FDI AND INTERNATIONAL TRADE BETWEEN THE EU AND CHINA

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Abstract

Background and Objective: The relationship between FDI and trade has long been the subject of much economist research. However, many theoretical and empirical studies have not reached a universal and definitive conclusion. The prevailing view is that there may be substitution, complementarity and ambiguity between the two. The scientific goal of the article is to explore the relationship between China's FDI and trade with the European Union (EU) and to examine whether it is complementary or substitute.

Materials and methods: The paper selects China's imports and exports from the EU and China's total direct investment in the EU from 2005-2020 and utilises quantitative analyses. The co-integration analysis and Granger causality test analysis were conducted in this paper.

Results: It can be concluded that there is a stationary linear combination and long-term equilibrium relationship between Chinese FDI to the EU and trade with the EU. At the same time, Granger causality tests revealed a bidirectional causality relationship between China's FDI and trade with the EU.

Practical implications: This paper provides information on the relationship between investment and trade when developed regions receive investment from a developing country. The study shows that Chinese investment in the EU and China-EU trade are mutually reinforced.

Conclusion and summary: Chinese direct investment in the EU and China-EU bilateral trade interact with each other. A complementary relationship was found between China's FDI and trade with the European Union.

Keywords: International trade; FDI; cointegration test; exports and imports

JEL classification: C22, F14, F21

Paper type: research study

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1. Introduction

FDI and international trade are essential economic variables, and the relationship between them has been the subject of much discussion and research. The International Monetary Fund (IMF) defines FDI as 'a category of cross-border investment associated with a resident in one economy having control or a significant degree of influence on the management of an enterprise that is resident in another economy' (IMF, 2013). International trade is the concept of this exchange of goods or services between people or entities in two or more different countries (ICC, 2021).

China and the EU, as essential actors of the world economic scene, are also major players in world investment and trade. UN trade and development data show that the EU, as an early collective of developed countries, has always accounted for around a third of total global trade and is a significant exporter of direct investment and a major recipient. China has gradually participated in world trade as an emerging economy since the 1990s. Its share of total global trade has climbed from around 2% in 1990 to around 10% in 2020, making it a leader among developing countries (UNCTAD, 2022). In addition, the pace of China's outward investment has greatly accelerated, especially since 2000, when the Chinese government proposed and implemented the 'One Belt, One Road' initiative and the 'Go Global' strategy, resulting in China's global share of outward investment rising from 0.34% in 1990 to 17.97% by 2020 (UNCTAD, 2021).

Since the establishment of full diplomatic relations between China and the EU in 1983, relations between China and the EU have become increasingly close, particularly in terms of economic and trade relations. On 1 May 2004, with the accession of 10 Central and Eastern European countries, including Poland, Hungary and the Czech Republic, the EU expanded to 25 countries, overtaking Japan and the USA as China's top trading partner (MOFCOM, 2005). In recent years, China's total annual trade in goods with the EU has been around USD 600 billion, with an average of more than USD 1 million in trade exchanges between China and the EU every minute. 2020 saw China overtake the US as the largest trade partner of the EU (27 countries). 2021, according to the General Administration of Customs of China, the total value of China's imports and exports with the EU reached 828.11 billion in US dollar terms, an increase of 27.5% over the previous year. China continues to maintain its position as the EU's top trading partner, with the EU as China's second-largest trading partner. (General Administration of Customs of the People's Republic of China, 2022). In addition, China's direct investment flows to the EU have grown from just over US$100 million in 2003 to US$10 billion by 2020 (MOFCOM, 2020).

The purpose of this paper is to determine the relationship between foreign direct investment (FDI) and international trade (imports and exports) through an empirical analysis of the China-EU. Section 1 of this paper introduced the current overview. Literature reviews were presented in section 2 of this paper. It mainly includes theoretical and empirical studies. Section 3 briefly described the selected

data and methodology. The cointegration test and Granger causality test were chosen for the empirical analysis and discussed in section 4 and the last part contains the conclusions.

2. Literature review

There have been many relevant studies on the relationship between FDI and international trade, with some scholars focusing on theoretical research; others conducting empirical analyses.

In general, the relationship between FDI and international trade can be divided into the following three types: substitution, complementarity and ambiguity.

2.1. Theoretical considerations

One of the first scholars to conclude that there is a substitution relationship between FDI and international trade was Robert A. Mundell, Mundell (1957) used the international trade model as a basis to study the different cases of tariffs on trade and capital taxes on investment by building a 2*2*2 model and concluded that there is a substitution relationship between investment and trade. Vernon (1966) took the United States as an example and put forward the product cycle theory. He believed that the development of products needed to go through the different stages of the new product, maturing product, standardised product, different countries due to the existence of technological differences, the same product development cycle would also reflect the difference. Thus the product competitiveness was different. With the progress of technology, the technical differences between regions narrowed, the product cycle was getting shorter, and the direct investment of multinational companies in the export substitution effect was enhanced. In his book, a macroeconomic approach to foreign direct investment, Kojima (1973) presented two different types of FDI from a macro perspective: trade-oriented (the Japanese type) and anti-trade-oriented (the American type). It was argued that trade-oriented FDI should be encouraged because it was the most beneficial to both home and host countries. It promoted industrial upgrading, but it also facilitated trade between the two sides. Svensson (1982) analysed general factor proportional models and showed that commodities and factors traded are substitutes but may sometimes be complementary, depending on whether traded and non-traded factors are 'cooperative' or 'non-cooperative'. Using the factor proportion model, Markusen (1983) suggested that the substitution relationship between trade in goods and factor movements may be a special result based on the Heckscher-Ohlin model. It also concludes a complementary relationship between factor movements and world trade arising from differences in international factor prices. With the development of the new trade theory, Helpman and Krugman (1985) began to examine the relationship between OFDI and foreign trade from the perspective of investment motives. They argued that firms' choice of location for OFDI was

mainly influenced by the resource endowment and relative production costs of the host country and found a complementary relationship existed between vertical OFDI and trade when transport costs are not considered. Bhagwati et al. analysed (1987) the new type of FDI (tariff-threat-defusing) from a political economy perspective and finds that trade barriers or measures to remove them promote home country outward foreign direct investment (OFDI), i.e., there is a complementary relationship between OFDI and foreign trade. Neary (1995) proposed a two-country model of factor flows and trade flows, which he noted has the advantage of being richly responsive to exogenous shocks compared to the H-O model. His model concluded that the relationship between trade in goods and factor flows can manifest itself differently depending on the direction of capital flows, i.e., the two are uncertain.

2.2. Empirical evidence

Based on a wealth of theoretical research, many scholars have begun to study the relationship between trade and investment from an empirical perspective. Lipsey and Weiss (1981) found that OFDI had a catalytic effect on US exports, using US manufacturing as a study. Pfaffermayr (1996) found a clear complementary relationship between investment and trade in the 1980s and 1990s based on the Austrian manufacturing data. Goldberg and Klein (1997, 1999) examined data on the relationship between US FDI and foreign trade in Latin American countries and Japanese FDI in Southeast Asian countries, respectively, and found that some FDI from the US boosts trade when it entered specific sectors of Latin American economies, while others do the opposite. Pain and Wakelin (1998) studied manufacturing data for 11 OECD countries and found a complex relationship between OFDI and foreign trade, with OFDI increasing trade and decreasing exports for some countries. The impact of outward investment on trade varies from country to country. Åberg (2001) demonstrated that Japanese outward investment was trade-oriented and his findings supported Kojima's (1978) view that 'Japanese outward investments are trade creating' (Åberg, 2001). Using firm-level data, Head and Ries (2001) found that vertical OFDI has a boosting effect on exports, while horizontal OFDI has a discouraging effect. Song (2014) analysed investment and trade between China and Brazil, starting with emerging economies, and found that while trade between the two countries facilitated investment, investment had no significant effect on trade. Keorite (2016) examined the impact of Chinese direct investment on bilateral trade between China and Thailand and found that Chinese investment in Thailand has boosted bilateral trade between China and Thailand. A scholar selected panel data from 21 European countries and analysed the relationship between Chinese investment and bilateral trade in Europe through the gravity model since the introduction of the Belt and Road Initiative, showing that the complementary relationship is stronger than the substitution relationship (Ma et al. 2019). By examining the relationship between FDI and foreign trade in India, Jana et al. found (2020) a significant and positive long-term

relationship between the two. Xiong (2021) concluded that there is a complementary relationship between FDI and trade by using a gravity model to analyse FDI and trade data for over 140 countries. Pan and Chong (2023) pointed out that the Belt and Road Initiative promoted the positive influence of FDI on trade, particularly in the low-tech, medium-tech and high-tech sectors for exports. In fact, the research about China's OFDI in Europe is abundant. For example, Bieliński et al. (2019) explored the motives for Chinese investment in Central and Eastern European countries and determined one of the major motives was access to European markets. However, Chinese investment in developed economies, represented by the US and Western Europe, declined notably after the Covid-19 crisis (Fang et al. 2021).

To sum up the above, most of the research prefers to concentrate on the FDI that flows from developed to developing countries or between developing countries, with less research on investment from developing countries. With the increasingly frequent trade between China as the largest developing country and the EU as the largest group of developed countries, it is of practical importance to study the investment and trade relationship between China and the EU.

3. Materials and methods

Chinese investment in the EU is characterised by a late start. In addition, the EU experienced a massive expansion of its member states in 2004. In order to make the empirical results more accurate, the time frame chosen for the analysis of the sample is 2005 to 2020. Table 1 presents the data for the empirical analysis of the paper. The econometric software used in this paper is Gretl.

The specific empirical steps were divided into three parts. Firstly, the selected variables needed to be tested for stationarity. In order to eliminate the heteroskedasticity in the data and there are no effects on the overall cointegration relationship after taking logarithms of the original data, this paper took logarithms of Chinese direct investment (FDI) to the EU, Chinese imports from the EU (IM) and Chinese exports to the EU (EX) to obtain a new series of variables: LFDI, LIM and LEX. Afterward, the three variables of China's direct investment in the EU, China's exports to the EU and China's imports from the EU were tested for their stationarity through the ADF test. Only variables that passed the stationarity test were eligible for further analysis.

Secondly, the variables were tested for cointegration. In this paper, the variables were tested by the Engle-Granger (EG) two-step method, i.e., China's direct investment in the EU versus China's exports to the EU and China's direct investment in the EU versus China's imports from the EU to determine whether there was a long-run cointegration relationship between the two variables and to prepare for the next step of the empirical analysis.

Finally, the causal relationship between the selected variables was tested. This paper used the Granger causality test to test the causal relationship between each of

the three sets of variables and determine the direction of influence between the two variables.

Table 1. The data of empirical analysis

Years	Chinese direct investment flows to the EU (USD: 0,000)	Exports (USD: 0,000)	Imports (USD: 0,000)
2005	18954	14371158	7359542
2006	12873	18198335	9031898
2007	104412	24519173	11095951
2008	46662	29287820	13269950
2009	296643	23628419	12775751
2010	596306	31123542	16847713
2011	756083	35601983	21119300
2012	611990	33398845	21205485
2013	452350	33898502	22005530
2014	978716	37088434	24425486
2015	547978	35587590	20887894
2016	999426	33904794	20797000
2017	1026748	37204153	24487422
2018	886638	40863164	27353260
2019	1069917	42851427	27659551
2020	1009883	39097800	25855100

Note: 1. 2005, and 2006 are non-financial OFDI flows. 2. EU 2012 and prior aggregates exclude Croatia. 3. EU 2007 and prior aggregates exclude Romania and Bulgaria.

Source: MOFCOM (2020), Statistical Bulletin of China's Outward Foreign Direct Investment (2006,2007,2008,...,2020).

4. Results and discussion

4.1. ADF analysis

Dickey and Fuller (1979) introduced the Dickey-Fuller test, which determined the stationarity of a series by testing for the presence of a unit root. Shortly afterward,

Said and Dickey (1984) expanded and modified the Dickey-Fuller test to form the Augmented Dickey-Fuller test (ADF), which had the advantage of excluding the effects of autocorrelation compared to the Dickey-Fuller test.

By looking at the time series plots of the variables, it can be seen that the above three time series have a clear upward trend and an intercept term, hence the ADF test with constant and trend in this paper. Table 2 is the results of the ADF test using Gretl for the variables LFDI, LIM and LEX.

Table 2. ADF Stationary Testing

Variables	(c,t,k)	ADF Statistics	P-Value	Conclusion
LFDI	(c,t,1)	–2.216	0.480	nonstationary
ΔLFDI	(c,t,1)	–8.426	0.000***	stationary
LIM	(c,t,1)	–1.693	0.755	nonstationary
ΔLIM	(c,t,1)	–3.695	0.023**	stationary
LEX	(c,t,1)	–3.042	0.121	nonstationary
ΔLEX	(c,t,1)	–4.659	0.001***	stationary

Note: Δ denotes the first difference; (c,t,k) indicates the constant term, the trend term and the lag orders. *** indicate significant at the 1% level. ** indicate significant at the 5% level.

Source: Own elaboration based on Gretl results.

The ADF test reveals that the original series of LFDI, LEX and LIM are all non-stationary, i.e. there are unit-roots. The ADF test on the first-order difference series of LFDI, LEX and LIM respectively reveals that all the above three variables are stationary series at the 5% test level. Therefore, LFDI, LEX and LIM are all I(1) series.

4.2. Co-integration analysis

The cointegration test allows determining whether there is a stationary linear combination between two different sets of variables or multiple variables, i.e., whether there is a long-run equilibrium relationship. A cointegration relationship between variables is a prerequisite for conducting a causality test. The main cointegration tests include the Engle-Granger (EG) test and the Johansen-Juselius (JJ) test. The former tests whether the residual term of the regression equation is stationary and is suitable for examining the cointegration relationship between two variables, while the latter is a test for regression coefficients and applies to multiple variables. The number of data in this paper is less than 200, and the econometric test is a small

sample test, so it is not suitable for JJ test cointegration. Moreover, the JJ test is based on a VAR model, and the order of the variables has an important impact on the results of the VAR model. Based on the above two reasons, the analysis will adopt the Engle-Granger (EG) two-step method which was proposed by Engle and Granger (1987).

Unit root tests have been performed above for LFDI, LIM and LEX respectively and these series were found to be stationary on first-order differences. Cointegration analysis can be performed.

First, a regression model is constructed to obtain the residual series and the relationship between the two. Table 3 shows the results of the OLS regression analysis of LFDI and LIM using Gretl. Table 4 shows the results of the OLS regression analysis of LFDI and LEX using Gretl.

Table 3. Regression results of LFDI and LIM

Variables	Coefficient	Std. error	t-ratio	P Value
const	13.422	0.354	37.900	0.000***
LFDI	0.258	0.027	9.308	0.000***
Mean dependent var	16.697		S.D.dependent var	0.411
Sum squared resid	0.353		S.E.of regression	0.159
R-squared	0.861		Adjusted R-squared	0.851
F(1, 14)	86.648		P-value(F)	0.000
Log-likelihood	7.808		Akaike criterion	–11.617
Schwarz criterion	–10.072		Hannan-Quinn	–11.538
rho	–0.114		Durbin-Watson	2.141

Note: *** indicate significant at the 1% level.

Source: Own elaboration based on Gretl results.

The results of Table 3 show that the equation of the long-term regression model on LFDI and LIM is:

$$LIM = 0.258 * LFDI + 13.422 \quad (1)$$

As can be seen from the long-term regression model, adjusted $R^2 = 0.851$, which indicates that the regression equation obtained has a high degree of explanation at 85.1%. p-value=0.000 indicates that the overall model is significant, but the validity of the long-term regression model equation needs to be further tested.

Table 4. Regression results of LFDI and LEX

Variables	coefficient	std.error	t-ratio	P Value
const	14.92	0.308	48.330	0.000***
LFDI	0.183	0.024	7.567	0.000***
Mean dependent var	17.241		S.D.dependent var	0.302
Sum squared resid	0.268		S.E. of regression	0.138
R-squared	0.804		Adjusted R-squared	0.790
F(1, 14)	57.262		P-value(F)	0.000
Log-likelihood	10.002		Akaike criterion	–16.005
Schwarz criterion	–14.460		Hannan-Quinn	–15.926
rho	–0.242		Durbin-Watson	2.267

Note: *** indicate significant at the 1% level.

Source: Own elaboration based on Gretl results.

The results of Table 4 indicate that the long-term regression model equation on LFDI and LEX is:

$$LEX = 0.183 * LFDI + 14.920 \quad (2)$$

As can be seen from the long-term regression model, adjusted R^2 =0.790, which indicates that the regression equation obtained has a high degree of explanation at 79%. p-value=0.000 indicates that the overall model is significant, but the validity of the long-term regression model equation needs to be further tested.

The second step of the Engle-Granger (EG) two-step method is to test whether the residual term of the regression equation is stationary or not. If the residual term is a stationary series, the above long-term regression equations hold true.

The results in Table 5 show that the residual terms all pass the ADF test and are stationary series. This indicates a cointegration relationship between LFDI and LIM and LFDI and LEX. The long-term regression model equations established in the previous section hold. It can be concluded that there is a stable and long-term equilibrium relationship between Chinese FDI to the EU and Chinese imports from the EU and between Chinese FDI to the EU and Chinese exports to the EU. In the long run, every 1 unit increase in LFDI causes an average increase in LIM of 0.258 percentage points and an average increase in LEX of 0.183 percentage points, which means that for every 1% increase in China's imports from the EU, China's FDI to EU increase by 3.88% (1/0.258) and that for every 1% increase in China's exports to the EU, China's FDI to EU increase by 5.46% (1/0.183).

Table 5. ADF test results of residuals

Variables	(c,t,k)	ADF Statistics	P-Value	Conclusion
Residuals-1	(0,0,0)	–4.286	0.000***	stationary
	(c,0,0)	–4.127	0.007***	stationary
	(c,t,0)	–4.480	0.015**	stationary
Residuals-2	(0,0,3)	–5.415	0.000***	stationary
	(c,0,3)	–5.254	0.000***	stationary
	(c,t,3)	–2.863	0.175	nonstationary

Note: (c,t,k) indicate the constant term, the trend term and the lag intervals. *** indicate significant at the 1% level. ** indicate significant at the 5% level.

Source: Own elaboration based on Gretl results.

4.3. Error correction model (ECM)

This section examines the short-run dynamics of the equilibrium relationship between variables through an error correction model, following the long-run model derived in the previous section. The short-run model allows for the analysis of fluctuations in the equilibrium relationship between variables that deviate from the long-run model in the short run due to other factors. Table 6 shows the coefficients of the error correction models for FDI and imports, FDI and exports, respectively.

Table 6. The test results of the error correction model

Variables	coefficient	std.error	t-ratio	P Value
const	0.059	0.023	2.603	0.023**
D_LFDI	0.079	0.029	2.708	0.019**
$ECM_1(-1)$	–0.670	0.154	–4.536	0.000***
const	0.044	0.026	1.702	0.114
D_LFDI	0.075	0.034	2.201	0.048**
$ECM_2(-1)$	–0.944	0.205	–4.600	0.000***

Note: D denotes first difference. *** indicate significant at the 1% level. ** indicate significant at the 5% level.

Source: Own elaboration based on Gretl results.

The results in Table 6 show that the LFDI is related to the LIM error correction model by:

$$\Delta LIM = 0.079 * \Delta LFDI - 0.67ECM(-1) + 0.059 \quad (3)$$

LFDI is related to the LEX error correction model by:

$$\Delta LEX = 0.075 * \Delta LFDI - 0.944ECM(-1) + 0.044 \quad (4)$$

With coefficients of –0.67 and –0.944 for the error correction term, respectively, the negative coefficient ensures convergence of the short-run dynamics with the long-run model, in other words, reflecting the strength of the ECM's correction for deviations from long-run equilibrium.

4.4. Granger causality analysis

Through the above analysis, it has been found that there is an equilibrium relationship between LFDI and LIM, LFDI and LEX, which means that these variables affect each other. However, it is not known which variable causes which variable to change. In order to clarify their causal relationship and determine the independent and dependent variables, the Granger causality test was conducted. Since the Granger causality test results are susceptible to the lag order, the results are presented here when the lag order is 1, 2 and 3 respectively.

Table 7. Results of Granger Causality Test of ΔLFDI and ΔLIM, ΔLFDI and ΔLEX

Lag Intervals	H0	F-Statistics	P-Value	Results
1	ΔLFDI is not granger cause for ΔLIM	3.637	0.061*	Reject H0
	ΔLIM is not granger cause for ΔLFDI	2.982	0.092*	Reject H0
2	ΔLFDI is not granger cause for ΔLIM	4.404	0.036**	Reject H0
	ΔLIM is not granger cause for ΔLFDI	1.510	0.287	Do not reject H0
3	ΔLFDI is not granger cause for ΔLIM	2.956	0.127	Do not reject H0
	ΔLIM is not granger cause for ΔLFDI	2.105	0.216	Do not reject H0
1	ΔLFDI is not granger cause for ΔLEX	6.369	0.015**	Reject H0
	ΔLEX is not granger cause for ΔLFDI	3.689	0.059	Do not reject H0
2	ΔLFDI is not granger cause for ΔLEX	**15.791**	**0.000*** **	Reject H0

continued tab. 7

3	ΔLEX is not granger cause for ΔLFDI	5.276	0.022**	Reject H0
	ΔLFDI is not granger cause for ΔLEX	12.630	0.007*	Reject H0
	ΔLEX is not granger cause for ΔLFDI	1.162	0.444	Do not reject H0

Note: Δ denotes the first difference. *** indicate significant at the 1% level. ** indicate significant at the 5% level. * indicate significant at the 10% level

Source: Own elaboration based on Gretl results.

The results of the Granger causality test are presented in Table 7. It shows that when the lag order is 1, neither ΔLFDI nor ΔLIM can reject the hypothesis at the 5% level of significance. However, at the 10% level of significance, the p-value equals 6.1% and 9.2% respectively. Therefore, the hypothesis can be rejected. In other words, ΔLIM is the Granger cause of ΔLFDI below the 93.9% level of significance and ΔLFDI is the Granger cause of ΔLIM at 90.8% level of significance; When the lag order is 2, ΔLFDI is the Granger cause for ΔLIM while ΔLIM is not granger cause for ΔLFDI; when the lag order is 3, there is no Granger relationship between the two variables.

The results of the Granger causality test between ΔLFDI and ΔLEX show that when the lag order is 1, ΔLFDI has a unidirectional causality with ΔLEX and ΔLFDI is the Granger cause for ΔLEX; when the lag order is 2, ΔLFDI has a bidirectional causality with ΔLEX; when the lag order is 3, ΔLFDI has a unidirectional causality with ΔLEX, and ΔLFDI is the Granger cause of ΔLEX.

4.5. Discussion

The empirical results show that FDI flows to developed regions are complementary to international trade (imports and exports) for China as a representative of developing countries. This is in contrast to some earlier theoretical findings, including Mundell (1957) and Vernon (1966). However, it is similar to many empirical studies, for example Lipsey and Weiss (1981), Pfaffermayr (1996), Åberg (2001), Keorite (2016), Xiong (2021) and Pan and Chong (2023). Furthermore, there are differences with some empirical studies, where for instance Song (2014) did not find a significant impact of investment on trade. Head and Ries (2001) proposed that horizontal OFDI did not promote trade. Ma et al. (2019) figured out that both complementarity and substitution relationships existed between investment and trade. In conclusion, the findings of the study with China and the EU enrich the current literature on FDI from a developing country to developed areas and international trade.

5. Conclusions

The ADF test shows that the time series of China's direct investment in the EU and China-EU imports and exports are non-stationary time series with unit roots. In contrast, the series is stationary after the first-order difference and does not have unit roots. A cointegration relationship may be between China's direct investment in the EU and China-EU imports and exports, respectively.

Cointegration tests show a cointegrating relationship between Chinese FDI to the EU and the value of China-EU imports and exports, respectively. For every 1% increase in China's imports from the EU, China's FDI to the EU increases by 3.88% (1/0.258) and for every 1% increase in China's exports to the EU, China's FDI to the EU increases by 5.46% (1/0.183).

The error correction model test (ECM) shows that short-term fluctuations in FDI deviating from the long-term trend for one reason or another can converge to the equilibrium of the long-term model when the correction strength is –0.67 and –0.944 respectively.

Granger causality tests show that China's direct investment in the EU is the Granger cause of China's imports from the EU and the opposite is also true when the lag order is 1. At the same time, when the lag order is 2, there is a two-way causal relationship between China's direct investment in the EU and the amount of China-EU exports. Because the optimal lag order is 1 for the Granger causality test of ΔLFDI and ΔLIM, 2 for the Granger causality test of ΔLFDI and ΔLEX based on the lag selection in Gretl. There is a two-way causal relationship between Chinese investment in the EU and Chinese trade (imports and exports) with the EU.

This paper examines the interlinkages between Chinese FDI in the EU and bilateral trade flows through annual observations. In the long run, the following conclusions are drawn: For every 1% increase in China's FDI to the EU, China's imports from the EU increase by 0.258% and China's exports to the EU increase by 0.183% or for every 1% increase in China's imports from the EU, China's FDI to the EU increase by 3.88% (1/0.258) and for every 1% increase in China's exports to the EU, China's FDI to the EU increases by 5.46% (1/0.183). There is a stationary linear combination and long-term equilibrium relationship between Chinese FDI to the EU and trade with the EU. In other words, the empirical analysis indicated that Chinese FDI to the EU has a positive relationship with the volume of imports and exports on both sides. An increase in Chinese FDI to the EU positively affects trade between the two sides. A complementary relationship existed between China's FDI in the EU and international trade (imports and exports) with the EU. Furthermore, Granger causality tests revealed a bidirectional causality relationship between Chinese investment in the EU and Chinese imports and exports to the EU, which means that Chinese direct investment in the EU and China-EU bilateral trade interact with each other. The results suggest that China and the EU should continue to encourage and guide capital flows and trade between the two sides.

In sum, both China and the EU are major players on the world economic stage and have always been important partners for each other. At the same time, investment and trade have an influential impact on economic development. Therefore, the research in this paper not only fills the research gap on China and the EU and enriches the research on factor mobility and international trade, but also provides a reference for the future economic policy making of China and the EU, which is beneficial to the future development of both economies.

It should be noted that the paper did not consider the possible impact of external variables such as politics, the economic crisis, the Russia–Ukraine war and institutional factors on China's OFDI and bilateral trade, which may affect the accuracy of the analysis. Meanwhile, the period of empirical analysis was relatively short. In addition, the study did not analyse in depth the link between structural changes in investment and trade. Future research could take these factors into account and examine the relationship between capital mobility and international trade further.

Additional information:

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