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Foreign Direct Investment: South Africa's Elixir of Life?

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Abstract

Foreign direct investment (FDI) has of late been revered as the solution to a great deal of the developing world's problems. This paper seeks to examine the macroeconomic link between foreign direct investment in South Africa, and its resultant impact on potential output. Cointegration techniques and time-series data from 1970-2003 are utilized to construct a model suitable for policy analysis. Policy options, through which the level of foreign direct investment inflow can be raised, and its' ultimate impact on output are investigated. Empirical results indicate that market size, openness, infrastructure and nominal exchange rate are factors on which South African policy makers should focus when seeking to attract foreign direct investment.

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1.   Introduction

"The theme of the quest is ancient. In many versions, it is the search for a precious object with magical properties: the Golden Fleece, the Holy Grail, the Elixir of Life. The precious object in most of the stories either remains elusive or a disappointment when found. Fifty years ago, in the aftermath of World War II, we economists began our own audacious quest: to discover the means by which poor countries in the tropics could become rich …" – William Easterly (2002)

For many poor developing nations foreign direct investment has of late been portrayed as just such an elixir. These countries rely heavily on foreign aid and investment to alleviate poverty and foster sustainable growth. In today's global world South Africa is competing with various developing and emerging economies for a piece of the international pool of foreign direct investment (FDI).

Chakrabarti (2003) indicates that the distribution of foreign direct investment remains highly skewed, with the top five per cent of the world receiving 68 per cent of foreign direct investment, while the bottom five receive only 1 per cent. This scenario has led to a situation in which developed countries not only contribute but also receive the majority of FDI. In addition, during the 1980's FDI boom, 80 per cent of the FDI flowing to developing countries, found its way to only 20 countries. The developing country receiving the largest FDI portion during this time was China. At the same time Sub-Saharan Africa, Middle East and North Africa together received only 6 per cent of developing country FDI flows.

After the 40 per cent decrease in FDI inflows to Africa in 2002 there has been an improvement in FDI flows to Africa in 2003. Although the volume of FDI is still below the peak recorded in 2001, FDI increased with 28 per cent from $12 billion in 2002 to $15 billion in 2003 (World Investment Report, 2003). However, this increase does not imply that there is a significant change in the trend of FDI flows. Based on UNCTAD data for 2003, nearly 70 per cent of total FDI flows to developed

countries and only 30 per cent to developing countries. Sixty-two per cent of FDI to developing countries flows to Asia and the Pacific, followed by Latin America and the Caribbean with 29% and finally, Africa with only 9 percent (UNCTAD FDI data base). Although FDI also seemed to flow to small African economies, mainly those that are resource abundant such as Chad, Sudan and Equatorial Guinea, FDI remains unevenly distributed within Africa.

This paper seeks to investigate the macroeconomic link between FDI and output, in the case of South Africa. And in so doing determine the possible benefits in terms of increased output due to an increase in the inflow of foreign direct investment. In order to do so, a supply-side macro-econometric model is developed to measure the impact of FDI on output for the South African case. Empirical results indicate that market size, openness, infrastructure and the nominal exchange rate are factors on which South African policy makers should focus when seeking to attract foreign direct investment. Exogenous policy shocks are applied to the market size, openness, infrastructure and exchange rate variables, and the adjustment path towards a new equilibrium is determined in order to analyse the impact of these factors on FDI and output.

The paper is structured as follows. Section 2 examines the benefits of FDI followed by an exposition of FDI in Africa and the determinants of FDI in section 3 and 4 respectively. Section 3 contains the methodology regarding supply-side macro-econometric modelling as well as the empirical model. This is followed by the empirical estimation results in section 6. The model is then simulated to determine the impact of different policies on FDI and output. The final section contains a summary and conclusions derived from the research.

2. Benefits of Foreign Direct Investment

Few will disagree that for Africa to successfully reduce poverty and increase standards of living, substantial external financing is required. The debate with regard to the efficacy of FDI as the

source of this financing however remains a contentious issue. It would seem difficult for even the most cynical of economists to completely disregard the potential benefits of FDI in Africa. As Van der Walt (1997) indicates, the fact that FDI implies the acquisition of a direct and controlling stake, means it is more likely to have both a greater and longer lasting impact on economic growth.

As a proponent of FDI, Ngowi (2001) regards foreign direct investment as the best alternative source of financing, claiming that the impact of ignoring FDI as a source of financing can be seen in many African countries. The author indicates that during the nineteen sixties and seventies, African countries were discouraged from turning towards FDI as it was regarded as an expensive form of capital. Many thus borrowed instead and in so doing acquired significant international debt. As a direct result of these debts already cash strapped, poor countries now experience even further reduced access to international funds. In addition, Ngowi (2001) indicates that it is not solely the financial aspects of FDI, which are of importance. Others include; job creation through the employment of local workers, the transfer of technology from highly developed countries, the potential for better management practices to be adopted in the FDI receiving country, assistance with capital formation, increased access to foreign markets and increased product diversity. The argument being that the sum of these qualities allows FDI to become a catalyst for economic growth.

Not everyone shares this optimism, however. Devarajan, Easterly and Pack (2003) show, using cross-country evidence that no significant relationship exists between the growth rates of African countries and levels of investment. As such the authors feel that a higher level of investment will not in itself lead to a higher GDP growth rate but that several underlying fundamentals, resulting in unproductive investments, need to be addressed before the international community should heed the calls of Africa for increased FDI.

A recent article by Akinlo (2004) however points out that it cannot unambiguously be said that FDI is growth enhancing. Many of the studies with showing a positive relationship between FDI and growth, focused on Latin American and Asian countries, where the FDI is focussed on the manufacturing industry. Akinlo (2004) examines the effect of FDI on growth in Nigeria, using data from 1970 until 2001. The FDI environment in Nigeria is characterised by its focus on the oil industry, an extractive industry. The results of the study show that FDI in Nigeria only has a positive impact on growth, after a considerable lag. FDI in the Nigerian case does thus not have the same effect as it has had in Asia and Latin America. Akinlo speculates that this is due to the nature of the extractive oil industry. The Nigerian oil industry has very little linkages with other sectors because; as with most natural resource industries there is rarely a requirement for substantial inputs and intermediate materials, procured from local suppliers. These results perhaps indicate that interest in our valuable extractive mining industry should be redirected towards other industries, specifically those having a greater degree of integration with the rest of the South African economy.

Durham (2002) examines the effect of FDI on output growth, across 80 countries. The author, similarly concludes that the effect if FDI is not always positive. The author attributes this to the fact that the influence of FDI is dependent on the "absorptive capacity" of the economy in question. Countries in which the financial and institutional environments are well regulated are more likely to exhibit a positive relationship between growth and FDI.
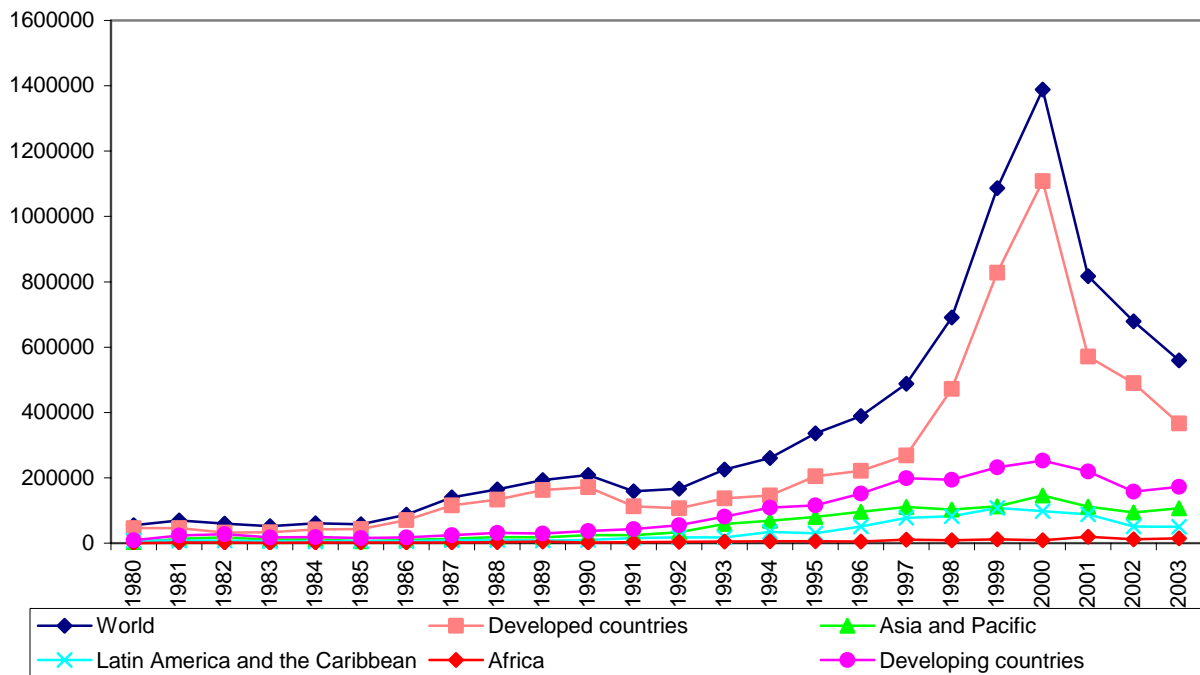
3.   FDI in Africa

During 2002 to 2003, FDI to developing countries decreased significantly. Even though there has been an improvement of FDI flows to these countries, in 2003, only 31 per cent of total FDI flows to developing countries, of which Africa only receives 4 per cent. While in 2003, FDI inflows to Africa increase with 28 per cent and several small economies share in this growth, the distribution of FDI remains skew. Within Africa, countries that are resource abundant, receive the bulk of the

FDI. Of the 34 least developed countries in Africa only 3 countries[1] received more than 1 billion dollars in FDI and 26 receiving no more than $200 million (World Investment Report, 2004). Figure 1 illustrates the FDI inflow between regions.

Figure 3.1   FDI inflows in US$ millions, 2001 to 2003

Source: World Investment Report (2004)

Data: http://stats.unctad.org/fdi/eng/TableViewer/wdsdim/dimensionp.asp

Among the top 10 African recipients of FDI were least developed countries such as Chad, Equatorial Guinea, Angola and Sudan. Petroleum exploration received the bulk of FDI in Algeria, Angola, Chad and Libyan Arab Jamahiriya, Nigeria and Sudan. The highest growth rates of inflows were registered in Djibouti, Equatorial Guinea, Kenya, Madagascar and Morocco (World Investment Report, 2004). Figure 2 indicate the top 10 African recipient countries of FDI for the period 2001 to 2003. The drastic increase of FDI for South Africa in 2001 was mainly the result of two cross-border Mergers and Acquisitions.

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[1] Countries receiving more than $1 billion in 2003 are Equatorial Guinea, Angola and Sudan.

Figure 3.2   FDI inflows to Africa, top 10 countries from 2001 – 2003

Source: World Investment Report (2004)

Data: http://stats.unctad.org/fdi/eng/TableViewer/wdsdim/dimensionp.asp
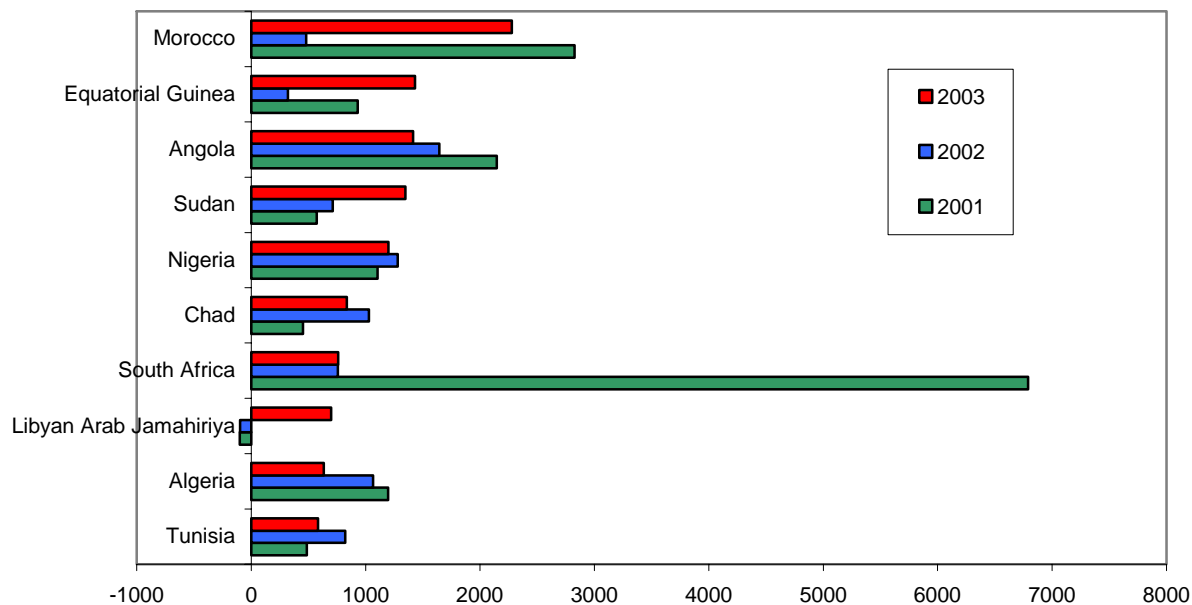
The increase in FDI can be contributed to several actions taken by African countries. Countries continue to liberalise their FDI policies, resume economic reforms and privatisation specifically in the development of infrastructure, thereby reducing restrictions on investors. In addition to the economic reform, a number of negotiations commenced to establish free trade areas between groups of African countries and other regions or countries such as the European Union and the United States. Measures taken by the World Bank and the African Trade Insurance Agency also facilitate FDI. These agencies offer risk insurance to long term FDI for physical damage resulting from war or terrorism, debt related projects and trade transactions (World Investment Report, 2004).

If the proponents of FDI are to be believed when they claim that Africa's future economic growth depends on FDI, it is vital to understand why this skewed distribution exists and identify means by which it can be drawn to the region. The following section describes possible determinants of FDI.

4.   Determinants of FDI

Countries that experience **economic growth** tend to exhibit political and economic stability and implement policies that attract FDI. In addition FDI increase total capital, which leads to an overall increase in GDP and productivity. The expected sign is positive. Nonnemberg and Cardoso de Mendonca Bengoa showed in their panel data study of 38 developing countries that the average rate of GNP growth in pervious periods to be significant and that the current rate of product growth not to be significant

The **markets size** of the foreign direct investment receiving country exhibits a positive relationship with levels of FDI. This relationship exists as the receiving country's market size may indicate a country's economic conditions as well as potential demand for produced goods. Investors may also prefer larger countries in order to benefit from economies of scale. Chakrabarti (2003) interestingly points out that an increase in one regions' FDI levels may be beneficial to other regions provided these regions trade the goods produced by the foreign firm. Fung, Iizaka and Parker (2002) also found a positive relationship between the market size and FDI and suggest that the magnitude of the positive coefficient should be larger if the foreign investors target local markets instead of exporting the produced goods. The expected sign is positive.

The **degree of political, economic and social stability** plays an important role regarding investment decisions. A positive relationship seems to exist between these factors and FDI. Bengoa and Sanchez-Robles (2003) find, in their study of 18 Latin American countries, that economic freedom, a stable economy and liberalized markets are requirements for FDI. Bevan, Estrin and Meyer (2004) examining the institutional framework in transitional Eastern European economies, find that FDI is positively related to the degree of private business ownership, legal development, foreign exchange and trade liberalization and the degree of banking sector reform.

Therefore, economic freedom is an important factor considered by investors and has a positive impact on output growth.

Countries experiencing an increase in their **debt burden** have higher risk ratings and tend to be less attractive to foreign investors. This high-risk rating implies that the probability of defaulting on the foreign debt becomes greater. This could lead to the implementation of restrictions on the outflows of international capital. Nonnemberg and Cardoso de Mendonca Bengoa showed in their panel data study of 38 developing countries that risk is highly significant and affects FDI negatively. Sanchez-Robles (2003) includes in their study, as a measurement of debt service, the debt/GDP ratio. This ratio was found not to be significant at conventional levels. As an alternative measurement, dummy variables were introduced. The first dummy variable captures the acute debt crisis experienced in 1980 to 1985 and the second dummy variable captures the effect of the devaluation of the Mexican currency in 1994. During this time there was the fear that other Latin America countries will face similar problems. Their study confirms the significant and negative impact large debt burdens and financial crises have of FDI.

Inflation is often used as an indicator for monetary discipline and macroeconomic stability. A high inflation rate illustrates a lack of discipline and commitment regarding policy issues. Bengoa and Sanchez-Robles (2003) find inflation to be highly significant negatively correlated with FDI. Nonnemberg and Cardoso de Mendonca Bengoa also used inflation as a proxy for macroeconomic stability and found it to be negatively correlated with FDI. However, in a more restricted estimation, this variable is not significant.

Opinions differ regarding the effect of **currency strength** on FDI movements. Chakrabarti (2003) feels that two channels exist, the revenue and the cost channel. The revenue channel occurs as a result of a strong currency translating local currency profits into larger foreign currency profits. The

cost channel exists as a result of immobile factors becoming more costly, resulting in product prices rising and decreased competitiveness. The author thus claims that provided the revenue channel exceeds the cost channel, a positive relationship will exist between FDI and currency appreciations. Onyeiwu and Shrestha argue that inflation reduces a countries real effective exchange rate. This depreciation reduces the amount of foreign exchange that an investor can repatriate as profits. If the domestic asset prices do not increase, this inflation-induced depreciation may lead to a decrease in net wealth. Ngowi (2001) on the other hand, feels that a weak currency is more likely to attract FDI. In addition the cost of conversion will result in foreign firms ploughing profits back into the FDI receiving country.

It is assumed that countries with an efficient and integrated **infrastructure** attract more FDI. Onyeiwu and Shrestha and Zhang found a positive correlation between the level of infrastructure and FDI. Fung, Iizaka and Parker on the other hand showed that infrastructure has no positive influence on Japanese FDI in China and that infrastructure has a positive but very small coefficient regarding US FDI In China. Bengoa and Sanchez-Robles (2003) found that although infrastructure has a positive effect on FDI, the variable was not significant.

Empirical evidence on the effect of **incentive policies** indicates that they may prove effective in attracting FDI. Marwah and Tavakoli (2004) investigate the relationship between FDI and economic growth in Asia, with specific reference to Indonesia, Malaysia, the Philippines and Thailand. The international policies of all four countries were changed after the 1970's. The policy shift generally included the relaxation of foreign investment regulations or alternatively the implementation of initiatives to attract FDI. Based on data from 1970-1998, the results show that 20 to 25 per cent of the productivity of capital stock was generated by growth in foreign direct investment. In addition, import tariffs in the FDI receiving country may create protectionary

incentives for a foreign firm to expand its business in a country rather than increase its exports to that country.

Lui (2002) points out that China provides incentives for FDI, in the form of exemption from income tax for the first two years and a 50 per cent reduction for three years thereafter. These incentives are offered due to the belief that FDI promotes growth, specifically from the associated technology transfers. Using data from 29 industries from 1993 to 1998 Lui (2002) investigates whether technology spillovers, promoting growth, do in fact occur in China, as a result of FDI. The results indicate that there are large spillover effects and that domestic sectors, specifically the manufacturing sector, reap the benefits.

A country that implements **trade liberalization** policies, the more likely it is to attract FDI. Nonnemberg and Cardoso de Mendonca are of the opinion that trade openness is a good proxy for the type of relation a given country has with foreign capital. A country with a larger degree of trade openness is more directed towards external markets and would be more open to foreign capital. Onyeiwu and Shrestha found trade openness to be very important and although the coefficient is small it is significant on a 1 per cent level of significance.

Onyeiwu and Shrestha argue that **natural resource availability** is a very important variable explaining FDI inflows into Africa. Countries that are well endowed with natural resources seem to attract more FDI than other countries. This might explain why Angola, Botswana, Nigeria and Tunisia attract the most FDI in Africa.

There seems to be consensus regarding the effect of **schooling** on FDI. Fung, Iizaka and Parker found that level of schooling might explain the major difference in FDI inflows. FDI from the US and Japan are influenced significantly by the regional labour quality compared to FDI inflows from

Hong Kong and Taiwan that are not influenced by the level of schooling. This could be because FDI form Hong Kong and Taiwan is concentrated in labour intensive industries that do not require highly skilled labour.

The prevailing **wage rate** is identified as an important determinant of FDI levels, stemming from changes in competitiveness. Higher relative wages may cause a foreign firm to be less competitive in one region than in another and is therefore commonly associated with lower levels of foreign direct investment. However, as Fung, Iizaka and Parker (2002) point out regional wages may increase due to high local inflows of FDI.

Nonnemberg and Cardoso de Mendonca argues that the more **sophisticated the industrial structure**, the more favourable are the strategic asset-seeking or efficiency-seeking FDI inflows. In their study they use per capita energy consumption in host the countries to measure the degree of development of the industrial structure. The expected sign is positive. They also argue that investment is associated with international mergers and acquisitions. This is also strongly influenced by stock market performance. Therefore, increases in the index DOWJONES reflect moments of euphoria resulting in an increased willingness to make riskier investments. Their study shows that the Dow Jones index is positively related to FDI.

Table 4.1   A summary of the determinants of some recent FDI studies

Author	Method	Determinants	Proxy	Sign and /or Significance
Onyeiwu and Shrestha (2004)	Panel dataset for 29 African countries (1975 – 1999)	Economic growth Inflation Openness International reserves Natural resource availability Real interest rate External debt Tax Political rights Infrastructure	GDP growth rate Inflation rate Sum of imports and exports divided by GDP International reserves as a % of GDP Fuel exports as a % of total exports Real interest rate External debt as a % of GDP Corporate profit tax rate Freedom House Annual survey Main telephone lines per 1000 people	Positive and significant Negative and significant Positive and significant Wrong sign Positive and significant Not significant Significant only in random effects model Significant only in random effects model Not significant Not significant
Fung, Iizaka and Parker (2002)	Regional panel data (1991 – 1997). Determine the relative importance of the determinants of US and Japanese direct investment in China.	Local market size Labour cost Human capital Density of roadway and railway Policy incentives	Gross domestic product Nominal wage lagged one period Number of student enrolled in higher education relative to the population Dummy variable take the value of 1 for the regions that are designated as SEZ and OCC or ETDZ[2] or 0 otherwise	Positive Negative Positive
Bengoa and Sanchez-Robles (2002)	Panel data fir 18 Latin American countries (1970-1999)	Index of economic freedom Gross domestic product Debt services Inflation Railways Dummy (1980 –1985) Dummy (1990-1995)	Fraser index PPP Debt service divided by GDP Physical units of railway Alternative for debt services	Positive and significant Positive and significant Negative and not significant Negative and significant Positive but not significant Negative and significant Negative and significant

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[2] SEZ and OCC is the Special Economic Zones and Open Coastal Cities
ETDZ is the Economic and Technological Development Zones

| Zhang (2001) | Cross section and Panel data: China | Market size
Labour cost
Labour Quality

Agglomeration economies
Transportation
FDI incentives

Cultural links

Openness | Real GDP of a province
Average real wage rate of manufacturing workers in a province
Share of secondary-school students in total population in a province
Share of manufacturing output in a province's GDP
Railroad and highways in km per square km of a province
Dummy variable that takes value of 1 for coastal provinces with special economic zones/opened cities, and 0 for other provinces
Dummy variable that takes a value of 1 for Guangdong and Fujian provinces, and 0 for other provinces
Dummy variable that takes a value of 1 for the years since 1991, when the liberalized FDI regime was adopted, and 0 for other years | Positive
Negative
Positive

Positive
Positive
Positive

Positive

Positive |
| Nonnemberg and Cardodo de Mendonca | Panal data for 38 developing countries (including transition countries) (1975 – 2000) | Gross domestic product
Average growth rate of GDP
Level of schooling

Trade openness

Inflation
Risk
Energy consumption
Dow Jones index
Growth in FDI exporters |
Average growth rate of GDP over the previous 5 years

% of corresponding segment of the population enrolled in secondary school
Proxy for the type of relation a given country has with foreign capital
Proxy for the level of macroeconomic stability
Risk rating measured by Euromoney
Per capita energy consumption
Measures stock market performance and euphoria
Average rate of growth in the largest OECD exporters of FDI to developing countries | Positive and significant
Positive and significant

Positive and significant

Positive and significant

Negative and significant
Negative and significant
Not significant
Positive and significant
Positive and significant only if risk is not included |

Own summary

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5.   Methodology and empirical model

5.1   A supply-side approach

Supply-side economics can be defined as a study of policies designed to stimulate economic growth and promote price stability through measures such as lower taxation, increased savings, increased productivity etc., that affect the supply of goods and services (Hailstones 1982:3). Keynesian principles had been at the core of economic policy for many decades and although the term supply-side economics was known as early as the 1960's, it was only in the past few decades that supply-side theory, policy and the modelling thereof, have become more popular in the field of economics. The inadequacy of demand-oriented theory, policy and models to explain and solve problems such as unemployment, stagflation, double-digit inflation, high interest rates, lagging productivity and depreciating currencies led to the development of supply-side models.

The Keynesian approach focus on federal budgetary and monetary policies as means to stimulate demand for goods and services to foster growth in production, based on the principles that an increase in demand will automatically trickle down to increase aggregate supply. According to the Keynesian approach, fiscal policy influences disposable income via spending, and the balanced budget multiplier ensure that this change is transmitted to economic growth and employment. The main difference between the classical and the supply-side approach is their view on savings. The Keynesians consider savings as a leakage; an increase in savings will lead to a decline in economic growth, while the supply-sider do not agree, since savings are not lost, but converted into investment.

Supply-side economics stresses the necessity of understanding the structure of the production process and the effect of each of the production factors on the level of output. A further aspect to be taken into account when modelling supply-side behavioural equations is the incorporation of

supply-side policy instruments and their effect on the economy (Nickell 1988: 202). The purpose of this paper is to estimate the impact of supply-side policy instruments through FDI on production of the South African economy. In order to analyse the impact of FDI on the long-run economic growth, an aggregate neoclassical production function for the South African economy is estimated.

5.2 The empirical model

It is evident from the literature review in section 4 that openness, infrastructure and market size impacts positively on the attraction of FDI flows to a particular country. The empirical model specification for FDI and portfolio investment is as follows:

$$fdin = f(mkts, rd, infra, open, sancdum) \tag{5.1}$$

$$pin = f(us\_gdp, rd, gdp\_diff, crime, sancdum) \tag{5.2}$$

A capital flows variable *flows* is created in order to capture the link between FDI and portfolio investment through the net capital inflows variable reported in the national accounts, which feeds into a financial constraints variable.

$$flows = netcapn - fdin - pin \tag{5.3}$$

$$finn = scn + sgn + spn + den + fdin + pin + flows + gldresn \tag{5.4}$$

The link from the real financial constraints variable *finn* to capital and output is realized through investment. This capital stock identity then forms the foundation of the link with output where an aggregate neoclassical production function for the South African economy is estimated as a function of capital, labor and technology.

$$\text{if} = f(\text{gdp}, \text{ucc}, \text{fin}) \qquad\qquad (5.5)$$

$$k = (1 - \text{deprate})k_{-1} + \text{if} \qquad\qquad (5.6)$$

$$y = f(k, n, \text{tech}) \qquad\qquad (5.7)$$

Where

> fdin = nominal inflow of foreign direct investment
> pin = nominal inflow of portfolio investment
> mkts = market size
> rd = Rand/US dollar exchange rate
> infra = infrastructure
> open = measure of openess
> sancdum = dummy for sanctions
> us_gdp = US gross domestic product
> gdp_diff = differential of US and SA real gross domestic product
> netcapn = nominal net capital inflow
> scn = nominal corporate savings
> spn = nominal private savings
> sgn = nominal government savings
> den = consumption of fixed capital
> gldresn = change in gold and foreign reserves
> ucc = user cost of capital
> fin = real financing of gross domestic investment
> if = gross fixed capital formation
> deprate = depreciation rate
> k = capital stock
> n = labourforce
> y = real gross domestic product
> tech = dummy for technological innovation

6.   Empirical estimation results

6.1   The data

Data series employed in the empirical estimation of the theoretical model above are graphically represented in appendix B. Sources include the South African Reserve Bank, Stats SA and the World Bank. All data series were employed in first differenced form in error correction models,

thus considered to be integrated of order 1. Table 1A and 2A contain the test results of the Augmented Dickey-Fuller (ADF) and Phillips Peron test for stationarity on the different series. The sample period is 1970 to 2003.

6.2   Estimation technique

A single equation residual based estimation procedure was chosen, despite well-known potential defects. We follow this methodology due to the macro-modelling context in which this study is conducted. Single equation estimation is still widely used by practitioners and more specifically in a macro-modelling context (Bank of England, 2000). This methodology entails the determination of the long-run relationship through testing for stationarity of the residuals, employing an Augmented Dickey-Fuller test. The null hypothesis of no cointegration is rejected when the ADF statistic is smaller than the calculated p percent critical values using MacKinnon response surface analysis. An error correction model is then estimated, containing both the long-run cointegration equation lagged by one period as well as the short-run adjustment towards equilibrium.

6.3   Estimation results

In this section the empirical estimation of the theoretical behavioural equations are reported, namely foreign direct investment inflows (FDI), portfolio investment inflow (PIN), gross fixed capital formation (IF) and output (Y).

A number of conventions apply with regard to reporting of results. An uppercase l (L) preceding a variable indicate natural logs and Δ indicates a first difference. Each relationship is written to distinguish athe long-run solution of the equation from the short-run dynamics. Long-run solutions appear in square brackets, and follow from the usual practice of estimating correction models. Associated t-statistics are included in parentheses below coefficients. A standard set of diagnostic tests are reported containing test-statistics, p-values and conclusions.

6.3.1 Foreign direct investment

Foreign direct investment in the long run is specified and estimated in terms of market size and nominal rand/dollar exchange rate. A dummy variable (Sancdum), being equal to 1 from 1985 to 1992, accounting for the period when South Africa experienced sanctions from the rest of the world was also included. The short-run dynamics of the system is influenced by infrastructure and the openness of the South African economy. A dummy variable (Dum99), equal to 1 in 1999 was also included in order to capture the demutualization of Old Mutual. The estimation results of the long run and error correction model are reported in equation 6.1 followed by the results of the diagnostic tests.

$$\Delta Lfdi_t = 0.0913 + 0.5423 \Delta Lopen_t + 0.0224 \Delta Infra_{t-2} - 0.1531 Sancdum_t + 0.9452 Dum99_t$$

$$(6.11) \quad (2.01) \qquad\qquad (6.18) \qquad\qquad (-4.87) \qquad\qquad (11.66)$$

$$- 0.2292 \: [Lfdi_{t-1} - 49.4557 - 5.1237 Lmkts_{t-1} - 1.627 Lrd_{t-1} + 0.5902 Sancdum_{t-1}]$$

$$(-4.51) \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (6.1)$$

Adjusted R-squared: 0.90

Equation standard error: 0.0710

Purpose of test	Test	Test statistic	Probability	Conclusion
Normailty	Jarque-Bera	0.66	0.71	Normaly distributed
Heteroscedasticity	ARCH LM	0.02	0.88	No heteroskedasticity
	White	4.06	0.94	No heteroskedasticity
Serial correlation	BG LM	0.33	0.84	No serial correlation
	LB Q-statistic	1.86	0.93	No serial correlation
Specification	Ramsy RESET	4.53	0.10	Indicative of stability

6.3.2 Portfolio investment

Portfolio investment in the long run is specified and estimated in terms of US gdp and nominal rand/dollar exchange rate. A dummy variable (Sancdum), being equal to 1 from 1985 to 1992, accounting for the period when South Africa experienced sanctions from the rest of the world was

also included. The short-run dynamics of the system is influenced by the difference between South African and US gdp, the nominal rand/dollar exchange rate and crime in South Africa. A dummy variable (Dum99), equal to 1 in 1999, as well as a dummy variable (Dum00), equal to 1 from 2000 to 2003, was also included in order to capture impact of the Asian crises on South Africa. The estimation results of the long run and error correction model are reported in equation 6.2 followed by the results of the diagnostic tests.

$$\Delta Lpin_t = 0.2779 + 2.6703\Delta\,Lgdp\_diff_t + 0.3508\Delta\,Lrd_t + 0.7467\Delta Lcrime_t - 0.3694Dum00_t +$$

$$(6.5386) \quad (3.9017) \quad\quad (2.6951) \quad\quad (3.0987) \quad\quad (-4.8539)$$

$$0.1748Dum99_t - 0.2256[Lpin_{t-1} - 4.257 - 0.7911Lus\_gdp_{t-1} - 1.4323Lrd_{t-1} + 0.5144Sancdum_{t-1}8]$$

$$(2.4219) \quad\quad (-2.4773) \quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad (6.2)$$

Adjusted R-squared: 0.67
Equation standard error: 0.0918

Purpose of test	Test	Test statistic	Probability	Conclusion
Normailty	Jarque-Bera	0.04	0.72	Normaly distributed
Heteroscedasticity	ARCH LM	0.02	0.88	No heteroskedasticity
	White	9.27	0.51	No heteroskedasticity
Serial correlation	BG LM	3.07	0.21	No serial correlation
	LB Q-statistic	7.30	0.29	No serial correlation
Specification	Ramsy RESET	0.67	0.72	Stable

6.3.3   Gross fixed capital formation

Gross fixed capital formation the long run is specified and estimated in terms of gross domestic product, user cost of capital and financial constraints. The short-run dynamics of the system is influenced by financial constraints and a dummy variable (Sancdum), being equal to 1 from 1985 to 1992, accounting for the period when South Africa experienced sanctions from the rest of the world was also included. The estimation results of the long run and error correction model are reported in equation 6.3 followed by the results of the diagnostic tests.

$$\Delta Lif_t = 0.0293 + 0.2815 \Delta Lfin_t - 0.0527 Sancdum_t - 0.8272[LIF_{t-1} - 1.2288 LGDP_{t-1} +$$

$$(4.9202) \quad (7.1069) \quad (-4.2667) \quad (-8.5355)$$

$$0.1579 LUCC2 + 0.4125 LFIN_{t-1} - 10.0792] \tag{6.3}$$

Adjusted R-squared: 0.86

Equation standard error: 0.0291

Purpose of test	Test	Test statistic	Probability	Conclusion
Normailty	Jarque-Bera	0.9479	0.6225	Normaly distributed
Heteroscedasticity	ARCH	0.0121	0.9121	No heteroskedasticity
	White	9.2868	0.0981	No heteroskedasticity
Serial correlation	Breusch-Godfrey LM	4.1066	0.1283	No serial correlation
	Durbin Watson	1.5318		No serial correlation
	Q-Statistic	6.2184	0.399	No serial correlation
Specification	Ramsy RESET	5.5555	0.0622	Stable
Parameter	CUSUM			
stability	CUSUM of squares			
	Recursive estimate			All indicative of stability
	Recursive residuals			

6.3.4 Actual output

The actual output in the long run is specified and estimated in terms of capital and labor. A Cobb-Douglas production function as fitted to the data and due to the nature of the South African Labour market data; it was necessary to constrain the long-run actual output estimation to constant returns to scale. A trend dummy variable (Tech), equal to 1 in 1995, was also included in order to capture technological innovation. The estimation results of the long run model are reported in equation 6.4.

$$Lgdp_t = 0.4338 Lk_t + 0.5662 Ln_t + 0.0323 Tech_t + 6.0889 \tag{6.4}$$

$$(0.0361) \quad (12.6774) \quad (13.8256)$$

Adjusted R-squared: 0.98

Equation standard error: 0.0276

7.   Policy Implications

As noted in the introduction, the aim of this paper is to determine which factors are instrumental in attracting foreign direct investment, and how a rise in FDI, as a result of policy implementation, would ultimately influence output. In order to have a clear understanding of how a policy shift, aimed at increasing FDI levels, will affect output, it is necessary to shock the determinants of FDI.

The degree of openness, market size, infrastructure and the nominal Rand/dollar exchange rate are shocked with different percentages from 1988 to 2003.

7.1   Openness

It is evident from figure 7.1.1 below that FDI subsequently increase by 2.4 percent as a result of a 5 per cent increase in the degree of openness before returning to its equilibrium level over time. The increase in FDI in turn increases output to a new equilibrium level 0.05 per cent higher than the initial output.
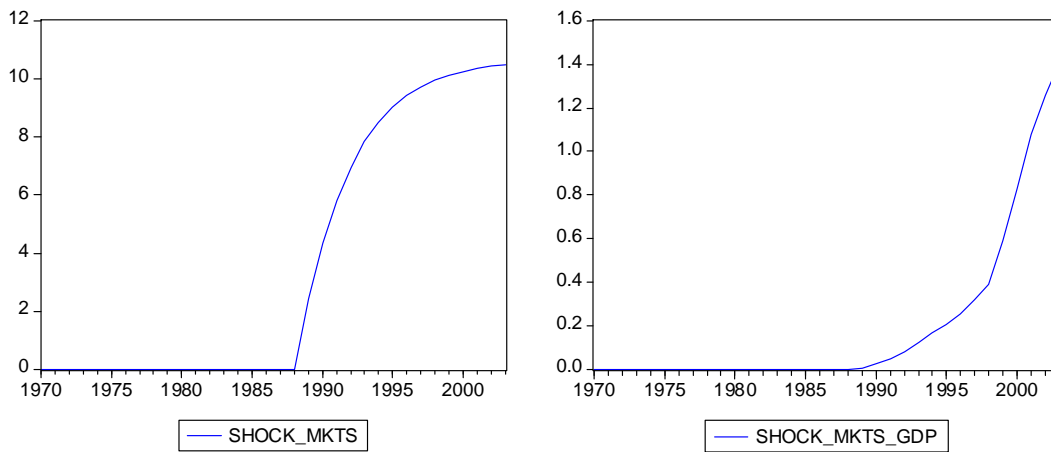
Figure 7.1.1: Response characteristics of 5% shock of openness on FDI and output

7.2   Market Size

22
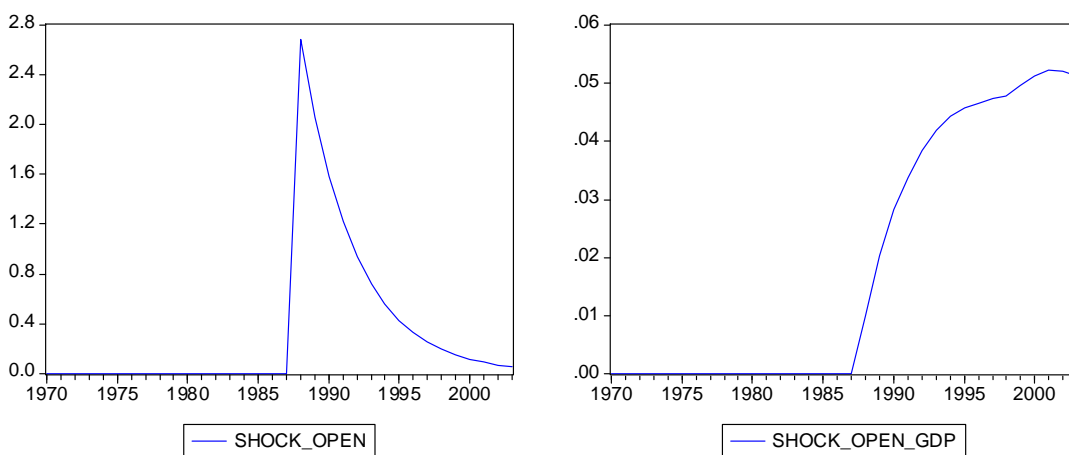
Market size was identified as a long-run determinant of FDI. It is therefore not surprising that 2 per cent increase in the market size variable translates into a permanent increase in FDI. A sizable increase in FDI inflows is anticipated, with a rise in market size, and from figure 7.2.1 it is evident that the 2 per cent rise in market size resulted in a new equilibrium for FDI 10 per cent higher than the initial equilibrium. The increase in FDI in turn increases output by a large amount but it is not evident to what equilibrium level output will return.
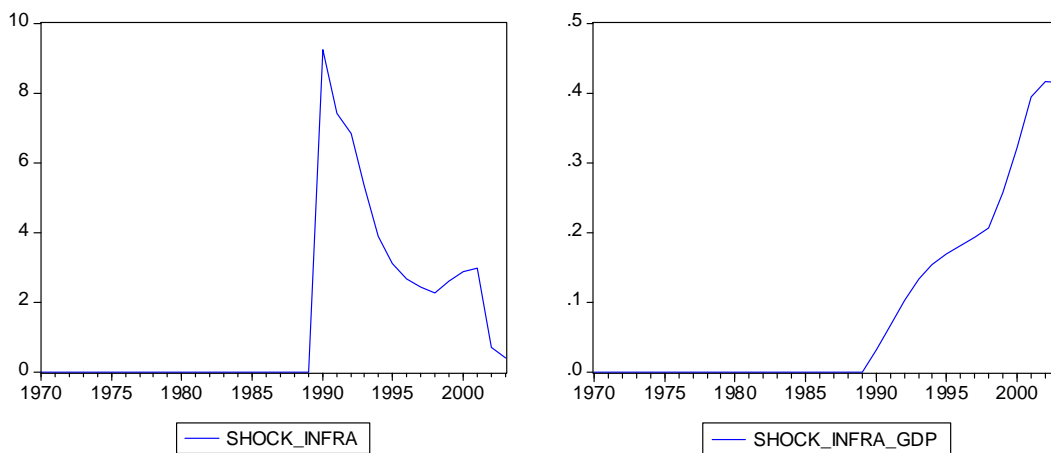
Figure 7.2.1:   Response characteristics of 2% shock of market size on FDI and output

7.3   Infrastructure

Similar to the openness variable, the response characteristics of infrastructure increases after a 5 per cent increase shock before returning to its initial equilibrium level. A 5 per cent increase in infrastructure increases FDI by approximately 9 percent. The increase in infrastructure impacts positively on output, raising it to a new equilibrium level of 0.4 per cent higher than the initial equilibrium output.

Figure 7.3.1:   Response characteristics of 5% shock of infrastructure on FDI and output

7.4   Rand/dollar exchange rate

The response characteristics of the Rand/dollar exchange rate are similar to the market size variable, both determinants in the long-run equation of FDI, in that the long-run shock has a permanent effect on FDI. A 4% depreciation of the Rand/dollar exchange rate results in a decrease in FDI, which reaches a new equilibrium over time of 6.5 per cent lower than the initial equilibrium. It is not clear what the size of the impact of the decrease in FDI will have on output in the long run but it is evident that it is a negative effect.

Figure 7.4.1:   Response characteristics of 4% shock of Rand/dollar on FDI and output

8.   Conclusion

At a time when South Africa is struggling with poverty and the ravishes of HIV/AIDS, a recipe-like formula for sustained economic growth would be warmly welcomed. It was perhaps the recent success of the "Asian Miracle" countries that pushed the idea of foreign direct investment to the

forefront of many economists' minds, leading them to believe that a solution to Africa's growth problems had indeed been found.

This study finds a link between FDI and economic growth. The empirical results of this study indicate that policies aimed at improving openness, market size, infrastructure and appreciating currency, would substantially increase FDI levels, which impacts on output.

This study has focused on the direct link between FDI and output, as it filters through new capital formation. This link thus does not take other factors such as increased employment, improved skills and new management techniques into account. All factors which have the potential to improve (Nolan en Bohlies) productivity and thus output.

FDI should thus not blindly be regarded as the absolute answer to poverty reduction and improved standards of living. As Devarajan, Easterly and Pack (2003) indicate, it is perhaps a case of underlying structural fundamentals, resulting in unproductive investments, needing to be addressed before additions to capital via FDI will result in improved potential output.

9. References

Akinlo, A 2004. "Foreign direct investment and growth in Nigeria An empirical investigation" *Journal of Policy Modeling* 26:627-39

Bengoa, M & Sanchez-Robles, B 2003. " Foreign direct investment and economic growth: New evidence from Latin America" *European Journal of Political Economy* 19(3) 529-45.

Bevan, A; Estrin, S & Meyer, K 2004. "Foreign investment location and institutional development in transition economies" *International Business Review* 13:43-64.

Chakrabarti, A 2003. "A theory of the special distribution of foreign direct investment" *International Review of Economics & Finance* 12:149-69.

Durham, J 2004. "Absorptive capacity and the effects of foreign direct investment and equity foreign portfolio investment of economic growth" *European Economic Review* 48(2):285-306.

Easterly, W 2002. *The Elusive Quest for Growth Economists' Adventures and Misadvetures in the Tropics*. The MIT Press Cambridge.

Hailstones, T.J. 1982. *A Guide o Supply-Side Economics.* New York: Robert F. Dame.

Lui, Z 2002. "Foreign direct investment and technology spillover: Evidence from China" *Journal of Comparative Economics* 30:579-602.

Marwah, K & Tavakoli, A 2004. "The effect of foreign capital and imports on economic growth: further evidence from four Asian countries (1970-1998)" *Journal of Asian Economics* 15:399-413.

Ngowi, H 2001. "Can Africa increase its global share of foreign direct investment" *West Africa Review* Vol 2(2).

Van der Walt 1997. "A neoclassical model of foreign direct investment" Unpublished Thesis, University of Pretoria.

Appendix A: Unit root tests

Table 1A   Unit root tests

Series	Model	ADF Lags	ADF τ_τ τ_μ τ	ADF ϕ_3 ϕ_1	Philips Peron
lgdp	T, c	8	-2.5761	3.6935	-2.43
	C	8	-1.2191	1.4864	-1.15
	None	8	3.0099		5.54
lk	T, c	8	-3.4386*	232.22***	-3.42*
	C	8	-2.9690	270.92***	-9.64***
	None	8	0.1973		3.30
ln	T, c	8	-2.6828	15.21***	-2.14
	C	8	-2.0751	9.658**	-3.00**
	None	8	0.8916		1.45
lndirinvn	T, c	8	-1.5682	1.57	-1.61
	C	8	0.3310	0.10	0.61
	None	8	3.4727		4.42
lmkts	T, c	8	-2.6157	3.48	-2.36
	C	8	-2.1646	4.01*	-1.85
	None	8	0.3962		0.36
lrd	T, c	8	-2.9862	3.84	-2.53
	C	8	-0.2139	0.04	-0.29
	None	8	2.6593		2.48
linfra	T, c	8	-0.8213	1.74	-0.33
	C	8	-1.3291	1.76	-1.24
	None	8	2.3070		3.49
lcrime	T, c	8	-1.4553	1.64	-1.63
	C	8	-0.0027	0.00	-0.29
	None	8	1.5789		1.28
lif	T, c	8	-2.0914	7.54**	-2.23
	C	8	-1.7236	9.46*	-1.95
	None	8	1.4907		1.50
lucc2n	T, c	8	0.1557	3.61	3.24
	C	8	-2.5719	6.61**	-2.72*
	None	8	-1.8589*		0.16
lfint	T, c	8	-2.3007	2.66	-2.40
	C	8	-1.9079	3.64	-1.89
	None	8	0.9735		1.32
linvestdef	T, c	8	-1.280111	9.81	0.44
	C	8	-2.805128*	12.03***	-1.79
	None	8	-3.318247***		-4.38***
lppi	T, c	8	-0.499067	12.91	0.27
	C	8	-1.889789	19.88*	-1.55
	None	8	-2.156128**		-3.16***

*   Statistically significant at 10% level
**   Statistically significant at 5% level
***   Statistically significant at 1% level

Table 2A   Unit root tests, first differences

Series	Model	ADF Lags	ADF $\tau_\tau\ \tau_\mu\ \tau$	ADF $\phi_3\ \phi_1$	Philips Peron
Δgdp	T, c	8	-4.13**	8.64**	-3.92**
	C	8	-4.19***	17.57***	-4.01***
	None	8	-2.59**		-2.42**
Δk	T, c	8	-1.05	6.264018	-1.43
	C	8	-1.17	8.368454	-1.06
	None	8	-1.73		-1.62*
Δn	T, c	8	3.06	3.69	-1.19
	C	8	-1.30	1.70	-1.76
	None	8	-1.04		-1.47
Δndirinvn	T, c	8	-4.60***	11.77***	-6.11***
	C	8	-5.88***	4.65***	-5.89***
	None	8	-2.52**		-4.50***
Δmkts	T, c	8	-4.16**	8.74**	-3.95**
	C	8	-4.22***	17.8***	-4.03***
	None	8	-4.28***		-4.10***
Δrd	T, c	8	-4.40***	7.93**	-3.96**
	C	8	-4.42***	11.53***	-4.09***
	None	8	-3.72***		-3.76***
Δinfra	T, c	8	1.45	7.05	-4.19**
	C	8	-4.11***	16.96***	-4.12***
	None	8	-3.06***		-3.06***
Δcrime	T, c	8	-4.40***	9.69***	-4.37***
	C	8	-4.36***	19.03***	-4.34***
	None	8	-4.18***		-4.22***
Δif	T, c	8	-4.36***	6.68*	-2.52
	C	8	-4.48***	10.31***	-2.77*
	None	8	-4.14***		-2.74***
Δucc2n	T, c	8	-6.86***	23.73***	-7.23***
	C	8	-5.65***	31.95***	-5.65***
	None	8	-0.70		-4.06***
Δfint	T, c	8	-5.53***	11.68***	-5.34***
	C	8	-5.63***	18.08***	-5.44***
	None	8	-5.45		-5.23***
Δinvestdef	T, c	8	-3.34*	6.66*	-3.31*
	C	8	-2.68*	7.20***	-2.63*
	None	8	-0.40		-0.85
Δppi	T, c	8	-2.51	4.04	-1.95
	C	8	-2.08	4.36*	-1.93
	None	8	-0.86		-0.72

*   Statistically significant at 10% level
**   Statistically significant at 5% level
***   Statistically significant at 1% level

The unit root test indicates that the ADF test statistics are smaller that the critical values and therefore the null hypothesis of non-stationary are rejected on at least a per cent level of significance. The Phillips-Perron statistics is smaller than the critical values and suggests that the null hypothesis can be rejected on at least a 10% level of significance.

Appendix B Graphs