. The higher tangible asset rate means that the company has more fixed assets for mortgage, i.e., the company with higher tangible asset rate is less affected by financing constraints. Since the international trade data sources of this paper do not include the ISIC classification, this paper follows Muendler (2009) to correspond the ISIC 3 digit data with the SITC(-rev 2) 2 digit data. Table 4 presents the data on external financing dependence and tangible asset rate of 27 industries based on Braun (2005) according to the ISIC 3 digit data. It can be seen that in terms of external financing dependence, plastic products (ISIC356) and scientific research equipment (ISIC385) depend most on external financing. The tangible asset rates of electric appliances (ISIC383), ceramics

(ISIC361) and leather products (ISIC323) are relatively low, and make these industries greatly affected by financing constraints, i.e., these industries depend most on external financing in terms of tangible asset rate.

Table 4: Correspondence table of ISIC 3 digit industry with SITC 2 digit industry

industry	ISIC 3 digit	SITC(-rev2) 2 digit	external financing dependence	tangible asset ratio
Food products	311	1~9 21, 22, 29 41, 42, 43, 59	0.1368	0.3777
Beverages	313	11	0.0772	0.2794
Tobacco	314	12	-0.4512	0.2208
Textiles	321	26, 65, 84	0.4005	0.3730
Wearing apparel, except footwear	322	84	0.0286	0.1317
Leather products	323	61, 83	-0.1400	0.0906
Wood products, except furniture	331	24-63	0.2840	0.3796
Furniture, except metal	332	82	0.1756	0.5579
Paper and products	341	25, 59, 64	0.2038	0.3007
Printing and publishing	342	64, 89	0.2050	0.4116
Electric Power Generation, Transmission And Distribution	351	23, 26, 51, 52, 53, 56, 58, 59, 43	0.2187	0.1973
Other chemicals	352	53, 54, 55, 57, 59	0.0420	0.6708
Petroleum refineries	353	33, 34	0.3341	0.3038
Misc. petroleum and coal products	354	32, 33, 34	0.2265	0.3790
Plastic products	356	58, 82, 89	1.1401	0.3448
Pottery, china, earthenware	361	66, 81	-0.1459	0.0745
Glass and products	362	66, 81	0.5285	0.3313
Other non-metallic products	369	27, 66	0.0620	0.4200
Iron and steel	371	67, 69	0.0871	0.4581
Non-ferrous metals	372	68, 69	0.0055	0.3832
Fabricated metal products	381	67, 68, 69, 71, 73, 74, 81	0.2371	0.2812
Machinery, except electrical	382	69, 71, 72, 73, 74, 75, 77	0.4453	0.1825
Machinery, electric	383	76, 77	0.7675	0.07675
Transport equipment	384	71, 74, 78, 79, 89	0.3069	0.2548
Prof and scient equipment	385	54, 59, 74, 87	0.9610	0.1511
Other manufactured products	390	69, 83, 89	0.4702	0.1882

Source: this paper presents a correspondence table of ISIC 3 digit industry with SITC(-rev 2) 2 digit industry following Rajan & Zingales (1998), Maskus (1989), and Braun (2005).

This paper introduces an industry dummy variable $MOST_k$, whose value is 1 when bilateral trade is about the industries depend most on external financing, or 0 otherwise. The empirical results are regressed with external financing dependence and tangible asset rate respectively. When external financing dependence is taken as a measure of impacts on the industry by financing constraints, the value of $MOST_k$ is 1 if the export belongs to plastic products (ISIC356) and scientific research equipment

(ISIC385), otherwise it is 0. When tangible asset rate is taken as a measure of impacts on the industry by financing constraints, the value of $MOST_k$ is 1 if the export belongs to electric appliances (ISIC383), ceramics (ISIC361), leather products (ISIC323), otherwise it is 0. The model in this section is shown as Equation (2).

$$\ln X_{kijt} = \beta_0 CONTROL_{ij} + \beta_1 RTA_{ijt} + \beta_2 FI_{it} + \beta_3 FI_{it} \times RTA_{ijt} + \beta_4 FI_{it} \times RTA_{ijt} \times MOST_k + \beta_5 rtaquantity + \beta_6 member + \pi_{it} + \mu_{jt} + \gamma_t + \varepsilon_{ijt} \quad (2)$$

Table 5: Regression results of industries depend most on external financing

Variable	(1)	(2)
	external financing dependence	tangible asset rate
lnexgdp	1.609*** (0.0396)	1.614*** (0.0395)
lnimgdp	0.991*** (0.0308)	0.991*** (0.0308)
lndistw	-1.224*** (0.0106)	-1.224*** (0.0106)
comlang	0.422*** (0.0177)	0.422*** (0.0177)
contig	0.643*** (0.0181)	0.643*** (0.0181)
rta	0.243*** (0.0322)	0.241*** (0.0322)
exfi	0.00409*** (0.000448)	0.00407*** (0.000448)
rtaxexfi	-0.000675*** (0.000227)	-0.000964*** (0.000227)
rtaxexfixmost1	0.00246*** (0.000357)	
rtaxexfixmost2		0.00619*** (0.000299)
rtaquantity	0.00644*** (0.00150)	0.00663*** (0.00150)
member	0.00663*** (0.00243)	0.00672*** (0.00243)
_cons	-0.770* (0.468)	-0.801* (0.467)
Exporter FE	Yes	Yes
Importer FE	Yes	Yes
Industry FE	Yes	Yes
Year FE	Yes	Yes
N	281,317	281,317
\hat{R}^2	0.577	0.578

Note: Standard errors are reported in parentheses and clustered by country-pair level. *, **, *** denote significance at the 10%, 5% and 1% level, respectively.

Since it is expected that the export promoting effect of financial development on industries depend most on external financing is less affected by RTA than that on other industries, the coefficient of β_4 is expected to be positive. The regression results are shown in Table 5:

Wherein, the value of $MOST_k$ in column (1) and column (2) follows the standards of external financing dependence and tangible asset rate respectively. The regression results show that after introducing the intersection of $FI_{it} \times RTA_{ijt} \times MOST_k$, the coefficients of RTA signing in columns (1) and (2) are significantly positive, which is consistent with expectation, while the intersection of RTA and financial development is still significantly negative. The synergy of RTA and financial development has negative effects on bilateral trade value, i.e., the positive impact of financial development on export is weakened by signing RTA between trading partner countries. Except the variable $FI_{it} \times RTA_{ijt} \times MOST_k$, all other variables generally have same significance and sign with the baseline regression results. Coefficients of $FI_{it} \times RTA_{ijt} \times MOST_k$ in columns (1) and (2) are significantly positive, in line with expectation, reflecting that whether from the standard of external financing dependence or tangible asset rate, the industries depend most on external financing are less affected by the synergy of financial development and RTA signing. It proves that the industry relies most on external financing has rigid demand for external financing, and the industry cannot keep on operation if there is no external financing. Therefore, signing RTA will not lead to a significant reduction in its external financing needs.

Intersection of financial development and RTA signing in importing countries

The above regression only discusses the impact of the interaction between financial development of exporting country and RTA signing on bilateral trade. This section will discuss the impact of the interaction between financial development of importing country and RTA signing on bilateral trade value. Schmidt-Eisenlohr (2013) and Niepmann & Schmidt-Eisenlohr (2017) believe that external financing costs of importing country are equally important in international trade, and financial development of importing country has similar trade promotion impacts with that of exporting country. First, the high level of financial development reduces external financing constraints of companies in importing countries, who have more demand for goods and services to promote imports (Fauceglia, 2015). Second, exporters depend extremely on trade financing, such as export credit, letter of credit, export credit insurance, which requires implementation of banks in importing countries. Therefore, the financial development of importing countries are also important. Using cross-border bank lending with a gravity model, Caballero *et al.* (2018) find that bilateral trade increased. In addition, financial intermediaries in importing countries, such as banks and insurance companies, know local importers better and could help exporters per-

ceive the credit status of importers and promote trade. Therefore, the financial development of importing country can help exporters reduce export costs. When the two countries sign a RTA, the trade cost decreases, and the export promotion effect of the financial development of importing countries is likely to be weakened. To test this hypothesis, the paper makes a model shown in Equation (3).

$$\ln X_{kijt} = \beta_0 CONTROL_{ij} + \beta_1 RTA_{ijt} + \beta_2 FI_{jt} + \beta_3 FI_{jt} \times RTA_{ijt} + \beta_4 rtaquantity + \beta_5 member + \pi_{it} + \mu_{jt} + \gamma_t + \varepsilon_{ijt} \quad (3)$$

Wherein, FI_{jt} represents the financial development of importing country. The other control variables remain unchanged. The regression results of this model are shown in Table 6.

Table 6: Regression results with synergy of financial development and RTA in importing countries

Variable	(1) Domestic credit to private sector to GDP (%)	(2) Private credit by deposit money banks to GDP (%)
lnexgdp	1.567*** (0.0350)	1.565*** (0.0350)
lnimgdp	0.818*** (0.0344)	0.800*** (0.0342)
lndistw	-1.202*** (0.0106)	-1.203*** (0.0106)
comlang	0.415*** (0.0179)	0.417*** (0.0179)
contig	0.579*** (0.0184)	0.580*** (0.0184)
rta	0.225*** (0.0333)	0.275*** (0.0329)
imfi1	0.00647*** (0.000413)	
rtaximfi1	-0.000451* (0.000232)	
imfi2		0.00620*** (0.000409)
rtaximfi2		-0.000935*** (0.000254)
rtaquantity	0.0128*** (0.00159)	0.0121*** (0.00159)
member	0.00740*** (0.00246)	0.00681*** (0.00246)
_cons	0.560 (0.455)	0.782* (0.455)

Variable	(1) Domestic credit to private sector to GDP (%)	(2) Private credit by deposit money banks to GDP (%)
Exporter FE	Yes	Yes
Importer FE	Yes	Yes
Industry FE	Yes	Yes
Year FE	Yes	Yes
N	277,556	277,556
\hat{R}^2	0.573	0.573

Note: Standard errors are reported in parentheses and clustered by country-pair level. *, **, *** denote significance at the 10%, 5% and 1% level, respectively.

Wherein, column (1) and column (2) chose Private credit by deposit money banks to GDP (%) and Private credit by deposit banks and other institutions to GDP (%) to reflect the financial development respectively. In column (1) and column (2), the coefficients of financial development in importing countries are significantly positive, and the intersection of financial development and RTA has significantly negative effects. In addition, the coefficient of intersection of financial development and RTA in column (2) is more significant than that in column (1), meaning that besides banks, other financial institutions, such as insurance, trust, funds, also participate in trade financing, and companies seek external financing through the whole financial system rather than separate banks. Therefore, the regression results of column (1) and (2) strongly justify the conclusion that the export promotion effect of financial development in importing country is weakened by RTA.

Conclusions and implications

Based on the gravity model with industry level bilateral trade data from 2000 to 2021, this paper studies the impact of RTA signing on the export promotion effects of financial development, and distinguishes the impacts on industries with different financing constraints. The results show that (1) both RTA signing and financial development have positive impacts on export, while the RTA signing and entry into effect has negative impacts on the export promotion effects of financial development. The promotion effect of financial development in both exporting and importing countries on bilateral trade is weakened by signing RTA. (2) In the industries highly depend on external financing, the impact of RTA signing on trade promotion effects of financial development is weaker. The demand for external financing in some industries is rigid, and the operation of companies requires external financing. Therefore, the preferential treatment and convenience brought by RTAs will not greatly reduce the external financing needs.

The rise of trade protectionism and the prevalence of anti-globalization have hindered global economic development. In order to facilitate their own development and

integration into the world economy, countries need to actively sign RTAs to promote international economic and trade cooperation. Signing RTAs will help countries expand the free trade network and explore more space for production.

In industries highly depend on external financing, the healthy development requires support from financial intermediaries. The level of financial development reflects the comprehensive strength of a country. High level of financial development can promote the extensive margin and intensive margin of trade, and improve the trade structure of a country. Financial openness is a remarkable feature of high level financial development. Attracting foreign investment can significantly improve the level of a country's financial development. According to the empirical results of this paper, although signing RTA can reduce exporters' dependence on external financing, this conclusion just shows the importance and necessity of financial development. First, the impact of RTA on the export promotion effect of financial development is weak, indicating that RTA only overlaps with the export promotion effect of finance to some extent, and will not completely replace the export promotion effect of financial development. Second, since RTAs can partially replace the export promotion role of finance, it is necessary to develop financial industry, deepen the financial reform, encourage the participants of financial intermediaries, broaden the financing channels, and reduce the financing costs.

Further research direction

Every RTA studied in this paper has a party as a RCEP member country. However, there are more RTAs signed among non-RCEP members. Therefore, the sample might be expanded to include more RTAs. The industries might be further subdivided according to their financial constraints in order to make a comprehensive analysis.

Declarations

Funding

This paper was supported by the National Social Sciences Foundation of China (No. 18BGJ005) and Shanghai Philosophy and Social Sciences Planning Foundation (No. 2017BJL005).

Availability of Data and materials

In this paper, we exclusively used secondary data from public sources. Therefore, in this study, no new data is used or produced.

Code Availability

The Stata do-file is available upon request.

Competing Interest

The authors declare that they have no conflict of interest.

Authors' Contributions

Juan Zhang: Conceptualization, Methodology, Writing – review and editing, Project administration.

Jiahui Chen: Writing – original draft.

Zuanshi Liu: Data curation, Methodology.

REFERENCES

- Allee, T., & Peinhardt, C. (2011). Contingent credibility: the impact of investment treaty violations on foreign direct investment. *International Organization*, 65(3), 401–432. <https://doi.org/10.1017/S0020818311000099>
- Anderson, J. E., & van Wincoop, E. (2003). Gravity with Gravitas: A Solution to the Border Puzzle. *American Economic Review*, 93 (1), 170-192. <https://doi.org/10.1257/000282803321455214>
- Antràs, P., & Staiger, R. W. (2012). Offshoring and the role of trade agreements. *American Economic Review*, 102(7), 3140-3183. <https://doi.org/10.1257/aer.102.7.3140>
- Baier, S. L., & Bergstrand, J. H. (2007). Do free trade agreements actually increase members' international trade?. *Journal of International Economics*, 71(1), 72-95. <https://doi.org/10.1016/j.jinteco.2006.02.005>
- Baltagi, B. H., Egger, P., & Pfaffermayr, M. (2008). Estimating regional trade agreement effects on FDI in an interdependent world. *Journal of Econometrics*, 145(1-2), 194-208. <https://doi.org/10.1016/j.jeconom.2008.05.017>
- Beck, T. (2003). Financial dependence and international trade. *Review of International Economics*, 11(2), 296-316. <https://doi.org/10.1111/1467-9396.00384>
- Beck, T. (2002). Financial development and international trade: Is there a link?. *Journal of International Economics*, 57(1), 107-131. [https://doi.org/10.1016/S0022-1996\(01\)00131-3](https://doi.org/10.1016/S0022-1996(01)00131-3)
- Becker, B., Chen, J., & Greenberg, D. (2013). Financial development, fixed costs, and international trade. *The Review of Corporate Finance Studies*, 2(1), 1-28. <https://doi.org/10.1093/rcfs/cfs005>
- Berman, N., & Héricourt, J. (2010). Financial factors and the margins of trade: Evidence from cross-country firm-level data. *Journal of Development Economics*, 93(2), 206-217. <https://doi.org/10.1016/j.jdeveco.2009.11.006>
- Braun, M. (2005). Financial contractability and asset hardness. Harvard Law School. Retrieved December 1, 2023, from http://www.law.harvard.edu/programs/corp_gov/papers/Matias_Braun_Paper.pdf

- Caballero, J., Candelaria, C., & Hale, G. (2018). Bank linkages and international trade. *Journal of International Economics*, 115, 30–47. <https://doi.org/10.1016/j.jinteco.2018.08.006>
- Chaney, T. (2016). Liquidity constrained exporters. *Journal of Economic Dynamics and Control*, 72, 141–154. <https://doi.org/10.1016/j.jedc.2016.03.010>
- Estrades, C., Maliszewska, M., Osorio-Rodarte, I., & Seara e Pereira, M. (2023). Estimating the economic impacts of the regional comprehensive economic partnership, Asia and the Global Economy, 3(2), 100060. <https://doi.org/10.1016/j.aglobe.2023.100060>
- Faucegna, D. (2015). Credit market institutions and firm imports of capital goods: Evidence from developing countries. *Journal of Comparative Economics*, 43(4), 902–918. <https://doi.org/10.1016/j.jce.2015.03.007>
- Franco-Bedoya, S., & Frohm, E. (2022). Reduced ‘Border effects’, Free Trade Agreements and international trade. *The World Economy*, 45, 1112–1139. <https://doi.org/10.1111/twec.13211>
- Handley, K., & Limão, N. (2015). Trade and investment under policy uncertainty: theory and firm evidence. *American Economic Journal: Economic Policy*, 7(4), 189–222. <https://doi.org/10.1257/pol.20140068>
- Hayakawa, K., Laksanapanyakul, N., & Yoshimi, T. (2023). Firm-level Utilization Rates of Regional Trade Agreements: Importers’ Perspective. *Journal of Asian Economics*, 86, 101610. <https://doi.org/10.1016/j.asieco.2023.101610>
- Lim, S.-J., Park, J.-Y., Nam, H.-J., & Park, S.-H. (2020). The moderating role of ASEAN-Korea FTA on the relationship between trade and South Korean outward FDI. *International Journal of Trade and Global Markets*, 13(3), 348–365. <https://doi.org/10.1504/IJTG.2020.108781>
- Limão, N., & Maggi, G. (2015). Uncertainty and trade agreements. *American Economic Journal: Microeconomics*, 7(4), 1–42. <https://doi.org/10.1257/mic.20130163>
- MacDermott R. (2007). Regional trade agreement and foreign direct investment. *North American Journal of Economics and Finance*, 18(1), 107–116. <https://doi.org/10.1111/j.1747-1346.2011.00296.x>
- Magee, C. S.P. (2017). The Increasing Irrelevance of Trade Diversion. *Kyklos*, 70(2), 278–305. <https://doi.org/10.1111/kykl.12138>
- Manova, K. (2008). Credit constraints, equity market liberalizations and international trade. *Journal of International Economics*, 76(1), 33–47. <https://doi.org/10.1016/j.jinteco.2008.03.008>
- Manova, K. (2013). Credit constraints, heterogeneous firms, and international trade. *Review of Economic Studies*, 80(2), 711–744. <https://doi.org/10.1093/restud/rds036>
- Manova, K., Wei, S.-J., & Zhang, Z. (2015). Firm exports and multinational activity under credit constraints. *Review of Economics and Statistics*, 97(3), 574–588. https://doi.org/10.1162/REST_a_00480
- Maskus, K. E. (1989). Comparing International Trade Data and Product and National Characteristics Data for the Analysis of Trade Models. In Hooper, P., & Richardson, J. D. (Ed.). *International Economics Transactions: Issues in Measurement and Empirical Research*, Chicago, IL: University of Chicago Press, pp. 17–56.
- Melitz, M. (2003). The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity. *Econometrica*, 71, 1695–1725. <https://doi.org/10.1111/1468-0262.00467>
- Muendler, M.-A. (2009, January 8). Converter from SITC to ISIC. University of California-San Diego. Retrieved December 1, 2023, from <https://econweb.ucsd.edu/~muendler/docs/conc/site2isic.pdf>
- Neumayer E, & Spess L. (2005). Do bilateral investment treaties increase foreign direct investment to developing countries?. *World Development*, 33(10), 1567–1585. <https://doi.org/10.1016/j.worlddev.2005.07.001>
- Nguyen, D. B., & Vaubourg, A.-G. (2021). Financial intermediation, trade agreements and international trade. *The World Economy*, 44, 788–817. <https://doi.org/10.1111/twec.13010>

- Niepmann, F., & Schmidt-Eisenlohr, T. (2017). International trade, risk and the role of banks. *Journal of International Economics*, 107, 111–126. <https://doi.org/10.1016/j.jinteco.2017.03.007>
- Raff, H. (2004). Preferential trade agreements and tax competition for foreign direct investment. *Journal of Public Economics*, 88(12), 2745–2763. <https://doi.org/10.1016/j.jpubeco.2004.03.002>
- Rajan, R. G., & Zingales, L. (1998). Financial dependence and growth. *The American Economic Review*, 88(3), 559–586. Retrieved from <https://www.jstor.org/stable/116849> [December 1, 2023]
- Schmidt-Eisenlohr, T. (2013). Towards a theory of trade finance. *Journal of International Economics*, 91(1), 96–112. <https://doi.org/10.1016/j.jinteco.2013.04.005>
- Turkson, E., Oduro, A. D., Baffour, P., & Quartey, P. (2022). Regional integration and non-tariff barriers to Intra-Sub-Saharan Africa trade. *The World Economy*, 46, 396-414. <https://doi.org/10.1016/j.jinteco.2013.04.005>

