Economic Research-Ekonomska Istraživanja

ISSN: 1331-677X (Print) 1848-9664 (Online) Journal homepage: http://www.tandfonline.com/loi/rero20

Outward foreign direct investment and domestic investment: evidence from China

Waqar Ameer, Helian Xu & Mohammed Saud M Alotaish

To cite this article: Waqar Ameer, Helian Xu & Mohammed Saud M Alotaish (2017) Outward foreign direct investment and domestic investment: evidence from China, Economic Research-Ekonomska Istraživanja, 30:1, 777-788, DOI: 10.1080/1331677X.2017.1314824

To link to this article: http://dx.doi.org/10.1080/1331677X.2017.1314824

Published online: 08 May 2017.

ECONOMIC RESEARCH-EKONOMSKA ISTRAŽIVANJA, 2017
VOL. 30, NO. 1, 777–788
https://doi.org/10.1080/1331677X.2017.1314824

Routledge
Taylor & Francis Group

OPEN ACCESS Check for updates

Outward foreign direct investment and domestic investment: evidence from China

Waqar Ameer, Helian Xu and Mohammed Saud M Alotaish

School of Economics and Trade, Hunan University, Changsha, People's Republic of China

ABSTRACT

This paper examines the relationship between outward foreign direct investment (OFDI) and domestic investment (DI) in China using co-integration and Granger causality analyses (including bivariate and multivariate Granger causality models). The results suggest that the conclusions drawn from a bivariate model may not be valid because of the omission of important control variables. The results of the multivariate model show that there is a positive long-run unidirectional causal relationship running from OFDI to DI In the short run, DI and OFDI do not show Granger causality.

ARTICLE HISTORY
Received 14 September 2015
Accepted 25 July 2016

KEYWORDS
Outward FDI; domestic investment; co-integration; time series data

JEL CLASSIFICATIONS
C22; F21; O10

1. Introduction

Existing empirical and theoretical studies have mainly focused on the inter-relationship between foreign direct investment (FDI) inflows and economic growth (Lim, 2001; Hansen & Rand, 2006). Some research studies have explored the direction of causality between FDI inflows and economic growth by using the Granger causality test, including Zhang (2001), Chakraborty and Basu (2002), and Liu, Burridge, and Sinclair (2002). Although there are numerous studies on the inter-relationship between FDI inflows and economic growth, the number of studies on the relationship between outward FDI (OFDI) and economic growth is very limited. To the best of our knowledge, Herzer (2008) was the first to examine the relationship between OFDI and domestic output (DO) at the macroeconomic level. Unfortunately, the macroeconomic relationship between OFDI and domestic investment (DI) has rarely been researched, except for a few studies by Herzer and Schrooten (2008), Desai, Foley, and Hines (2005), and Feldstein (1994). Feldstein (1994) and Desai et al. (2005) used aggregate cross-country data to conclude that FDI outflow reduces DI in an approximately one-to-one ratio. The main problem with cross-country studies is that they assume similar economic structures across countries. In fact, economic structures, financial institutions, macro-economic environments, and economic policies may substantially differ across countries. Furthermore, contemporaneous correlations across countries do not imply causation, and these studies can suffer from endogeneity issues. Herzer and Schrooten (2008) explored the relationship between OFDI and DI in two industrialised

CONTACT Helian Xu xuhelian@163.com

countries using time series data, but this study failed to account for other important macroeconomic variables. In fact, DI and OFDI are not only correlated with each other, but they are also influenced by other macroeconomic variables such as real GDP, trade regimes, GDP per capita, etc. Omitting some of these crucial macroeconomic variables can result in biased estimates of the relationship. Thus, we have tried to bridge this shortcoming from the previous studies by adding important macroeconomic variables into a model that helps further the definition of the relationship between OFDI and DI. This study will identify the possible short- and long-run causal relationships between OFDI and DI. We will also try to establish the impact of OFDI on DI or the impact of DI on OFDI, if we indeed find a causal relationship between these two variables.

OFDI can be substituted for DI because of the scarcity of available resources (Herzer, Klasen, & Nowak-Lehmann, 2008). A reduction in DI can harm the output growth of the home country. An increase in DO stimulates domestic firms to invest abroad because these firms want to avoid the higher and costly factor prices, specifically labour costs, linked with economic growth, and they have sufficient resources to directly supply the markets (Lee, 2010). Al-Sadig (2013) argues that the effects of FDI outflows on DI may differ from one home country to another, depending on the home country's economic structure and macroeconomic environment. For instance, the effects of capital outflows in countries with abundant savings and other types of capital will differ significantly from the effects in countries with scarce capital. This paper revisits the OFDI and DI relationship with two purposes: (1) to analyse the casual relationship between OFDI and the DI of the home country; and (2) to critically analyse and revisit the findings of Herzer and Schrooten (2008).

China is the largest transition economy and the second highest FDI recipient in the world. Using foreign investment to improve its international competitiveness is a major pillar of China's reform and 'open-door' policy (Buckley, Clegg, Wang, & Cross, 2002; Fukasaku, Wall, & Wu, 1994; Lardy, 1994; Naughton, 1997). Since its reform and 'open-door' policy were implemented in 1978, China has attracted FDI globally and has become one of the world's largest FDI destinations. In the last two decades, there has been a dramatic increase in FDI outflows in China following the 1999 implementation of national policy encouraging DI to 'go out' (see Tables 1 and 2). Lee, Syed, and Xueyan (2013) suggest that the Chinese growth model is highly dependent on the accumulation of DI.

Our study contributes to the existing research literature by conducting an analyses using a macroeconomic perspective in order to investigate the impact of FDI outflows on DI in China. To the best of our knowledge, no previous research studies have analysed the impact of FDI outflows on DI at the macroeconomic level in the case of China. You and Solomon (2015) analysed the impact of FDI outflows on DI in China using industry-level data. Here, we will bridge this shortcoming in the existing literature by analysing the effect of FDI outflows on DI at the macroeconomic level by introducing new and interesting findings on the particular case of China. MOFCOM (2014) published a statistical report that highlighted that Chinese OFDI reached a record high of U.S.$107.84 billion in 2013. This was first time that Chinese OFDI exceeded U.S.$100 billion and represented a 23% rise relative to 2012. UNCTAD (2015) released a statistical report stating that China ranked third in OFDI in 2013, behind Japan and the U.S.A. Therefore, this study addresses this question with the data of the most emerging Asian country: China. Figure 1 provides a time series plot of China's DI (%GDP) measured as gross capital formation (%GDP) over the time period from 1979

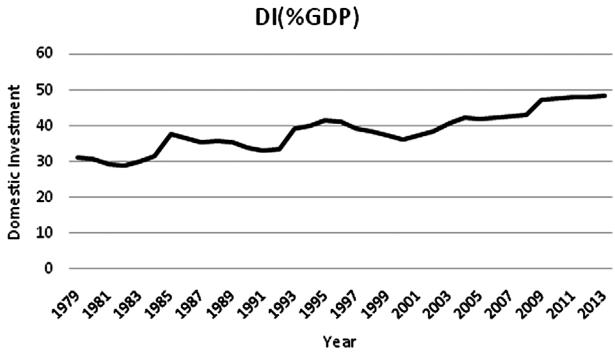

Figure 1. Time series plot of China's domestic investment measured as a percentage of GDP. Source: World Development Indicators online (www.worldbank.org).

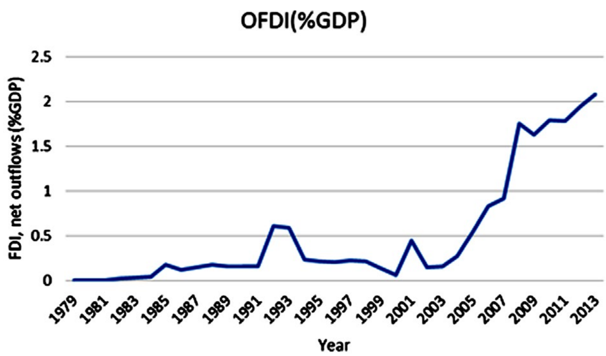

Figure 2. Time series plot of China's net outflows of foreign direct investment (FDI) measured as a percentage of GDP. Source: United Nations Conference on Trade and Development (www.unctad.org).

Table 1. China's FDI outflow and domestic investment over the timespan of 2003–2013.

Year	China OFDI	China OFDI (%GDP)	DI	DI (%GDP)
	(10,000 U.S.D.)		(10,000 U.S.D.)	
2003	285,465	0.17	67,134,227	40.91
2004	549,799	0.28	85,148,000	44.08
2005	1,226,117	0.54	107,256,428	48
2006	1,763,397	0.65	134,279,820	50.85
2007	2,650,609	0.76	172,262,224	51.66
2008	5,590,717	1.24	227,285,639	55.03
2009	5,652,899	1.13	323,392,032	65.88
2010	6,881,131	1.16	407,146,831	69.27
2011	7,465,404	1.02	460,129,995	65.84
2012	8,780,353	1.07	580,130,984	72.2
2013	10,784,000	1.17	689,546,772	76.52

Notes: FDI: foreign direct investment; DI: domestic investment; OFDI: outward foreign direct investment.
Source: China's FDI outflows data are collected from the Statistical Bulletin of China's Outward Foreign Direct Investment (2003–2013), published by the Ministry of Commerce. GDP and DI data are collected from the China Statistical Yearbook (various years).

to 2013. Figure 2 provides a time series plot of China's net outflows of FDI measured as a percentage of GDP over the time period from 1979 to 2013.

Table 2. Outward foreign direct investment flows measured in U.S. dollars at current prices.

Equation	2001	2004	2007	2010	2013
World	7,005,860.1	10,741,856.6	18,252,386.7	20,414,081.3	25,975,000.2
China	34,653.8	44,777.3	117,910.5	317,210.6	613,584.7

Note: Units for outward foreign direct investment flows are millions of U.S. dollars.
Source: UNCTAD, 2015.

The rest of the paper is presented as follows. Section 2 presents a literature review and Section 3 describes the data sources and econometric methodologies. Section 4 presents the results and findings of the analysis. Section 5 concludes the paper.

2. Literature review

Stevens and Lipsey (1992) argue that there is ongoing debate over whether or not FDI outflow reduces DI. One of the main arguments in this debate is that FDI outflow substitutes foreign activities for domestic activities, and thus for DI, when firms shift some proportion of their production abroad. In addition, there are potential interdependencies between domestic and foreign investment through production processes. Investments in different locations compete for scarce funds due to the rising cost of external financing. Thus, the decision to invest scarce resources abroad reduces DI at home. Feldstein (1995), using data from Organisation for Economic Co-operation and Development (OECD) countries between 1970 and 1980, concluded that each dollar of FDI outflow reduces DI by approximately one dollar. Andersen and Hainaut (1998), using data for the U.S.A., Japan, Germany and the U.K. for the timespan of the 1960s to the 1990s, found results that were similar to Feldstein.

Desai et al. (2005) used two different approaches to find the nexus between FDI outflow and DI In the first approach, they used specifications that were similar to Feldstein's, but used a much broader sample of OECD countries. In the second approach, they used time series data on capital expenditures of multinational firms based in the U.S.A. The findings from these two approaches differed. In the first approach, they concluded that FDI outflow reduces DI In the second approach, they found that higher capital expenditure by U.S. multinational firms is interlinked with higher domestic capital expenditure by similar firms, concluding that foreign and domestic firms are not substitutes, but are instead complements.

Dunning, Van Hoesel, and Narula (1998) explained that investments in developed countries may boost technology transfers to the home country through acquiring the latest technology and may promote economic growth. Desai et al. (2005) explained that higher OFDI is associated with higher levels of DI; thus, OFDI allows firms to import raw material from foreign affiliates at a cheaper rate and to generate exports of intermediate goods used by foreign affiliates. Industry combines home production with firms abroad to reduce the cost of production and to generate economies of scale, thereby increasing DO and DI.

The direction of causality between OFDI and DI can be mixed or can vary from one country to another if the countries are studied individually using time series data analysis because of differences in the economic structures of various countries. Therefore, the nature of the relationship between variables can be country specific and may depend on economic stability, trade openness, and the macroeconomic environment. This becomes obvious when we look at the empirical literature on the direction of causality between OFDI and GDP. For instance, Lee (2010) found long-run positive unidirectional causality from OFDI to GDP per capita (GDPP); in the short run, there is no Granger causality relationship between OFDI and GDPP. Zhang (2001) tested for short-run and long-run Granger causality between the FDI stock and GDP of four Latin American countries and seven East Asian countries. He found short-run causality from inward FDI stock to GDP for Singapore; short-run causality from GDP to inward FDI stock for Korea, Brazil, and Thailand; and no causality for Argentina. He found long-run causality from inward FDI stock to GDP for Hong Kong and Taiwan; bidirectional long-run causality from GDP to FDI stock for Mexico and Taiwan; and unidirectional long-run causality from GDP to FDI stock for Colombia.

Stevens and Lipsey (1992), using the firm-level data of seven U.S. multinationals for a timespan of 16–20 years, showed that there is a strong positive relationship between FDI outflows and DI. Sauramo (2008) found a relationship between DI and FDI outflow using macroeconomic data from Finland over the timespan of 1965–2006. He concluded that FDI outflow decreases DI in a one-to-one ratio. Hejazi and Pauly (2003), using industry-level data for Canada over the timespan of 1984–1995, concluded that the impact of FDI outflow varies according to the investment partner. For instance, Canada's FDI outflow to the U.S.A. increases DI in Canada, but FDI outflow to the rest of the world reduces DI in Canada.

Stevens and Lipsey (1992) identified two channels through which FDI outflows may affect DI. The first channel is through domestic financial markets. Firms wanting to invest abroad would transfer some proportion of their capital abroad. Thus, due to the scarce availability of funds and imperfect financial markets, the financial liquidity available to finance investment projects is reduced and local firms face problems in raising funds in domestic financial markets. Therefore, based on this mechanism, OFDI reduces DI at home, particularly if firms finance their overseas investment internally. The second channel is when firms affect product markets by shifting production abroad.

Goh and Wong (2012) found a negative impact of FDI outflow on DI during the timespan of 1999–2010 for Malaysia. You and Solomon (2015) analysed the OFDI impact on DI using industrial-level data. They used the system of generalised method of moments and found that FDI outflows have a positive impact on DI By linking these results to the theoretical mechanism through which FDI outflow affects DI, this positive impact can be attributed to abundant domestic savings, excessive foreign exchange reserves, and the important role played by the state.

In sum, the above theoretical explanations suggest that the impact of OFDI on DI can be negative, positive, or neutral, depending on the characteristics of each home country's economic structure, macroeconomic environment, and the firm's underlying motives for investing abroad. The macroeconomic effects of OFDI on DI are theoretically indeterminate and thus become an empirical issue.

3. Data and methodology

In this study, we used GDPP net OFDI (%GDP), exports of goods and services (EX), imports of goods and services (IM), gross capital formation (GCF), GDP deflator, and GDP GDPP, EX, IM, GCF, GDP deflator, and GDP are measured at constant 2005 U.S.$. Annual data from 1979 to 2013 are obtained from the UNCTAD FDI database. The starting period of this data-set is determined by the earliest availability date of the data. The sum of EX and IM divided by GDP is used as a proxy for trade openness (OPEN). The proxy for DI (%GDP) is defined as GCF (%GDP). The proxy for DO is real GDP, defined as GDP divided by GDP deflator.

We use the bounds testing approach to co-integration developed by Pesaran, Shin, and Smith (2001) to test for the existence of a long-run relationship. This test is based on the autoregressive distributed lag (ARDL) framework. It is used here because Pesaran and Shin (1999) showed that the ordinary least squares estimators of ARDL parameters are $\sqrt{n}$-consistent, where n is the sample size and the estimators of the long-run coefficients are super-consistent in small sample sizes. Furthermore, this approach can be used irrespective of whether the variables are integrated of $I(1)$, $I(0)$, or mutually co-integrated. Many unit root tests are available. In this study, we have used only two of them: the augmented Dickey and Fuller (1979, 1981) test (ADF test) and the test proposed by Kwiatkowski, Phillips, Schmidt, and Shin (1992; KPSS test).The null hypothesis of the ADF test is that a series is non-stationary, whereas the null hypothesis of the KPSS test is that a series is stationary. Both tests are performed with intercepts and time trends. The number of lags in the ADF test is selected based on the Schwarz information criterion. The choice of bandwidth parameter in the Bartlett kernel-based sum-of-covariance estimator in the KPSS test is selected based on the Newey–West data-based automatic bandwidth parameter method. The results of the unit root tests are reported in Table 3. Both the ADF and KPSS tests suggest that OFDI, OPEN, and DO are $I(1)$. The results of the unit root tests for GDPP and DI are contradictory. The ADF test suggests that GDPP is $I(1)$, and the KPSS test suggests that GDPP is $I(0)$. The unit root results of DI are quite similar to those of GDPP, Both the ADF and KPSS test results suggest that DI is integrated of $I(0)$.

The control variables (GDPP, OPEN, and DO) are chosen based on existing empirical work. Some research studies have also highlighted the effects of OPEN on DI. OPEN is expected to have a positive impact on DI through technology and knowledge spill-over. However, it may also exert a negative impact on DI if consumers prefer imported products (Ndikumana, 2000). The level of economic activity is captured by the growth rate of real GDP, and its expected effect is positive. We use real GDP as a proxy for DO. Existing and previous research studies have found that real GDP is the most important factor driving DI (Blejer & Khan, 1984; Greene & Villanueva, 1991; Wai & Wong, 1982). Existing empirical studies have also highlighted the impact of GDPP on DI. GDPP is expected to have a positive impact on DI. Alabdeli (2005) analysed the effects of several macroeconomic variables (i.e., exports and investment) on economic growth in 21 developing countries using time series data from 1960 to 2001. This study concluded that DI has a positive and significant relationship with economic growth. Frankel (1997) analysed the impact of economic factors,

Table 3. Results of the unit root tests.

	ADF		KPSS	
	First difference level		First difference level	
OFDI	0.9354[0]	0.0000*** [0]	0.1626**[4]	0.0930[3]
DI	0.0975*[1]	0.0038***[0]	0.0786 [2]	0.0696[5]
GDPP	0.1459[3]	0.0143***[4]	0.1183[3]	0.0402[2]
OPEN	0.7472[0]	0.0006***[0]	0.1790**[4]	0.1111[0]
DO	0.7203[1]	0.0889*[1]	0.1529**[4]	0.1031[3]

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Values in square brackets are either the number of lagged first differences used in the ADF test or the choice of bandwidth parameter in the Bartlett kernel-based sum-of-covariances estimator in the KPSS test. The number of lags was selected based on the Schwarz information criterion. ADF: augmented Dickey and Fuller test; KPSS: Kwiatkowski–Phillips–Schmidt–Shin test; OFDI: outward foreign direct investment; DI: direct investment; GDPP: gross domestic product per capita; OPEN: openness; DO: domestic output.
Source: Author(s) calculation.

including investment in the public and private sector, on economic growth in East Asian economies. This study concluded that investment is among the most important determinants of economic growth in the long run.

4. Results

In order to avoid the problems associated with conflicting results provided by conventional unit root tests, such as those found by Dickey and Fuller (1979, 1981) and Kwiatkowski et al. (1992), in this study, when these tests are used jointly, we use the ARDL testing approach for co-integration. Firstly, we consider only the bivariate long-run relationship between OFDI and DI. Then, three additional variables (i.e., GDPP, OPEN, and DO) are added as control variables in the model in order to determine the long-run relationship between OFDI and DI so as to capture country-specific effects.

In the bivariate model, the bounds test examines whether a long-run relationship exists in one of the following unrestricted error correction models:

$$\Delta \mathrm{OFDI}_t = a_0 + \sum_{i=1}^{n} a_{Gi}\, \Delta \mathrm{OFDI}_{t-i} + \sum_{i=0}^{n} a_{Fi}\, \Delta \mathrm{DI}_{t-i} + a_1 \mathrm{OFDI}_{t-1} + a_2 \mathrm{DI}_{t-1} + \varepsilon_{1t} \quad (1)$$

$$\Delta\, \mathrm{DI}_t = b_0 + \sum_{i=1}^{n} b_{Fi}\, \Delta\, \mathrm{DI}_{t-i} + \sum_{i=0}^{n} b_{Gi}\, \Delta \mathrm{OFDI}_{t-i} + b_1 \mathrm{DI}_{t-1} + b_2 \mathrm{OFDI}_{t-1} + \varepsilon_{2t} \quad (2)$$

In equation (1), the null hypothesis of no co-integration amongst the variables is H_0: $a_1 = a_2 = 0$ against the alternative hypothesis of H_1: $\{a_1 \neq 0\} \cup \{a_2 \neq 0\}$. In equation (2), the null hypothesis of no co-integration amongst the variables is H_0: $b_1 = b_2 = 0$ against the alternative hypothesis of H_1: $\{b_1 \neq 0\} \cup \{b_2 \neq 0\}$. The null hypothesis can be tested with the *F*-test. The *F*-test has a non-standard distribution. Pesaran et al. (2001) provided the critical values at table CI (iii). At $k = 1$, the critical values bounds are (4.04, 4.78) at the 10% level of significance, (4.94, 5.73) at the 5% level of significance, and (6.84, 7.84) at the 1% level of significance. In order to minimise the loss of degrees of freedom and to fulfil the assumption of no autocorrelation required by the ARDL test, the value of *n* corresponding to each equation is increased until the Breusch–Godfrey Lagrange multiplier test is unable to reject the null hypothesis of no autocorrelation with a lag order of 1 at the 5% level of significance. The results of the bounds test are reported in Table 4.

The results in Table 4 indicate that we do not reject the null hypothesis of no co-integration at the 1%, 5%, and 10% levels of significance for equations (1) and (2). Therefore, there is no long-run relationship between OFDI and DI when either OFDI or DI are assigned as the dependent variable.

Table 4. The results of the bounds test for co-integration.

Equation	H_0	*n*	*F*-value
(1)	$a_1 = a_2 = 0$	1	0.9087
(2)	$b_1 = b_2 = 0$	1	2.3467

Note: The number of lags was selected based on the Schwarz information criterion.
Source: Author(s) calculation.

The results of the short-run Granger causality test are reported in Table 5. This short-run Granger causality test is conducted with an F-test that is based on the null hypothesis that all lagged first differences of independent variable are jointly insignificant. The results in Table 5 suggest that OFDI and DI do not allow for Granger causality in the short run.

In the multivariate model, the ARDL test examines whether a long-run relationship exists in one of the following unrestricted vector autoregressive models:

$$\begin{aligned}\Delta \mathrm{OFDI}_t = \mathrm{k}_0 &+ \sum_{i=1}^{n} k_{\mathrm{G}i}\, \Delta \mathrm{OFDI}_{t-i} + \sum_{i=0}^{n} k_{Fi\,i}\, \Delta \mathrm{DI}_{t-i} + \sum_{i=0}^{n} k_{Di}\, \Delta \mathrm{OPEN}_{t-i} \\ &+ \sum_{i=0}^{n} k_{Oi}\, \Delta \mathrm{GDPP}_{t-i} + \sum_{i=0}^{n} k_{Pi}\, \Delta \mathrm{DO}_{t-i} + k_1 \mathrm{OFDI}_{t-1} + k_2 \mathrm{DI}_{t-1} \\ &+ k_3 \mathrm{OPEN}_{t-1} + k_4 \mathrm{GDPP}_{t-1} + k_5 \mathrm{DO}_{t-1} + \varepsilon_{3t}\end{aligned} \quad (3)$$

$$\begin{aligned}\Delta \mathrm{DI}_t = \mathrm{m}_0 &+ \sum_{i=1}^{n} m_{\mathrm{Fi}}\, \Delta \mathrm{DI}_{t-i} + \sum_{i=0}^{n} m_{Gi}\, \Delta \mathrm{OFDI}_{t-i} + \sum_{i=0}^{n} m_{Di}\, \Delta \mathrm{OPEN}_{t-i} \\ &+ \sum_{i=0}^{n} m_{oi}\, \Delta \mathrm{GDPP}_{t-i} + \sum_{i=0}^{n} m_{Pi}\, \Delta \mathrm{DO}_{t-i} + \mathrm{m}_1 \mathrm{DI}_{t-1} + \mathrm{m}_2 \mathrm{OFDI}_{t-1} \\ &+ \mathrm{m}_3 \mathrm{OPEN}_{t-1} + m_4 \mathrm{GDPP}_{t-1} + m_5 \mathrm{DO}_{t-1} + \varepsilon_{4t}\end{aligned} \quad (4)$$

In equation (3), the null hypothesis of no co-integration amongst the variables is H_0: $k_1 = k_2 = k_3 = k_4 = k_5 = 0$ against the alternative hypothesis of H_1: $\{k_1 \neq 0\} \cup \{k_2 \neq 0\} \cup \{k_3 \neq 0\} \cup \{k_4 \neq 0\} \cup \{k_5 \neq 0\}$. In equation (4), the null hypothesis of no co-integration amongst the variables is H_0: $m_1 = m_2 = m_3 = m_4 = m_5 = 0$ against the alternative hypothesis of H_1: $\{m_1 \neq 0\} \cup \{m_2 \neq 0\} \cup \{m_3 \neq 0\} \cup \{m_4 \neq 0\} \cup \{m_5 \neq 0\}$. From the table CI (iii) of Pesaran et al. (2001), at $k = 4$, the critical bounds are (2.45, 3.52) at the 10% level of significance, (2.86, 4.01) at the 5% level of significance, and (3.74, 5.06) at the 1% level of significance. Similarly, the value of n in each equation is determined by the Breusch–Godfrey Lagrange multiplier test. The results of the bounds test in multivariate model are reported in Table 6.

The results in Table 6 show that the null hypothesis of no co-integration is rejected at the 5% level for only equation (4). It is clear that with the presence of control variables, there

Table 5. The results of the short-run Granger causality test.

Dependent variable	ΔOFDI	ΔDI
ΔOFDI		0.8618[1]
ΔDI	0.0206[1]	

Notes: The numbers in square brackets are the value of n selected based on either equation (1) or equation (2). The number of lags was selected based on Schwarz information criterion. OFDI: outflow foreign direct investment; DI: direct investment.
Source: Author(s) calculation.

Table 6. The results of the bounds test for co-integration.

Equation	H_0	n	F-value
(3)	$k_1 = k_2 = k_3 = k_4 = k_5 = 0$	1	2.4471
(4)	$m_1 = m_2 = m_3 = m_4 = m_5 = 0$	1	4.6902***

Note: *** indicates statistical significance at the 1% level.
Source: Author(s) calculation.

is a long-run relationship between OFDI, DI, GDPP, DO, and OPEN, when DI is assigned as the dependent variable. In order to obtain the long-run coefficients, the ARDL model is estimated as shown here:

$$\begin{aligned}(1-\theta_1 L-\ldots-\theta_u L^u)\mathrm{DI}_t = \phi_0 &+ (1-\phi_1 L-\ldots-\phi_v L^v)\mathrm{OFDI}_t \\ &+ (1-\alpha_1 L-\ldots-\alpha_x L^x)\mathrm{OPEN}_t \\ &+ (1-\beta_1 L-\ldots-\beta_y L^y)\mathrm{GDPP}_t \\ &+ (1-\gamma_1 L-\ldots-\gamma_z L^z)\mathrm{DO}_t + \varepsilon_{5t}\end{aligned} \tag{5}$$

The optimal lags of the ARDL model are chosen based on the Schwarz information criteria. Because of the small sample size and annual data used in this study, the maximum possible values of u, v, x, y, and z in equation (5) are set at 1. The selected values of u, v, x, y, and z are 1, 1, 1, 1, and 1, respectively. The reparametrised equation (5) with long-run coefficients is reported in Table 7. The statistically significant and positive long-run coefficient of the independent variable OFDI indicates that OFDI has positive effects on DI. The long-run coefficient of GDPP also has significant and positive effects on DI.

Based on the results of the bounds test in the multivariate framework, the Granger causality tests are implemented in the models shown here:

$$\begin{aligned}\Delta\mathrm{OFDI}_t = \mathrm{q}_0 + \sum_{i=1}^{n} q_{\mathrm{G}i}\,\Delta\mathrm{DI}_{t-i} + \sum_{i=0}^{n} q_{Fi}\,\Delta\mathrm{OFDI}_{t-i} + \sum_{i=0}^{n} q_{Di}\,\Delta\mathrm{OPEN}_{t-i} \\ + \sum_{i=0}^{n} q_{\mathrm{O}i}\,\Delta\mathrm{GDPP}_{t-i} + \sum_{i=0}^{n} q_{Pi}\,\Delta\mathrm{DO}_{t-i} + \varepsilon_{6t}\end{aligned} \tag{6}$$

$$\begin{aligned}\Delta\mathrm{DI}_t = \mathrm{p}_0 + \sum_{i=1}^{n} p_{\mathrm{G}i}\,\Delta\mathrm{DI}_{t-i} + \sum_{i=0}^{n} p_{\mathrm{F}i}\,\Delta\mathrm{OFDI}_{t-i} + \sum_{i=0}^{n} p_{Di}\,\Delta\mathrm{OPEN}_{t-i} \\ + \sum_{i=0}^{n} p_{\mathrm{O}}\mathrm{i}\,\Delta\mathrm{GDPP}_{t-i} + \sum_{i=0}^{n} p_{\mathrm{P}i}\,\Delta\mathrm{DO}_{t-i} + \tau\mathrm{ECT}_{pt-1} + \varepsilon_{7t}\end{aligned} \tag{7}$$

$\mathrm{ECT}_{pt\text{-}1}(7)$ is the error correction term as reported in Table 8. A significant error correction coefficient indicates that there is long-run Granger causality from the independent to the dependent variables, where long-run Granger non-causality is regarded as equivalent. Similarly, the Breusch–Godfrey Lagrange multiplier test is again used to determine the value of n in each equation.

Table 7. Estimated long-run coefficients.

	Dependent variable
	DI
Constant	−0.3722 (0.5978)
OFDI	0.0172** (1.9391)
OPEN	−0.0449 (−1.1610)
GDPP	0.0309** (2.1689)
DO	0.0175 (0.5936)

Notes: ** indicates statistical significance at the 5% level. *T*-ratios are given in parentheses. OFDI: outward foreign direct investment; DI: direct investment; GDPP: gross domestic product per capita; OPEN: openness; DO: domestic output.
Source: Author(s) calculation.

Table 8. Results of the long-run Granger's causality test.

Equation	Coefficient of error correction term
(7)	−0.6823*** (−4.8104)

Note: *** indicates statistical significance at the 10 1% level. The *T*-ratio is given in parentheses.
Source: Author(s) calculation.

Table 9. Results of the short-run Granger causality test.

Dependent variable	ΔOFDI	ΔDI
ΔOFDI		1.3708[4]
ΔDI	0.0018[1]	

Notes: The numbers in square brackets are the values of *n* selected based on either equation (6) or (7). The number of lags is selected based on the Schwarz information criterion. OFDI: outward foreign direct investment; DI: direct investment.
Source: Author(s) calculation.

We have used the approaches of Ram (1988) and Zhang (2001) in order to determine the sign of the short-run Granger causality. The sign of the short-run Granger causality from an independent variable to a dependent variable is determined by adding up the coefficients of all lagged first differences of the independent variable. The results of the short-run Granger causality test are reported in Table 9. Based on the *F*-test, we cannot find evidence to support the existence of short-run Granger causality between OFDI and DI.

5. Concluding remarks

This paper examined the short- and long-run relationships between OFDI and DI with bivariate and multivariate frameworks. The obtained results in the bivariate model conclude that there are no short- and long-run relationships between OFDI and DI using Granger causality analysis. Bivariate model results can be unreliable due to the omission of important control variables. Omitting control variables can result in bias and unreliable results. Thus, the addition of important control variables is paramount to deriving unbiased and reliable findings. Siliverstovs and Herzer (2006) explained that the results of Granger causality tests may not be valid if the model suffers from the omission of important independent variables. However, after controlling for country-specific effects (i.e., with the inclusion of GDPP, DO, and OPEN) in the multivariate framework, the results of the multivariate model show that there is a positive long-run unidirectional causal relationship from OFDI to DI. In the short run, DI and OFDI do not allow Granger causality. This implies that the bivariate framework is misspecified in terms of omitting important independent variables. Herzer and Schrooten (2008) analysed the impact of FDI outflows on DI using data from two industrialised economies at the macroeconomic level. Here, we analysed the macroeconomic impact of FDI outflows on DI for a strongly emerging Asian country: China. Specifically, FDI outflow's impact on DI differs greatly in developed and developing countries because financial markets in developing countries are underdeveloped and multinational companies face more financial constraints in developing countries than in developed countries' multinationals. Our findings strongly support the notion that increased FDI outflows are the only causes of increased DI because there is a positive long-run unidirectional causal relationship from OFDI to DI. From our data-set, we found when FDI outflows increase, DI also behaves in similar way, which also strongly aligns with our econometric findings of there being positive, long-run, unidirectional causality running from OFDI to DI. Thus, our paper's findings do not support Herzer's (2008) proposition that increased FDI outflow is the cause and consequence of increased DO. In summary, our results partially agree with those of Herzer and Schrooten (2008). Our findings strongly support the idea that increased OFDI is the cause of increased DI.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

Helian Xu acknowledges support from the National Natural Science Foundation of China [grant number 41371134] (http://www.nsfc.gov.cn/). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

References

Alabdeli, A. (2005). Expectation of the impact of exports on economic growth in developing countries: An econometric and analytical study. *Al-Azhar University. Saleh Salem Centre Journal for Islamic Economy. 9th year, 27*, 215–259.

Al-Sadig, A. (2013). The effects of foreign direct investment on private domestic investment: Evidence from developing countries. *Empirical Economics,* 1–9.

Andersen, P. S., & Hainaut, P. (1998). *Foreign direct investment and employment in the industrial countries* (Bank for International Settlements Working Papers No. 61). Basle, Switzerland: Monetary and Economic Department.

Blejer, M. I., & Khan, M. S. (1984). Government policy and private investment in developing countries [Politique des pouvoirs publics et investissement privé dans les pays en développement] [Política estatal e inversión privada en los países en desarrollo]. *Staff Papers-International Monetary Fund, 31*, 379–403.

Buckley, P. J., Clegg, J., Wang, C., & Cross, A. R. (2002). FDI, regional differences and economic growth: Panel data evidence from China. *Transnational Corporations, 11*, 1–28.

Chakraborty, C., & Basu, P. (2002). Foreign direct investment and growth in India: A cointegration approach. *Applied Economics, 34*, 1061–1073.

Dickey, D. A., & Fuller, W. A. (1979). Distributions of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association, 74*, 427–431.

Desai, M. C., Foley, C. F., & Hines Jr., J. R. (2005). *Foreign direct investment and the domestic capital stock* (No. w11075). National Bureau of Economic Research.

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica, 49*, 1057–1072.

Dunning, J. H., Van Hoesel, R., & Narula, R. (1998). Third world multinationals revisited: New developments and theoretical implications. In J. H. Dunning (Ed.), *Globalization, trade and foreign direct investment* (pp. 255–286). Oxford: Pergamon Press.

Feldstein, M. (1994). *The effects of outbound foreign direct investment on the domestic capital stock* (Working Paper No. 4668). National Bureau of Economic Research/University of Chicago Press.

Feldstein, M. S. (1995). The effects of outbound foreign direct investment on the domestic capital stock. In R. E. Lipsey (Ed.), *The effects of taxation on multinational corporations* (pp. 43–66). Chicago: University of Chicago Press.

Frankel, J. (1997). Determinants of long term growth. Retrieved May 15, 2009, from http://ksghome.harvard.edu/~jfrankel/Apecgrow.PDF

Fukasaku, K., Wall, D., & Wu, M. (1994). *China's long march to an open economy*. Paris: Development Centre of the Organisation for Economic -operation and Development.
Goh, S. K., & Wong, K. N. (2012). Outward FDI and domestic investment. *International Proceedings of Economics Development and Research, 55*, 137–140.
Greene, J., & Villanueva, D. (1991). Private investment in developing countries: An empirical analysis. *Staff Papers-International Monetary Fund, 38*, 33–58.
Hansen, H., & Rand, J. (2006). On the causal links between FDI and growth in developing countries. *The World Economy, 29*, 21–41.
Hejazi, W., & Pauly, P. (2003). Motivations for FDI and domestic capital formation. *Journal of International Business Studies, 34*, 282–289.
Herzer, D. (2008). The long-run relationship between outward FDI and domestic output: Evidence from panel data. *Economics Letters, 100*, 146–149.
Herzer, D., & Schrooten, M. (2008). Outward FDI and domestic investment in two industrialized countries. *Economics Letters, 99*, 139–143.
Herzer, D., Klasen, S., & Nowak-Lehmann, D. F. (2008). In search of FDI-led growth in developing countries: The way forward. *Economic Modelling, 25*, 793–810.
Kwiatkowski, D., Phillips, Peter C.B., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationaryagainst the alternative of a unit root. *Journal of Econometrics, 54*, 159–178.
Lardy, N. R. (1994). *China in the world economy*. Washington, DC: Institute for International Economics.
Lee, C. G. (2010). Outward foreign direct investment and economic growth: Evidence from Japan. *Global Economic Review: Perspectives on East Asian Economies and Industries, 39*, 317–326.
Lee, M. I. H., Syed, M. M. H., & Xueyan, M. L. (2013). *China's path to consumer-based growth: Reorienting investment and enhancing efficiency* (No. 13-83). Selangor Darul Ehsan, Malaysia: International Monetary Fund.
Lim, E. G. (2001). *Determinants of, and the relation between, foreign direct investment and economic growth: A summary of the recent literature* (IMF Working Paper No. WP/01/175). Washington, DC: International Monetary Fund.
Liu, X., Burridge, P., & Sinclair, P. J. N. (2002). Relationships between economic growth, foreign direct investment and trade: evidence from China. *Applied Economics, 34*, 1433–1440.
MOFCOM. (2014). Ministry of commerce of China. Retrieved from http://english.mofcom.gov.cn
Naughton, B. (Ed.). (1997). *The China circle: Economics and electronics in the PRC, Taiwan, and Hong Kong*. Washington D.C: Brookings Institution Press.
Ndikumana, L. (2000). Financial determinants of domestic investment in Sub-Saharan Africa: Evidence from panel data. *World Development, 28*, 381–400.
Pesaran, M. Hashem, & Shin, Y. (1999). An autoregressive distributed lag modeling approach to cointegration analysis. In S. Strom (Ed.), *Econometrics and economic theory in the 20th century: The Ragnar Frisch centennial symposium* (pp. 371–413). Cambridge, UK: Cambridge University Press.
Pesaran, M. Hashem, Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*, 289–326.
Ram, R. (1988). Additional evidence on causality between government revenue and government expenditure. *Southern Economic Journal, 54*, 763–769.
Sauramo, P. (2008). *Does outward foreign direct investment reduce domestic investment* (Discussion Paper 239). Labor Institute for Economic Research [online]. Retrieved March 5, 2010, from http://www.labour.fi/tutkimusjulkaisut/tyopaperit/sel239.pdf
Siliverstovs, B., & Herzer, D. (2006). Export-led growth hypothesis: Evidence for Chile. *Applied Economics Letters, 13*, 319–324.
Stevens, G. V., & Lipsey, R. E. (1992). Interactions between domestic and foreign investment. *Journal of International Money and Finance, 11*, 40–62.
UNCTAD. (2015). *World investment report*. Washington DC: World Bank.
Wai, U. T., & Wong, C. H. (1982). Determinants of private investment in developing countries. *Journal of Development Studies, 19*, 19–36.
You, K., & Solomon, O. H. (2015). China's outward foreign direct investment and domestic investment: An industrial level analysis. *China Economic Review,* 1–39.
Zhang, K. H. (2001). Does foreign direct investment promote economic growth? Evidence from East Asia and Latin America. *Contemporary Economic Policy, 19*, 175–185.