



## Singapore's economic growth: FDI?

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### Abstract

Singapore's impressive economic growth has seen accompanied increase inward FDI yet there have been variant findings of these variables. This paper investigates the relationship between FDI inflows and economic growth based on a time series data covering the period 1970 – 2015. The Johansen co-integration methodology is applied on yearly data of Gross domestic product (GDP), current government expenditure (CGE), foreign direct investment (FDI), gross fixed capital formation (GFCF) and net trade (NT). Vector error-correction model (VECM) used to test the long-run relationship. There are positive long-run relationship and bidirectional causality between GDP and FDI between FDI and economic growth.

**Keywords:** FDI, economic growth, net trade, Singapore

### 1. Introduction

Singapore's economy has made phenomenal economic growth in the last three decades but before this, its economy was characterized by high unemployment, social unrest, and the likes (Venu, 2007). This, as a result, the government needed drastic measures to solve the menace and improve the lives of its nationals. The country's lack of resources but strategic geographical position compel to pursue pragmatic policy to achieve economic development by an open economy agenda through foreign trade and services accompanied by foreign direct investment. The country planned to achieve its economic development on a proactive strategy to attract FDI using trade openness. Policies implemented by the government at that time yielded positive results attracting FDI from mainly the USA and Japan growing the Singaporean economy double digits whilst keeping inflation below world average in the period of 1965 to 1973 (Hamanaka, 2012). Just about the 1973 recession, the economy of Singapore suffered from the recession slowing down its economic growth. This break in the growth surge later redirected the government to introduce privatization, by that certain government establishments were for sale and private control, which attracted multinationals companies (Yuen, 1989). Privatization was successful to bring the economy back to its growth it had set to achieve. FDI might have played critical role in the transitions. By this time, there had been enough capital accumulation in the economy to diversify into the production of industrial goods and chemicals. Banking and financial services also joined the core drivers of the economy. In 2017, Singapore was the highest recipient of FDI in the ASEAN region and fifth largest recipient of global FDI stock (The ASEAN Secretariat, 2018). The economic rationale for offering special incentives to attract FDI frequently derives from believes that foreign investment produces externalities in the form of technology transfers and others. From studies, FDI has a major contribution to the economic development of both emerging and developed economies. These economies have a common interest in encouraging FDI flows although their

goals are different (Resmini, 2000) ;( Meyer & Estrin, 2001). FDI is a major source of technological change and improving human capital with the effect of promoting modern technology in the host country Borensztein et al. 1998.

This paper empirically investigates the relationship between FDI inflows and Singapore's economic growth for the period 1970 to 2015. Gross domestic product is the broad measurement of a country's economic activity of goods produced for a specified period. It is proxy to measure growth in the analysis. Current government expenditure is the funds spent by the government on goods and services to satisfy the need of its public. FDI inflows are the investment made by non-residents investors in an economy. Foreign direct investment provides information about technological changes or progress. Technological progress plays a crucial role in the long-term growth and development by raising the productivity of existing resources. Gross fixed capital formation variable is a measure of capital build up in the economy over the years. It represents the value of durable goods acquire by units resident in order to be used later in the production process. Net export is the difference between the monetary value of a nation's exports and imports over a certain period. We include these variables since FDI contributes to technological and capital development of a nation. Net trade is control as a result of Singapore's strategy of attracting FDI is by trade openness.

### 2. Literature review

From the last two centuries, trade has grown and remarkably transformed the global economy. It stems from economic models that argue the importance of trade and FDI to achieve economic growth. Amongst such theories is the Heckscher-Ohlin model (H-O). The H-O model is an economic theory that identifies the difference in factor endowments as the motivation for trade. The model emphasizes the production and export of goods a country has in abundance and importing goods that it is inefficient in production. Countries tend to specialize in the production and trading of goods its comparative advantage. Silajdzic &

Mehic, (2018) talks about how trade openness can bring about economic growth through increasing market size, specialization, and efficiency in resource allocation, shared technology, and knowledge transfer. Trade plays the role of upgrading skills through the importation and adoption of superior production technology and innovation. By increasing the size of the market, trade openness allows economies to better capture the potential benefits of increasing returns to scale and economies of specialization (Gerring et al., 2011; Svetličić, 1996).

In the neo-classical analysis, long-run economic growth is explained by considering capital accumulation, labor, and technological progress. It predicts that in the long run, economies converge to their steady-state equilibrium and that permanent growth is achievable only through technological progress.

Although technological progress has a positive impact on economic growth, the determinants of technological progress are not clearly defined. FDI is one of the sets of inputs that determines the level of technological progress through foreign improved technology to the host country (Lin, Lee, & Yang, 2011; Newman, Rand, Talbot, & Tarp, 2015). FDI amongst the three variables discussed by neo-classic economists to drive economic growth has the advantage of capital accumulation and advanced technology (Bermejo Carbonell & Werner, 2018).

Akalpler & Adil, (2017) test the long-run impact of FDI on economic growth. The study employed a Vector Error Correction Model for the period between 1980 and 2014. The results from the study show strong evidence absence of a long-run relationship or causality that runs from gross savings, foreign direct investment, trade and gross fixed capital formation. It was observed that the variables in question do not Granger cause each other in the long-run. However, negative associations between GDP and gross savings as well as FDI and international trade exist, although Gross fixed capital accumulation relates to economic growth positively.

Khan & Nawaz, (2019) investigate the relationship between trades, FDI and income distribution for Commonwealth of Independent States (CIS). The study uses data from the period 1990 to 2016. A system-generalized method of moments is used to estimate the model. FDI and trade have a positive significant effect on income distribution, with trade having an inverted U-shaped curve. Imports from advanced countries have a positive relationship with income and exports from both developed and developing countries having statically insignificant results.

Belloumi, (2014) states that FDI does not influence the long-run growth rate for Tunisia, but only the level of output. An exogenous increase in FDI would increase the amount of capital and income per capita temporarily as diminishing returns (on the marginal product of capital) would impose a limit to this growth in the long run. The impact of FDI on the long-run growth rate can occur only through technological progress or growth of the labor force, which both considered exogenous.

Zahonogo, (2017) measures trade openness and associated economic growth for developing countries focusing on sub-Saharan Africa (SSA). Data on 42 countries from the year 1980 to 2012 was employ. Pooled Mean Group estimation technique is used for analysis. Trade openness is confirmed to have a significant positive relationship with economic

Growth in the long run to a threshold beyond which the effects declines. Laffer Trade Curve is tested positive the countries under study.

Liu, Burrige, & Sinclair, (2002) tested the existence of a long-run relationship among economic growth, foreign direct investment, and trade in China. The co-integration framework was used with quarterly data for FDI, imports, export, and growth from 1981 to 1997. A bi-directional causal relationship existed among growth, exports, and FDI. Economic development, exports, and FDI appear to be mutually reinforcing under the open-door policy.

Antwi & Zhao, (2013) researched on impact of foreign direct investment and economic growth in Ghana. The co-integration methodology was applied on yearly data from 1980 to 2010 of FDI, GDP, and GNI to determine the existence of a long-run relationship amongst the variables. Long-run equilibrium and causal relationships were found to exist amongst FDI, GDP, and GNI.

Chakraborty & Basu, (2002) apply the co-integration model and Vector Error correction mechanism for the study. There exist co-integrating vectors between GDP, FDI, the unit labor cost and the share of import duty in tax revenue, which captures long-run relationship between FDI and GDP. The result suggests that GDP in India is not Granger caused by FDI but rather the causality runs more from GDP to FDI.

From existing studies, FDI's impact on growth varies from country to country making it controversial as to what really the relationship is positive or otherwise.

**3. Methodology**

**3.1 Data Collection and Source**

The data used in this study is secondary data from the period of 1970 to 2015 of annual observation for each variable. The variables used for the empirical analysis are real GDP, government current expenditure, the net inflow of foreign direct investment, net trade and gross capital formation accessed from the World Bank *World Development Indicators database*. All variables measured in real term and natural logarithm is applied to the data.

**3.2 Unit Root Test**

The unit root test is performed using augmented Dicker-Fuller (ADF) at the level and first difference. The lag length selection in the ADF test based on Schwarz Info Criterion (SIC). The results show that all the variables are non-stationary at level I (0), but are stationary at first difference I (1).

**Table 1:** ADF unit root test

Variables	At levels		First Difference	
	T statistic	P value	T Statistic	P value
LnGDP	-2.474	0.339	-3.974	0.017
LnCGE	-1.830	0.362	-4.837	0.000
LnFDI	-1.316	0.613	-6.761	0.000
LnGFCF	-2.220	0.410	-6.066	0.000
LnNT	-2.428	0.995	-8.019	0.000

*Source:* author's contribution using Eviews software

**3.3 Model specification and analysis**

**3.3.1. Co-integration Test**

We use Johansen Co-integration test to determine that long-run equilibrium exists in the equation

**Table 2:** Johansen Co-Integration Test

Null hypothesis	Test Statistics		Critical Values (5%)	
	Trace	Max-Eigen	Trace	Max-Eigen
None*	90.259*	34.238*	69.819	33.877
At most 1	56.021*	28.495*	47.856	27.584
At most 2	27.526	21.255*	29.797	21.132
At most 3	6.271	4.681	15.495	14.265
At most 4	1.591	1.591	3.841	3.841

Note (\*) denotes rejection of the null hypothesis at 5%

From table 2, we reject the null hypothesis if the trace statistic value is higher than the 5% critical value. We reject none null hypothesis that there is no co-integrating equation for trace test and max-Eigen test. Both tests suggest that there is one co-integrating vector between growth and its determinants.

**3.4. Long-run Estimates**

**Table 3:** Vector Error Correction Results

Variables	Coefficient	Standard Error	T-statistics
Constant	0.014***	0.009	1.510
LnCGE	-0.364*	0.201	-1.812
LnFDI	0.084**	0.027	3.108
LnGFCF	-0.209*	0.119	-1.759
LnNT	-0.026	0.027	-0.948

Note (\*\*) (\*) denotes 5% and 10% statistical significance level respectively

R<sup>2</sup> = 0.478 R<sup>2</sup> Adjusted = 0.393

Durbin Watson = 1.889 F-statistic = 5.645

Current government expenditure has a negative relationship with GDP. This means a percentage increase in current government expenditure decreases the economic growth by 36 percent. Whereas FDI has a positive impact on GDP of 0.084. For every, a percentage increase in foreign direct investment attracted to the economy contributes to growth by 8.4percent. GFCF has a negative relationship with GDP. The percentage increase in CGEFC will result in a decrease of 20percent in GDP. Akalpler & Adil, (2017) predicts this can be attributed to the fact that GFCF is applied for unproductive or consumption purposes that do not add value

to the economic performance of the nation. Thus, an increase in GFCF reduces the number of resources available for productive uses. The net trade of Singapore has a negative impact on the economy by 2.6 percent. Trade increase of a percentage will have a reducing effect of 2.6 percent on GDP growth.

**3.5. Granger-Causality**

Pairwise Granger causality test is run on the GDP, FDI, and Net trade to provide better understanding of the relationship amongst the variables.

**Table 4:** Results of pairwise granger causality test

No	Null hypothesis	Obs	F-statistic	Prob
1	FDI does not granger cause GDP	44	4.801	0.014
2	GDP does not granger cause FDI		7.370	0.002
3	NT does not granger cause FDI	44	1.959	0.163
4	FDI does not granger cause NT		1.653	0.213
5	GDP does not granger cause NT	44	2.098	0.145
6	NT does not granger cause GDP		1.095	0.351

From table 4 at a 5% significance level, we reject null hypotheses 1 and 2 implying a bi-directional Granger causal links between GDP and FDI (Maria & Ean, 2012). We accept null hypothesis 3, 4, 5, and 6 at 5% significance level. There is no such causal relationship between FDI and net trade, also same for GDP and net trade.

variability of a variable is unequal across the range of values of a second variable that predicts it. The null hypothesis is that there is no heteroscedasticity. The probability of the chi-square value is 0.086, which is more than 0.05 so we fail to reject the null hypothesis. Implying no heteroscedasticity.

**3.6. Serial Correlation Test**

Breusch-Godfrey serial correlation LM test is used to test for autocorrelation that error terms correlate. The null hypothesis is there is no autocorrelation. We accept the null hypothesis that there is no autocorrelation since the chi-square value obtained is 0.320.

**Table 5:** Results of Serial Correlation

<b>F-statistic</b>	<b>1.134</b>
Prob. F	0.315
Prob. Chi-square	0.320

**3.7 Heteroscedasticity Test**

Heteroscedasticity refers to the circumstance in which the

**Table 6:** Heteroscedasticity Test

Joint Test		
Chi-square	Df	Prob
206.42	180	0.126

**4. Conclusion**

This study investigates the impact of FDI as well as some growth variables in the case of Singapore. The study uses yearly time series data from 1970-2015 obtained from the World Bank (WDI) and is in the natural logarithm (Ln) scale. Augment Dicker Fuller test is used to test unit-roots or nonstationary and dataset is stationary at first difference. Johansen Co-integration is further used to examine if there exist long-run relationships among variables. Empirical results obtained indicates long-run relationship exists among

variables. The vector error correction model is used to determine the long-run equation. From the long-run equation, FDI inflows have positive effects on economic growth possible reason being that FDI provides externalities in the form of advanced technologies that in turn result in inefficient utilization of resources and consequently higher production. Current government expenditure, Gross fixed capital formation and net trade has a negative impact on the growth of the economy. Pairwise Granger causality test is performed showing a bidirectional causal link between GDP and FDI. Serial correlation and heteroscedasticity diagnostic tests are performed. Results obtained indicates there is no autocorrelation and no heteroscedasticity.

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