Economics Bulletin

Volume 38, Issue 3

Foreign Investment, Domestic Investment and Economic Growth in China: Does Foreign Investment Crowd in or Crowd out Domestic Investment?

Najid Ahmad
School of Business, Hunan University of Science and Technology

Mouna Hdia
University of Evry and EconomiX University of Evry

Hong-Zhou Li
Dongbei University of Finance and Economics

Jianlin Wang
Dongbei University of Finance and Economics

Xian-Liang Tian
Wenlan School of Business, Zhongnan University of Economics and Law

Abstract

This study assesses the effects of foreign direct investment (FDI) on domestic investment and economic growth, in addition to the extent to which foreign investment either crowds in or crowds out domestic investment in China. Yearly data from 30 Chinese provinces for the period 2000–2014 has been used. Pedroni and Kao tests confirmed the existence of long-run relations. We found positive and significant effects of FDI and domestic investment on the economic growth of China using DOLS, FMOLS and GMM estimators; however, domestic investment made a higher contribution to the growth and development of the Chinese economy. As regards crowding in or crowding out, FMOLS showed a neutrality hypothesis, while DOLS and GMM demonstrated that FDI crowded out domestic investment. We conclude that the effects of FDI on domestic investment (in other words, on the economy) are not always favorable.

We would like to thank Editor in Chief, Professor Dr. John P. Conley and Associate Editor, Prof. Dr. Joydeep Bhattacharya, for giving us the opportunity to revise the manuscript. We are thankful of two anonymous referees for valuable suggestions and helpful comments which have significantly enhanced the quality of the paper. All remaining errors and omissions are our own.

Citation: Najid Ahmad and Mouna Hdia and Hong-Zhou Li and Jianlin Wang and Xian-Liang Tian, (2018) "Foreign Investment, Domestic Investment and Economic Growth in China: Does Foreign Investment Crowd in or Crowd out Domestic Investment?", *Economics Bulletin*, Volume 38, Issue 3, pages 1279-1291

Contact: Najid Ahmad - najid_2iqbal@yahoo.com, Mouna Hdia - hdiamouna@yahoo.fr, Hong-Zhou Li - hli@dufe.edu.cn, Jianlin Wang - wangjianlin100@163.com, Xian-Liang Tian - xianliangtian@gmail.com.

Submitted: April 06, 2018. **Published:** July 18, 2018.

Economics Bulletin

Submission Number: EB-18-00308

Foreign Investment in China: Does it Crowd in or Crowd out Domestic Investment?

Najid Ahmad
Business School, Hunan University of Science and Technology, Hunan, China

Hong-zhou Li
Dongbei University of Finance and Economics, Dalian, China

Jianlin Wang
Dongbei University of Finance and Economics, Dalian, China

Xian-liang Tian
Wenlan School of Business, Zhongnan University of Economics and Law, Wuhan, Hubei, China

Abstract

This study assesses the effects of foreign direct investment (FDI) on domestic investment and economic growth, in addition to the extent to which foreign investment either crowds in or crowds out domestic investment in China. Yearly data from 30 Chinese provinces for the period 2000–2014 has been used. Pedroni and Kao tests confirmed the existence of long-run relations. We found positive and significant effects of FDI and domestic investment on the economic growth of China using DOLS and FMOLS estimators; however, domestic investment made a higher contribution to the growth and development of the Chinese economy. As regards crowding in or crowding out, FMOLS showed a neutrality hypothesis, while DOLS and GMM demonstrated that FDI crowded out domestic investment. We conclude that the effects

Submitted: April 06, 2018.

1. Introduction

Foreign direct investment (FDI) is considered a prize for developing countries, as multinational enterprises (MNEs) bundle assets with their investments. It is often argued that developing countries are poor in many assets, including technology, skills, product design, and brand names. Thus, MNEs provide a solution by offering otherwise scarce resources. Recent study by Tauguchi and Wang (2017) has stated that "stock value of FDI in the world increased from 2.2 trillion US dollars in 1990 to 25.0 trillion US dollars in 2015 by about 11 times, whereas the world GDP grew by only three times during the same period. As a result, the FDI ratio relative to GDP rose from 9.6 percent in 1990 to 34.6 percent in 2015 in the world. Even in China, a large economy, the ratio went up from 5.2 percent in 1990 to 10.9 percent in 2015". It shows foreign investment is with overall increasing trend and particularly, in developing countries like China. However, the key question regarding the performance of FDI on development is whether FDI either crowds in (i.e., stimulates) domestic investment or crowds out domestic investment (either by displacing domestic producers or by reducing domestic investors' opportunities). This is an important question, because theoretical and empirical literature has, in recent years, considered FDI to be a key determinant of economic growth. In other words, if FDI either crowds out domestic investment or fails to contribute to capital formation, it is reasonable to expect FDI benefits for the country. Further, there is need to flourish country's entrepreneurial talents and foreign firms may displace domestic firms. It is also a doubt on FDI role in the development of an economy. This paper is an attempt to answer the question of whether FDI either crowds in or crowds out domestic investment in China. Since the Chinese reform and opening-up policy (1978), China has become one of the largest FDI destinations and has been ranked as the world's third largest FDI flow source, after the US and Japan. China not only has the largest receipt of FDI but is also one of the fastest growing economies in the world. Therefore, it is often said that if any country has the power to bargain with MNEs, it is China. So, it is important to consider that, if FDI crowds out domestic investment (that is to say, discourages domestic firms) then total investment may not increase at the rate at which FDI is increasing. If FDI crowds in domestic investment, then total investment should increase by more than the increase of FDI.

In the literature, it has been stated that production costs may decrease when a firm combines domestic investment with foreign investment; thus, FDI stimulates domestic investment (Desi, Foley, and Hines, 2005). However, recent studies have also shown that the combination of domestic and foreign investment for production purposes may have various impacts, depending on foreign investors' motives (Al-Sadig, 2013). Al-Sadig (2013) has pointed out that most studies use either aggregate macro data or firm-level data, and their results remain inconclusive, i.e., the effect of FDI on domestic investment was negative, neutral, and/or positive. In other words, some researchers have proven that FDI crowds in domestic investment (Xu and Wang, 2007; Lean and Tang, 2011) while others have found that FDI crowds out domestic investment (Adams, 2009; Pilbeam and Oboleviciute, 2012). Some studies (Agosin and Machado, 2005; Wang, 2010) find that FDI inflow follows a neutrality hypothesis; i.e., FDI neither crowds in nor crowds out domestic investment. Thus, the role of FDI has become controversial in the development of economies, particularly for developing countries.

This study extends previous discussion and contributes in the literature by several ways as: (1) Up to our knowledge, it is the first attempt that investigate the relationship between, economic growth, FDI and domestic investment for China that utilizes maximum provinces of China and data from 30 Chinese provinces[1] (only one province, Tibet, has been excluded from analysis) have been collected to increase the reliability of results. (2) This study does not only check the effect of FDI and domestic investment on China's economic growth (real GDP) but also explains whether FDI has a positive effect and contributes to domestic capital. In other words, this study answers the important question whether FDI crowds in or crowds out domestic investment or validate the neutrality hypothesis for China. (3) This study uses three panel unit root tests that overcome the problem of reduction in size and power, caused by conventional unit roots. For example, Im et al. (2003) proposed panel unit root test has been used that allow heterogeneity of autoregressive coefficients in all panel dynamic and remove serial correlation, it has ability to test small sample. Further, Maddala and Wu (1999) and Choi (2001) offer two type of tests i.e. Fisher-PP and ADF-Fisher. These tests allow heterogeneity in panel units as much as possible and don't require panel balance. These tests are used in the study as they are superior to others because their value is not dependent on individual lag lengths for ADF regression and nonparametric approach is thought to be better since it does not require assumption of normality for data distribution. Further, in the presence of unit roots, this study uses Pedroni (1999, 2004) panel cointegration tests which give additional power by combining cross section and time series' data together, allowing heterogeneity across provinces (Pedroni, 1999; 2004). Addition to this, Kao test (1999) that assumes homogeneity across the provinces has also been used to confirm robust cointegration. (4) In order to extract coefficients estimates, this study utilizes DOLS and FMOLS estimators as these estimators are free from serial correlation, small sample bias and they overcome endogeneity issue. Addition to this, DOLS and FMOLS results have been robustify with GMM estimators as it overcome endogeneity issue by introducing lags in the model and will reconfirm DOLS and FMOLS results.

The rest of the paper is structured as follows: section 2 is for literature review of previous work and highlight contribution of the study; section 3 is for data and econometric model, section 4 is for results and discussion and section 5 concludes the paper.

2. Literature Review and contribution

In the light of previous literature, we find, most of the previous studies have focused on the relationship between FDI and economic growth, and some focus on FDI and domestic investment, whereas few focus on FDI, domestic investment, and economic growth, particularly in the context of FDI either crowding in or crowding out domestic investment. In the respect of the relationship between FDI and economic growth, results are mixed. For example, some studies find that FDI has a positive impact on economic growth (see, for example, Mun et al. (2008), Chang (2010), Asghar and Nasreen (2011), and Lean and Tan (2011)), while other studies find that FDI can have a negative impact on the economic growth (see, for example, Mencinger (2003) and Saqib et al. (2013)). The relationship between FDI and domestic investment is also controversial and datable till date. For example, Lean and Tan (2011), Tang et al. (2008), and Mohamed et al. (2013) found

[1] Provinces are as: Beijing, Tianjin, Hebei, Shanxi, Neimenggu, Liaoning, Jilin, Heilongjiang, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Hainan, Chongqing, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang. Only Tibet has been excluded because of data non-availability.

that FDI crowds in domestic investment, while Acar et al. (2012) and Pilbeam and Oboleviciute (2012) found that FDI crowds out domestic investment. There are also studies that show no relationship between FDI and domestic investment and termed it as "neutrality hypothesis" (Sağlam and Yalta (2011), Agosin and Machado (2005), and Wang (2010)).

Researchers like Tang et al. (2008) have extended our understanding in this direction and have used multivariate VAR and co-integration to explore the relationship between economic growth, FDI, and domestic investment and found that FDI and domestic investment complement each other. On the other hand, Elboiashi et al. (2009) found the relation between FDI, domestic investment, and economic growth for Egypt, Tunisia, and Morocco, using co-integration and causal relation. It was found that FDI has a negative impact on both domestic investment and economic growth and that this relationship turns to positive in long run. Lean and Tan (2011) used Granger causality test to investigate the relationship between domestic investment, FDI, and economic growth for Malaysia for 1970–2009. They confirmed that FDI has a positive impact on economic growth and that FDI crowds in domestic investment. Similarly, Chang (2010) confirmed that FDI crowds in domestic investment for Taiwan.

Sooreea-Bheemul and Sooreea (2013) used Granger causality test to explore the relation between FDI, domestic investment, exports, and economic growth for 28 developing and emerging economies. They found bidirectional causality between all variables, except for economic growth and domestic investment. There was unidirectional causality from growth to domestic investment. Contrary, Chowdhary and Kushwaha (2013) find no relationship between FDI and domestic investment, however, there was bidirectional causality between economic growth and domestic investment. Samuel Adams (2009) explored the relationship between domestic investment, foreign investment and economic growth for sub-Saharan Africa using data for 1990–2009. He found that OLS results show that both domestic and foreign investment have a positive effect on economic growth, while fixed effect estimations show that the influence of foreign investment is not significant. He also found that FDI crowds out domestic investment. Manuel Agosin and Ricardo Mayer (2000) conducted an empirical investigation to know whether FDI crowds in or crowds out domestic investment by using the regions of Asia, Africa, and Latin America. They found that in Asia and, to some extent in Africa, there were signs that FDI crowds in domestic investment. The study included China, and they found that FDI has a neutral influence on domestic investment in China; i.e., FDI neither crowds in nor crowds out domestic investment in China.

Recent study by Taguchia and Wang (2017) explore the effect of foreign direct investment on the economic growth of China under granger causality and impulse response function in VAR system. They have shown that foreign direct investment has positive and significant effect on the economic growth of China. They offered comprehensive literature review for Chinese economy. Hsiao & Hsiao (2006) found unidirectional causal relation between real GDP and FDI for eight east and south-east Asian countries where China was also included in the analysis. On the other hand, Liu et al., (2002) have confirmed long run causal relation between foreign direct investment and real GDP of China at aggregate level. Contrary, Wei (2002) tests foreign direct investment effect on regional growth of China and by applying time-pooling analysis and cross section data, the results confirm that foreign direct investment inflows contribute in the economic growth of China. Braunstein and Epstein (2002) explored the relationship between investment, wages, FDI, tax generation, and job creation in China using provincial data for 1986–1999. They found that FDI has little positive impact on wage and job creation and has a negative influence on tax generation and domestic investment. Finally, they found that FDI crowds out domestic investment.

Above literature has revealed that there were fewer studies focusing on Chinese economic growth, foreign direct investment and domestic investment and those fewer studies offer mix results. Present study tends to extend previous discussion in several ways as: First, up to our knowledge, it is the first attempt for China that investigate relationship between economic growth, FDI and domestic investment that utilizes maximum provinces of China and thus, data from 30 Chinese provinces (only one provinces, Tibet, has been excluded due to its data non-availability) have been collected to increase the reliability of results with maximum sample size. Second, this study does not only check the effect of FDI and domestic investment on China's economic growth but also explains whether FDI has a positive effect and contributes to domestic capital. In doing so, this study answers the important question whether FDI crowds in or crowds out domestic investment or validate the neutrality hypothesis for China. Third, three panel unit root tests has been used to confirm unit root property since in the presence of unit roots, conventional panel OLS, random effect or fixed effect may lead to misleading conclusion. These panel unit roots overcome the problem of reduction in size and power, caused by conventional unit roots. Im et al. (2003) panel unit root test has been used that allow heterogeneity of autoregressive coefficients in all panel dynamic and remove serial correlation, it has ability to test small sample. Further, Maddala and Wu (1999) and Choi (2001) proposed two types of tests i.e. Fisher-PP and ADF-Fisher. These tests allow heterogeneity in panel units as much as possible and don't require panel balance. They are superior as their value is not dependent on individual lag lengths for ADF regression and nonparametric approach is supposed to be better since it does not require assumption of normality for data distribution. Further, in presence of unit roots, paper uses Pedroni (1999, 2004) panel cointegration tests which give additional power by combining cross section and time series' data together, allowing heterogeneity across provinces (Pedroni, 1999; 2004). Fourth, in order to extract coefficients estimates, DOLS and FMOLS estimators have been used as these estimators are free from serial correlation, small sample bias and they overcome the issue of endogeneity. Addition to this, DOLS and FMOLS results has been robustify with GMM estimators as it overcome endogeneity issue by introducing lags and will also reconfirm the results from DOLS and FMOLS.

3. Data and model

Data on foreign direct investment is investment invested by foreign enterprises in China, hundred million dollars and is obtained from Chinese statistical year book (various issue from 2001 to 2015), Real GDP is in Billion yuan and it is the conversion of nominal GDP into real GDP using GDP index and sources from Chinese statistical year book (various issues from 2001 to 2015), Stock of capital (Hundred million Yuan) is measured by following Young's formula (Young, A. 2000) i.e. $k_t = i_t + (1-\sigma_t)k_{t-1}$ where k, i, and σ represent capital stock, fixed asset investment and a constant depreciation rate, respectively where fixed asset investment is obtained from China statistical year book (various issues from 2001 to 2015) and Agriculture productivity is proxies of total power of agricultural machinery unit ten thousand kilo watt source Chinese statistical year book (various issues from 2001 to 2015). Descriptive statistics are provided in Appendix. Data were collected for 30 provinces for 2000–2014 by only excluding Tibet due to its non-availability of data. Time spanned is according data availability for maximum provinces. Variables were transformed into natural log form for smoothness and to interpret coefficients in elasticities (Ahmad et al., 2018; 2017).

In literature, we encounter two types of theories: one is modernization theory and other is dependency theory. Modernization ideology, which suggests that FDI will promote economic growth in developing countries, is based on neoclassical and endogenous theories, as it suggests that economic growth requires investment to grow and, thus, FDI fills this gap. It can be argued that FDI is the source of new technologies and bundles the resources, such as marketing skills, market know-how, managerial skills, and marketing networks. Thus, FDI not only offers capital accumulation but also helps to increase total factor productivity (Nath, 2005). In contrast, dependency theory argues that depending on foreign investment can have a negative impact on the growth and development, and distribution of income. It has been argued that FDI promotes monopoly (Bornschierand Chase-Dunn, 1985). Keeping these two theories in mind, we will estimate first model (equation 1) where economic growth (real GDP) is treated as a dependent variable, while foreign investment as main independent variable along with domestic investment and agri. productivity as additional variables to overcome omitted variable bias in regression. However, key question regarding the performance of FDI on development will be whether FDI either crowds in (i.e., stimulates) domestic investment or crowds out domestic investment (either by displacing domestic producers or by reducing domestic investors' opportunities). This is an important question, because theoretical and empirical literature has, in recent years, considered FDI to be a key determinant of economic growth. In order to answer this question, equation 2 will be estimated to test either FDI crowding in or crowding out domestic investment. Additional variables income (real GDP) and agriculture machinery serve to overcome omitted variables bias. Regression equations will be as follows:

$$Y_{it} = \alpha_i + \delta_{it} + \beta_{1i} FDI_{it} + \beta_{2i} I_{it} + \beta_{3i} M_{it} + \varepsilon_{it} \qquad (1)$$

$$I_{it} = \alpha_i + \delta_{it} + \beta_{1i} FDI_{it} + \beta_{2i} Y_{it} + \beta_{3i} M_{it} + \varepsilon_{it} \qquad (2)$$

In equations 1 and 2, i=1, 2, 3, 4….., 30 denotes Chinese province, t is time period (2000–2014), parameters α_i and δ_i are province's fixed effect and deterministic trend coefficients, respectively, and ε_{it} is an error term that is assumed to be independent and identically distributed with zero mean and constant variance. Beta parameters can be interpreted in elasticity as all variables are in logarithms. I is domestic investment, FDI is foreign direct investment, M is agriculture contribution, and Y is real GDP. To test the null of no co-integration, ρ_i=0, unit root test is performed on residuals as:

$$\varepsilon_{it} = \rho_i \varepsilon_{it-1} + w_{it} \qquad (3)$$

4. Results and discussion

Analysis starts with the testing of panel unit roots and three tests have been employed to ensure stationary properties of variables under investigation. Im et al. (2003) proposed panel unit root test allows heterogeneity of autoregressive coefficients in all panel dynamic and remove serial correlation, it has ability to test small sample. If we talk about nonparametric tests, Maddala and Wu (1999) and Choi (2001) offer two type of tests i.e. Fisher-PP and ADF-Fisher. These tests allow heterogeneity in panel units as much as possible and don't require panel balance. They are

superior to others as their value is not dependent on individual lag lengths for ADF regression and nonparametric approach is thought to be better since it does not require the assumption of normality for data distribution. Results reported in table 1 confirm that variables are non-stationary at level and are integrated of order one i.e. I(1). In the presence of unit roots, study does not use a VAR or vector error correction model since results can be bias and misleading in the existence of long run cointegration relationship among variables that is confirmed through three panel unit root tests. So, in next step, we proceed with Pedroni (1999, 2004) panel cointegration to check long run association among variables. Pedroni proposed seven tests that have two types i.e. first type is within-demission that consists of four tests namely panel ADF-statistic, panel ρ-statistic, panel PP-statistic, and v-statistic. Second type of tests are between-dimension that shared 3 tests statistics: group ADF-statistic, group ρ-statistic, group PP-statistic. Pedroni panel co-integration tests offer additional power in the form of combining cross section and time series data and by allowing heterogeneity across provinces for cointegrated series. These tests follow asymptotically standardized normal distribution. Addition to Pedroni seven tests, Kao (1999) test based on Engle–Granger two-step procedure, and imposes homogeneity on members in panel has also been used to confirm robust cointegration. Results in table 2 report that Pedroni five and four tests rejects the null of no cointegration for equation 1 and 2 respectively. Additionally, Kao (1999) test that assumes homogeneity across provinces also rejects null of no cointegration for both equations.

Next step was to test long-run coefficients estimates for two equations. Since economic growth, FDI and domestic investment are interacted each other, thereby endogeneity and simultaneity problem usually coming out. In that case, structural VAR or VECM can be convenient method so that data can determine causalities and impulse responses. However, in the presence of panel unit roots that has been confirmed via three panel unit root tests and reconfirmation of cointegration via Pedroni and Kao tests for long run relationship reveal that relying only on pre-mentioned method can be misleading. So, fully modified OLS (FMOLS) and dynamic OLS (DOLS) estimators are employed on co-integrated series to extract coefficients as these estimators are free from serial correlation, small sample bias and they overcome the issue of endogeneity (Phillips and Hansen, 1990; Stock and Watson, 1993). Additionally, generalized method of moment (GMM) has been used because of its advantages like it overcome endogeneity issue by introducing lags and thus, making model dynamic and it will serve to robustify DOLS and FMOLS results. Table 3 reports results from DOLS, FMOLS and GMM. First results are discussed when economic growth is treated as dependent variable (equation 1). The coefficient of FDI range is 0.13–0.31, which is positive and statistically highly significant. Its coefficient shows that an increase of 1% in FDI will raise economic growth between 0.13% and 0.31% in long run via DOLS and FMOLS respectively. GMM results show that a 1% increase in FDI raises economic growth around 0.17%. The domestic investment coefficient range is 0.65-0.72 in three techniques and coefficients in each technique is highly significant. It shows that an increase of 1% in domestic investment will raise economic growth between 0.65% and 0.71% with FMOLS and DOLS respectively in long run while domestic investment coefficient with GMM is 0.72 that shows a 1% increase in domestic investment raises economic growth around 0.72%. It is important to note that, although both investments (domestic and foreign) positively contribute to the growth and development of Chinese economy, coefficient of domestic investment shows that this will raise growth more than twice as fast. In other words, domestic investment is more important for growth and development of Chinese economy. Furthermore, agriculture variable was insignificant, indicating that this variable may not influence growth and development in long run, however coefficient's sign moved from negative to positive from FMOLS to DOLS and in GMM, it is found positive and turns to

significant. It gives the impression that in the given equation, domestic investment and foreign investment are more important variables than agriculture variable, however, if agri. contribution is allowed for a longer period, it may serve to support growth and development of China. Results for equation 2 are helpful in finding whether FDI either crowds in or crowds out domestic investment. FMOLS, DOLS and GMM results show that the FDI coefficient is negative, which seems to support FDI crowding out domestic investment. In the case of FMOLS, FDI coefficient is negative (-0.067) but statistically insignificant, which indicates neutrality hypothesis. However, DOLS and GMM results show that the FDI coefficient is negative and highly significant, which confirms that FDI crowds out domestic investment in China. A 1% increase in FDI will decrease domestic investment by 0.16% in DOLS and a 1% increase in FDI will decrease domestic investment by 0.12% in GMM. These results are in line with Braunstein, Braunstein, and Epstein (2002), who found that FDI has a negative impact on domestic investment in China. Further, results show that economic growth will encourage domestic investment. The elasticity of growth is higher with the range between 1.067 and 1.406 in FMOLS and DOLS respectively and coefficients are highly significant. GMM results also confirm the results from DOLS and FMOLS. High growth always gives domestic investors the confidence to invest more. Agri. contribution is also having a positive and significant impact on domestic investment, implying that investment in agricultural machinery is encouraging domestic investors. Negative coefficient in GMM may be explained as China is industrialized economy so increase in investment in agriculture sector may not be as beneficial as in industrial sector.

Table 1: Stationary results for panel data

Variables	IPS	Fisher-ADF	Fisher-PP
K	6.71723 (1.0000)	25.3711 (1.0000)	1.40007 (1.0000)
ΔK	-2.92579* (0.0017)	92.4763* (0.0045)	96.9925* (0.0018)
FDI	0.99495 (0.8401)	69.1227 (0.1965)	60.8594 (0.4448)
ΔFDI	-4.17190* (0.0000)	110.442* (0.0001)	184.831* (0.0000)
Y	1.65972 (0.9515)	39.4563 (0.9814)	77.4572* (0.0642)
ΔY	-3.14070* (0.0008)	90.9064* (0.0061)	147.063* (0.0000)
M	3.15275 (0.9992)	40.8307 (0.9725)	52.7880 (0.7341)
ΔM	-2.01134* (0.0221)	85.9995* (0.0155)	130.595* (0.0000)

Note: P-value in parentheses. * and ** indicate the significance level at 1% and 5% respectively. Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All tests follow asymptotic normality.

Table 2: Pedroni and Kao results for co-integration

Statistics	1	2
Panel v	4.166*	12.237*
	(0.000)	(0.000)
Panel rho	4.467	4.961
	(1.000)	(1.000)
Panel PP	-2.975*	0.481
	(0.002)	(0.685)
Panel ADF	-5.393*	-3.249*
	(0.000)	(0.000)
Group rho	7.205	6.373
	(1.000)	(1.000))
Group PP	-4.912*	-2.958*
	(0.000)	(0.001)
Group ADF	-7.483*	-4.534*
	(0.000)	(0.000)
Kao-ADF	-5.813*	-3.153*
	(0.000)	(0.001)

Notes: P-values are in Parentheses. * indicate the rejection of null of no cointegration at 1% level of significance. For equation 1 and equation 2, Pedroni five and four tests respectively reject the null of no-co-integration. Kao test in both equations strongly rejects the null of no-co-integration.

Table 3: Long run coefficient estimates

	1			2		
Variables	FMOLS	DOLS	GMM	FMOLS	DOLS	GMM
FDI	0.309*	0.134*	0.173*	-0.067	-0.157*	-0.120*
	(0.033)	(0.040)	(0.011)	(0.048)	(0.063)	(0.016)
I	0.649*	0.712*	0.717*	-	-	-
	(0.030)	(0.037)	(0.016)			
M	-0.028	0.043	0.160*	0.275*	0.182*	-0.130*
	(0.044)	(0.068)	(0.010)	(0.054)	(0.000)	(0.015)
Y	-	-	-	1.067*	1.406*	1.181*
				(0.048)	(0.079)	(0.026)
Adj.R^2	0.98	0.99	0.97	0.98	0.99	0.96

Note: Standard error in parentheses. * indicate significance at 1% level of significance

5. Conclusion

The econometrics exercise, using various recent techniques, suggests that FDI crowds out domestic investment or neutrality hypothesis (FMOLS results) is valid in China. The main conclusion drawn from this exercise is that the positive effects of FDI are not assured in the case of China. Thus, total investment may fail to rise to meet the increase in FDI. Therefore, it may be necessary to identify foreign investment that will encourage total investment and furthermore, it should be environment friendly since reason behind results may be FDI inflow adds to pollution in the environment. Screening policies can be helpful to ensure either that FDI does not displace domestic firms or that MNEs contribute to the introduction of advanced environment friendly technologies. Though the results from DOLS and GMM suggest that FDI crowds out domestic investment and FMOLS results validate neutrality hypothesis in China, however, this conclusion may come only from total and macro analyses or specific time spanned of data, and if the issue were investigated from micro analysis, e.g. by industries and/or by provinces, conclusion might differ: FDI might have a crowd-in effect in some specific industries in some specific SEZ, for instance. So, in future research there is serious need for micro-analysis of FDI. Further, in future research, it will be equally interesting to add more explanatory variables such as real interest rate and role of government support.

References

Ahmad, N., Du, L., Tian, XL. et al. Qual Quant (2018). https://doi.org/10.1007/s11135-018-0755-0.

Ahmad, N., Du, L., Lu, J., Wang, J., Li, H., & Zaffar, M. (2017). Modelling the CO2 emissions and economic growth in Croatia : Is there any environmental Kuznets curve ? *Energy*, *123*, 164–172.

Al-Sadig, A. (2013). Outward foreign direct investment and domestic investment: The case of developing countries. IMF Working Paper, WP/13/52.

Asghar, N., & Nasreen, S. (2011). Relationship between FDI and economic growth in selected Asian countries: A panel data analysis. Review of Economics & Finance, 84–96.

Adams, S. (2009). Foreign direct investment, domestic investment, and economic growth in Sub-Saharan Africa. Journal of Policy Modeling, 31, 939–949.

Agosin, M. R., & Machado, R. (2005). Foreign investment in developing countries: Does it crowd in domestic investment? Oxford Development Studies, 33(2), 149–162.

Braunstein, E., Braunstein, E., & Epstein, G. (2002). POLITICAL ECONOMY RESEARCH INSTITUTE (PERI). Bargaining Power and Foreign Direct Investment in China: Can 1.3 Billion Consumers Tame the Multinationals? Working Paper Series 45.

Bornschier, V., & Chase-Dunn, C. (1985). Transnational corporations and underdevelopment. New York: Praeger.

Chowdhary, R., & Kushwaha, V. (2013). Domestic investment, foreign direct investment and economic growth in India since economic reforms. Journal of Transformative Entrepreneurship, 1(2), 74–82.

Chang, S. C. (2010). Estimating relationships among FDI inflow, domestic capital, and economic growth using the threshold error correction approach. Emerging Markets Finance & Trade, 46(1), 6–15.

Choi, I. (2001). Unit root tests for panel data. Journal of International Money and Finance, 20 (2), 249–272.

Desai, M.A., Foley, C.F., & Hines, J.R. (2005). Foreign direct investment and the domestic capital stock. American Economic Review, 95(2), 33–38.

Elboiashi, H., Noorbakhsh, F., Paloni, A., & Azemar, C. (2009). The casual relationships between foreign direct investment, domestic investment and economic growth in North African non-oil producing countries: Empirical evidence from cointegration analysis. Advances in Management, 2, 19–25.

Hsiao, F.S.T., & Hsiao, M.C.W. (2006). FDI, exports, and GDP in East and Southeast Asia – Panel data versus time-series causality analyses. Journal of Asian Economics, 17(6), 1082-1106. doi. 10.1016/j.asieco.2006.09.011.

Im KS, Pesaran MH, Shin Y. (2003). Testing for unit roots in heterogeneous panels. J Econom, 115, 53–74.

Kao, C., Chiang, M.H. (2000). On the estimation and inference of a cointegrated regression in panel data. Center for Policy Research, Paper 145.

Kao C., 1999. Spurious regression and residual based tests for cointegration in panel data, Journal of Econometrics 90, 1–44.

Levin A, Lin CF, Chu C. (2002). Unit root tests in panel data: asymptotic and finite sample properties. J Econom, 108, 1–24.

Liu, Z. (2002). Foreign direct investment and technology spillover: Evidence from China. Journal of Comparative Economics, 30(3), 579-602. doi. 10.1006/jcec.2002.1789.

Lean, H. H., & Tan, B. W. (2011). Linkages between foreign direct investment, domestic investment and economic growth in Malaysia. Journal of Economic Cooperation and Development, 32(4), 75–96.

Maddala GS, Wu S. (1999). A comparative study of unit root tests with panel data and a new simple test. Oxford Bull Econ Stat, 61, 631–52.

Mohamed, M. R., Singh, K. S. J., & Liew, C. Y. (2013). Impact of foreign direct investment & domestic investment on economic growth of Malaysia. Malaysian Journal of Economic Studies, 50(1), 21–35.

Mun, H. W., Lin, T. K., & Man, Y. K. (2008). FDI and economic growth relationship: An empirical study on Malaysia. International Business Research, 1(2), 11–18.

Mencinger, J. (2003). Does foreign direct investment always enhance economic growth? Kilkos, 56(4), 491–508.

Nath, H. (2005). Trade, foreign direct investment, and growth: Evidence from transition economies. SHSU Economics and International Business Working paper No. SHSU Eco WP05 04. Huntsville, TX: Sam Houston State University.

Pilbeam, K., & Oboleviciute, N. (2012). Does foreign direct investment crowd in or crowd out domestic investment? Evidence from the European Union. Journal of Economic Asymmetries, 9(1), 89–104.

Pedroni P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. Oxford Bull Econ Stat 61, 653–70.

Pedroni P. (2004). Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis: new results. Econom Theory 20, 597–627.

Phillips, P.C.B., Hansen, B.E. (1990). Statistical Inference in Instrumental variables regression with I(1) process.Rev.Econ.Stud.57,99–125.

Saqib, N., Masnoon, M., & Rafique, N. (2013). Impact of foreign direct investment on economic growth of Pakistan. Advances in Management & Applied Economics, 3(1), 35–45.

Stock, J.,Watson, M.W. (1993). A simple estimator of cointegrating vector in higher order integrated systems. Econometrica 6,783–820.

Sağlam, B. B., & Yalta, A. Y. (2011). Dynamic linkages among foreign direct investment, public investment and private investment: Evidence from Turkey. Applied Econometrics and International Development, 11(2), 71–82.

Taguchi, H. and Wang, Y. (2017). The Effect of Inward Foreign Direct Investment on Economic Growth in Chinese Provinces, Journal of Economic and Social Thought, 4(4): 387-399.

Tang, S., Selvanathan, E. A., & Selvanathan, S. (2008). Foreign direct investment, domestic investment and economic growth in China: A time series analysis. World Economy, 31(10), 1292–1309.

Wei, H. (2002). Effects of foreign direct investment on regional economic growth in China. Economic Research Journal 4(1), 19-26.

Wang, M. (2010). Foreign direct investment and domestic investment in the host country: Evidence from panel study. Applied Economics, 42(29), 3711–3721. http://dx.doi.org/10.1080/00036840802314580.

Xu, G., & Wang, R. (2007). The effect of foreign direct investment on domestic capital formation, trade, and economic growth in a transition economy: Evidence from China. Global Economy Journal, 7(2), 1–21.

Young, A. (2000). Gold into base metals: productivity growth in the People's Republic of China during the reform period. *National Bureau of Economic Research Working Paper*, 7856.

Appendix

Table 1A: Descriptive statistics

	Y	FDI	K	M
Mean	10869.28	681.2804	20788.59	2606.227
Median	6970.285	253.5900	13496.80	1880.225
Maximum	67809.85	7181.310	130534.2	13101.40
Minimum	263.5900	5.770000	751.0131	95.32000
Std. Dev.	11459.32	1110.817	21328.87	2615.539
Skewness	2.218772	2.973379	1.918892	1.948419
Kurtosis	8.910619	12.77099	7.469746	6.521624
Observations	450	450	450	450