

## TO INVESTIGATE HOW EXPORTS, EMPLOYMENT AND FOREIGN DIRECT INVESTMENT AFFECT ECONOMIC GROWTH IN ZAMBIA

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### **ABSTRACT**

*The objective of this paper is to investigate the determinants of economic growth by testing the validity of the export-led growth hypothesis by Keong et al (2002), model which explains economic growth as a function of exports, capital formation (investment), labour, imports and exchange rates. However, the model will maintain only three variables that is exports, employment and FDI but still be specified in the linear logarithmic regression form.*

*Based on this model, both exports and foreign direct investment have stimulated positive adjustment to economic growth, whereas variables such as imports and exchange rates are found to influence growth negatively. The study methodology of this paper involved the specification of mathematical and econometric model for Gross Domestic Product (GDP) as a dependent variable and exports, employment and foreign direct investment as explanatory variables. Furthermore the study took into account the Augmented-Dick Fuller (ADF) test for stationarity, Durbin Watson (DW) test for Auto-correlation, Jarque-Bera (JB) test for Normality, White Hetero-skedasticity Test for Hetero-skedasticity and Chow Break Point test for Structural Stability. The rationale of this study was to add knowledge for policy makers, economists and various stakeholders in making optimal decisions for meaningful progress of Zambia's economy. The study showed that foreign direct investment is positively correlated to economic growth in Zambia while unexpectedly it revealed that there is a negative relationship between economic growth and the other variables. Further analysis showed that exports Granger-cause economic growth in the period of study. Thus, this study provides further evidence to support the export-led growth hypothesis in the Zambian economy.*

**Key words:** Export-led growth, economic growth, foreign direct investment.

## **DEDICATION**

I dedicate this paper to my hardworking parents Mr. Michael mondoka and Mrs Linah mondoka and my brothers and sisters:

1. Jane mondoka
2. Geoginah mondoka
3. Michael mondoka
4. Linda mondoka

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1. Mr Darius mukuka
2. Mr Mwale enock

## ACRONYMS

ELG	EXPORT LED GROWTH HYPOTHESIS
EXP	EXPORTS
FDI	FOREIGN DIRECT INVESTMENT
GDP	GROSS DOMESTIC PRODUCT
IMF	INTERNATIONAL MONETARY FUND
K	CAPITAL
L	LABOUR
LDCs	LOW DEVELOPED COUNTRIES
LI-SSA	LOW-INCOME COUNTRIES IN SUB-SAHARAN AFRICA
PPP	PURCHASING POWER PARITY
R&D	RESEARCH AND DEVELOPMENT
TOT	TERMS OF TRADE
WB	WORLD BA

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## CHAPTER ONE

### 1.0. INTRODUCTION

#### 1.1. BACKGROUND INFORMATION

The causes of economic growth have intrigued economists and policymakers for quite some time. Over time, numerous theories and empirical studies have been generated examining different factors that are presumed to be at the core of Economic growth. Over the last decades the issue of economic growth has attracted increasing attention in both theoretical and empirical research. Yet, the process underlying economic performance and growth is poorly understood (Easterly, 2001), something, which can be partly attributed to the lack of a unifying theory on the subject matter and the reductionist way mainstream economics approach the issue.

Despite the lack of a unifying theory, there are several partial theories that discuss the role of various factors in determining economic growth. Two mainstream strands can be distinguished: the neoclassical, formalized by (Solow, 1956), which emphasizes the importance of capital accumulation, and the more recent, theory of endogenous growth, pioneered by (Romer, 1986) and (Lucas, 1988), which has drawn attention to human capital and innovation capacity. Furthermore, important insights on the issues of economic growth have been provided by the new economic geography which pays due respect to the spatial characteristics of development. In addition, other explanations have highlighted the significant role non-economic factors play in promoting Economic growth. These developments gave rise to a discussion that distinguishes between ‘proximate’ and ‘fundamental’ (or ‘ultimate’) sources of growth (Rodrik, 2003). The former refers to issues such as capital accumulation; labour and technology while the latter to institutions, political systems, socio-cultural factors, demography and geography.

Export-led growth is an economic development strategy in which export expansion plays a central role in economic growth. The mainstream thinking is that exports are very important for accelerating economic growth. According to the World Bank 2001, “export of goods and services is an important source of foreign exchange reserves and can reduce balance of payments problems, and creates employment opportunities”. This strategy has received praise from scholars and



proponents alike for the success stories of the Tiger nations which comprise China, Singapore, Hong Kong and South Korea. These countries were able to record double digits growth by among other things pursuing a vigorous export led growth strategy (ibid). The Tiger nations had an average growth rate of 10.3% during the study period of this paper.

Growth based on investment on the other hand is one in which the sustained increases in capital leads to an increase in the productive capacity of the nation. The Tiger nations once again have been known to have invested massively during the period under study and the period prior to that. As a result of recording unprecedented economic growth rates by pursuing a vigorous export strategy and investing massively in core sectors of the economy, international organization like the World Bank adopted this as the benchmark for any country that wanted to replicate the success of the Tiger nations. The World Bank 2001 is of the view that export led growth and huge investments in core sectors of the economy are the best chance for least developed countries to record double digits growth rates and therefore significantly affect real variables like poverty and unemployment. It should be noted that the paper refers to average double digit growth rate for the Tigers during the study period and not absolute growth rates, absolute growth rates showed fluctuations from 8.7% to 14.6% in China's case but on average the growth rate during the study period was a double digit growth rate.

Zambia has also attracted a remarkable amount of foreign direct investment (FDI). The ratio of FDI to GDP rose from 2.0 percent in 2001 to 6.4 percent in 2004. The ratio of gross domestic investment to GDP climbed from 17.6 percent in 2001 to a peak of 24.3 percent in 2003, and then contracted to an estimated 22.5 percent in 2005. The investment rate is now well above the LI-SSA average of 19.2 percent and Uganda's 20.3 percent and is comparable to the investment rate in Botswana (23.7 percent). Because government investment has declined from 11.9 percent in 2001 to an estimated 7.4 percent in 2005, the investment boom reflects a higher rate of private investment, which jumped from 5.7 percent of GDP in 2001 to an estimated 15.1 percent in 2005 (Bank of Zambia, 2004). On the export front, Zambia has performed remarkably well during the period under study. The export sector received a boost from a rise in copper prices on the international market as the nation's copper exports (main export commodity) increased from 340 million dollars in 2000 to 1755 million dollars in 2010 which is a 416% increase. This equates to an average of 38% growth of copper exports per annum.

In the above context, this study was about determinants of economic growth in Zambia, focusing on three major factors, that is foreign direct investment, employment and exports. The paper started by looking at the statement of the problem, nature of the problem, its significance, and hypothesis formulation in chapter one. Further, chapter two discussed the theoretical and empirical review of the study and the next chapter looked at the model specification and methods of estimation employed. Chapter four and five looked at the estimation procedure and regression results, discussion and interpretation of the findings and their policy implications and study recommendations.

## 1.2. STATEMENT OF THE PROBLEM

In light of the given statistics on the performance of exports and investment, one does not need an economic expert to tell them just how exceptional these statistics are. In the words of the World Bank 2001, Zambia's macroeconomic performance on indicators such as exports, capital investments and trade balance has consistently performed well during the past decade and present a recipe for success. As earlier alluded to, the main argument from scholars, proponents and international organizations like the World Bank and International Monetary Fund was that if the Tiger nations were able to record unprecedented double digit economic growth rates based on high capital investments and increased exports, other countries can do likewise. All in all, in as much as there are other factors that determine economic growth, the World Bank 2001 was of the view that increased exports and investment were the best chance for the country to start recording double digits growth rates on average which is the benchmark necessary to significantly affect the high Poverty levels and high unemployment. However despite Zambia recording exceptional increases in investment and exports over the past decade, the country still continues to record dismal growth rates with the average over the study period being 5.9%. Henceforth the benchmark of "average double digit growth rate" necessary to significantly affect real variables like poverty and unemployment as ascribed by the World Bank continues to elude the country and therein lies the problem of this paper. Stated in other words, even after remarkable performance of the export sector and increased investment in the country, Zambia has failed to replicate the success story of the Tiger nations, thus the study investigated the extent to which investment determine economic growth in Zambia, assessed the extent to which exports and employment determine economic growth in Zambia and the study topic was to investigate the determinants of economic growth in Zambia.

## 1.3. NATURE OF THE PROBLEM

Investment in Zambia has traditionally been concentrated in the extractive industries, although there has been some diversification into the manufacturing sector and tourism in recent years, the mining sector continues to be the mainstay of the economy. Copper exports continue to account for almost three thirds of total exports. The export of copper is especially problematic as it is exported in its raw form and therefore subject to increased fluctuations in its price on the world market. This problem has been faced by the country since time immemorial, the earnings from the export of copper in its raw form are not just enough.

However, there has been periods at which the price of copper has observed some stability on the world markets which has instilled some optimism in some economic observers of the start of the new era of “Real Growth” for the country, but this optimism soon fades when the reality of the mining sector being capital rather than labour intensive industry sets in. This explains the marginal employment generation in the country despite the huge investments being made especially in the mining sector. Furthermore the flow of investment to the extractive sector is not growth enhancing as much as other productive sectors, because the mining sector apart from being a highly capital intensive industry is also an enclave sector with little backward and inward linkages with other sectors like agriculture in developing countries like Zambia.

The agriculture sector on the other hand which is a source of employment for most people in rural areas is still a comedy of eras, if the country is still struggling with the distribution of inputs such as fertilizer and seeds 51 years after independence, one would wonder how on earth they would implement a mechanized and all year round farming (winter farming) which would be viable enough to generate “decent employment” for the greatest number of people.

## 1.4. SIGNIFICANCE OF THE STUDY

The findings of this study will be used by policy makers, economists and various other stakeholders in making optimal decisions for the meaningful progress of the Zambia’s economy. Furthermore this study will act as a foundation upon which other researches relating to the same can be done to extend, correct and verify the knowledge herein.

## 1.5. OBJECTIVES

### 1.5.1. General Objective

The general objective of this research was to evaluate the determinants of economic growth in Zambia .

### 1.5.2. Specific Objectives

The specific objectives of this study were:

- To verify if foreign direct investment, export and employment affect gdp
- To suggest the implementation of foreign direct investment, employment and export to boost GDP in Zambia.

## 1.6. HYPOTHESIS FORMULATION

The formulated hypotheses were:

H<sub>0</sub>: Gdp is not affected by foreign direct investment, employment and exports in Zambia.

H<sub>1</sub>: Gdp is affected by foreign direct investment, employment and export in Zambia.

## CHAPTER TWO

### 2.0. LITERATURE REVIEW

This section reviews theories and literature on a number of previous studies related to the study, that have been done and their research findings. It provides information on the driving forces of economic growth, specifically exports, employment and foreign direct investment.

### 2.1. THEORETICAL REVIEW

#### 2.1.1. THE SOLOW GROWTH MODEL

The Solow growth model is with the idea that output is produced with both labour and a time-varying stock of physical capital,

And that the capital stock can grow with net additions of new capital. Let  $X_t$  denote gross additions to the capital stock (i.e., gross investment). Assuming that the capital stock depreciates at a constant rate  $0 \leq \delta \leq 1$ , the net addition to the capital stock is given by  $X_t - \delta K_t$ , so that the capital stock evolves according to:

$$K_{t+1} = K_t + X_t - \delta K_t.$$

Of course, by allocating resources in an economy toward the construction of new capital goods (investment), an economy is necessarily diverting resources away from the production (and hence consumption) of consumer goods and services. Thus, the second modification introduced by the Solow model is the idea that a part of current GDP is saved, that is,

$$S_t = \sigma Y_t,$$

Where  $0 < \sigma < 1$  is the saving rate. In the Solow model, the saving rate is viewed as an exogenous parameter. However, the saving rate is likely determined by 'deeper' parameters describing preferences (e.g., time preference) and technology.

We are now in a position to examine the implications of the Solow model. We can start with the production function in (1), letting

$$F(K, N) =,$$

$y_t \equiv Y_t/N_t$

So that:

Where:

$k_t \equiv K_t/N_t$

As before, we can define per capita output as is the capital-labour ratio. Thus, per capita output according to the Solow model is an increasing and concave function of the capital-labour ratio thereby proving that investment is responsible for increases in per capital output.

Solow's pioneering contribution to growth theory has generated the theoretical basis for growth accounting. It is possible to decompose the contribution to output growth of the growth rates of inputs such as technology, capital, labour, inward FDI, or by incorporating a vector of additional variables in the estimating equation, such as imports, exports, institutional dummies.

## 2.1.2. ENDOGENOUS GROWTH MODEL

(Reis, 2001) formulated a model that investigates the effects of FDI on economic growth when investment returns may be repatriated. She states that after the opening up to FDI, domestic firms will be replaced by foreign firm in the R&D sector. This may decrease domestic welfare due to the transfer of capital returns to foreign firms. In this model, the effects of FDI on economic growth depend on the relative strength of the interest rate effects. If the world interest rate is higher than domestic interest rate, FDI has a negative effect on growth, while if the world interest rate is lower than domestic interest rate, FDI has a positive effect on growth.

## 2.1.3. NEOCLASSICAL TRADE THEORY

The international trade theory used in this work (Neoclassical Trade Theory) was based on the much acclaimed work of David Ricardo; the principle of comparative advantage. This principle states that a country has a comparative advantage in producing a good if the opportunity cost of producing that good, in terms of another good, is lower in that country than it is in other countries. Neoclassical trade theory assumes two factors of production (labour and capital), two goods A and B, equal technology in all countries, perfect competition, constant returns to scale, and factor mobility between sectors but not between countries (Appleyard et al., 2001).

Therefore, under the theory of comparative advantage, even if one country is efficient in the production of both goods, there is still a basis for trade between the two countries. One country need only specialize in the production of the good where its absolute advantage with another country is greatest, due to the existence of two countries in the model, then it so happens that if one country has a comparative advantage in the production of one good, say A, then the other country must have a comparative advantage in the other good which is B. In this respect, each country should specialize in the production and export of the commodity of its comparative advantage. Mutually beneficial gains are made when the two countries engage in the exchange of goods in the arena of international trade in a dynamic process of exportation and importation. It is this mutually beneficial gain from trade that forms the basis of economic growth.

#### 2.1.4. THE HECKSCHER-OHLIN THEOREM

The Heckscher-Ohlin theorem states that a country will produce and export the good whose production makes intensive use of the relatively abundant factors of production. This country should limit the production and increase the imports of the good whose production makes intensive use of the expensive factor of production (Appleyard et al., 2001). In the neoclassical trade theory, a country will gain from trade whenever its terms of trade (TOT) are different from its own relative prices in autarky. A country with different Terms of Trade has the advantage of expanding the production of the factor abundant good and thereby exporting the good to other countries and importing the good that is relatively more expensive to produce at home. The neoclassical trade theory will be evaluated in a neoclassical production function framework incorporating an additional factor of production (exports) into the production function. Exports are incorporated into the production function to capture their relationship with aggregate output. The augmented neoclassical production function is specified as follows:

$$Y = F(K, L, EXP),$$

Where Y = aggregate output (real GDP), K is capital, L is labour force, and EXP is total real exports of goods and services.

The above theories suggest that high foreign direct investment, employment and exports levels have a positive effect on economic growth and it is imperative therefore to determine their influence on Zambia's economic growth.

## 2.1.5. EMPIRICAL REVIEW

There have been a number of empirical studies that have been undertaken to ascertain the effects of investment and exports on economic growth in the real world. The following are some of the studies that have been undertaken;

Findlay 1984 and Krueger, 1985 conducted a study using rank correlation to test the Export Led Growth hypothesis for four Asian countries (Hong Kong, South Korea, Singapore, and Taiwan) using annual data for the period 1960-1982 (Darrat, 1986). The authors concluded that economic growth in all four countries was driven by the countries' export promotion. It was also concluded that higher exports caused economic growth in all countries. One major limitation of this study included failure to base conclusions on econometric testing.

Two of the most commonly reported studies on regression are those conducted by Ram in 1985 and 1987. Ram's studies represented a transition from the correlation approach to some judgment of causality that could be achieved through regression applications. The study in 1985 used the production function regressing real output on capital, labour, and exports to test the Export Led Growth hypothesis on various countries. The countries included in the analysis varied from developed to less-developed countries. It was found that export performance was important for economic growth for both developed and LDCs. The approach taken in this study was an improvement on previous studies because it included a large number of developed countries and within the sample a greater fraction of low income countries.

Anna and Sampath (1997) tested the validity of the Export Led Growth hypothesis in 97 countries using annual data for the period 1960-1992. They tested for stationary, integration, co-integration, and Granger-causality test. They found co-integration between GDP and exports in 36 countries. For the 61 remaining countries, 17 reported no evidence of co-integration, and 35 reported evidence of causality in at least one direction. In general, causality from economic growth to exports was found for 30 countries. The authors found that 29 countries reported positive effects from exports to economic growth.

In a widely cited work, Borensztein et al. (1998) examine the effect of FDI on economic growth in cross country regression framework, using data on FDI outflows from OECD countries to sixty-nine developing countries over the period 1970-1989. They found that FDI is an important vehicle



for adoption of new technologies, contributing relatively more to growth than domestic investment. In addition, they found that FDI has a significant positive effect on economic growth. However, they state that their results only hold if the host country has a minimum threshold stock of human capital.

Bende et al. (2001) studied the impact of FDI through spillover effects on economic growth of the ASEAN-5 for the period 1970-1996. They found that FDI accelerates economic growth either directly or through spill-over effects. They show that the impact of FDI on economic growth is positively signed and significant for Indonesia, Malaysia, and Philippines, while they identify a negative relationship for Singapore and Thailand. Similarly, Marwah and Tavakoli (2004) test the effect of FDI on economic growth in Indonesia, Malaysia, Philippines, and Thailand. Using time series annual data over the period 1970-1998, they found that FDI has positive correlation with economic growth for all four countries.

Bengoa et al. (2003) estimated the relationship between FDI and economic growth using panel data for eighteen Latin American countries over the period 1970-1999. They show that FDI has positive and significant impact on economic growth in the host countries. However, as in most other papers, Bengoa et al. (2003) found that the benefit to the host country requires adequate human capital, political and economic stability and liberalized market environment. Choe (2003) adapts a panel VAR model to explore the interaction between FDI and economic growth in eighty countries in the period 1971-1995. He finds evidence of Granger causality relationship between FDI and economic growth in either direction but with stronger effects visible from economic growth to FDI rather than the opposite.

Li and Liu undertook a study in 2005 in which they applied both single and simultaneous equation system techniques to investigate endogenous relationship between FDI and economic growth. Based on a panel of data for 84 countries over the period 1970-1999, they found positive effect of FDI on economic growth through its interaction with human capital in developing countries, but a negative effect of FDI on economic growth via its interaction with the technology gap. In contrast with these, Carkovic and Levine (2005) utilize General Method of Moment (GMM) to observe the relationship between FDI and economic growth. They use data for 1960-1995 for a large cross-country data set, and find that FDI inflows do not exert influence on economic growth directly nor through their effect on human capital.

Most similar to our own work, Vu et al. (2006) studied sector-specific FDI inflows for both China over the period 1985-2002 and Vietnam over the period 1990-2002. Using an augmented production function specification and regression methodology, they concluded that FDI has positive and direct impact on economic growth as well as an indirect effect through its impact on labour productivity.

Most recently a study on export led growth hypothesis was done on Zambia by Irene in 2007. The objective of the study was to examine the validity of the export-led growth hypothesis for Zambia. The study used annual time series data from 1970 to 2014. The study built on Keong *et al* (2002) model, which explained economic growth as a function of exports, imports, gross fixed capital formation, real exchange rates, labour force, terms of trade and degree of openness or trade openness. The Johansen and Juselius multivariate co integration approach and error correction model framework were utilized. Further the study examined causality between economic growth and exports. The findings of the study validate the export-led growth hypothesis. The results also confirmed the existence of long-run relationship between economic growth and exports. In addition, economic growth according to the model had been influenced by various factors such as exports, imports, gross fixed capital formation, labour force, terms of trade, real exchange rates and degree of openness. Further, a bidirectional relationship between exports and economic growth had been found. These results were in agreement with other studies such as Njikam, (2003) and Keong et al (2002) among others whose results were in support of export-led growth hypothesis.

## CHAPTER THREE

### 3.0. METHODOLOGY

#### 3.1. MODEL SPECIFICATION:

This paper built on **Keong et al (2002)** model which explains economic growth as a function of exports, capital formation (investment), labour, imports and exchange rates. However the model will maintain only three variables that is exports, employment and FDI but still be specified in the linear logarithmic regression form.

##### 3.1.1. MATHEMATICAL MODEL OF THE THEORY

1. The mathematical model was specified as:

$$\text{Log } Y = \alpha_0 + \alpha_1 \log Z_1 + \alpha_2 \log Z_2 + \alpha_3 \log Z_3$$

Where:

Y is economic growth measured by gross domestic product (GDP).

Z<sub>1</sub> is total Foreign Direct Investment (net inflows, % of GDP)

Z<sub>2</sub> is total exports

Z<sub>3</sub> is total Employment.

##### 3.1.2 THE ECONOMETRIC MODEL OF THE THEORY

To allow for other factors that would affect Y we include into the model.

The economic model is specified as:

$$\text{Log } Y = \alpha_0 + \alpha_1 \log Z_1 + \alpha_2 \log Z_2 + \alpha_3 \log Z_3 +$$

Where:

Y is economic growth measured by gross domestic product (GDP).

Z<sub>1</sub> is total Foreign Direct Investment (net inflows, % of GDP).

Z<sub>2</sub> is total exports.

Z<sub>3</sub> is total employment.

$\alpha_0$  is the constant term

is the stochastic term which includes other factors that affect GDP. An example of such factors are levels of technological advancements in the nation.

$\alpha_1, \alpha_2$  and  $\alpha_3$  are the coefficients of the explanatory variables foreign direct investment, total exports and employment respectively.

The reasons for the use of the above variables are as follows

**Economic Growth** - In this study, the dependent variable is Economic Growth. However, real GDP will be used as a proxy for economic growth.

**Exports** - Exports capture goods and non-factor services. Export expansion is said to be a significant catalyst in improving productivity growth.

**Foreign Direct Investment** - The neoclassical theory, stipulates that an increase in capital as an input in production leads to increases in output. It is therefore expected that Foreign Direct Investment will have a positive relationship with economic growth.

**Employment** – Employment is considered to play a vital role in economic growth. The neoclassical theory stipulates that as the input (labour) increases, total output increases. It is therefore expected that employment will have a positive relationship with economic growth.

### 3.2. DATA SOURCES AND SAMPLE

The study employed secondary annual time series data for the period of 30 years from 1970 to 2000. The secondary source of data was the Central Statistical Office (CSO) and the Bank of Zambia (BOZ). [www.globaleconomy.com](http://www.globaleconomy.com)

### 3.3. METHODS OF ESTIMATION

The following methods were used:

The Augmented-Dickey Fuller (ADF) was used to test for stationarity

The Durbin-Watson Test (DW) was used to test for autocorrelation

The JarqueBera (JB) Test of Normality was used to test for Normality

The White Heteroskedasticity Test was used to test for Heteroskedasticity

The Chow Break Point Test was used for Structural stability Test.

### **3.4. LIMITATIONS OF THE STUDY**

1. Lack of current literature on economic growth in Zambian Libraries such that i spent more time looking for the relevant literature rather than spending that time looking for relevant information in books, articles and other media.
2. Poor internet access limited the search for information
3. During the study I was financially unstable

## CHAPTER FOUR

### 4.0 Study results

After the model was developed using regression of GDP on FDI, EXPORTS, and EMPLOYMENT, the following results were obtained:

$$D(\text{GDP}) = 0.01912482755 + 0.04344692186 * D(\text{FDI}) - 0.2554455634 * D(\text{EXPORTS}) - 0.8274171149 * D(\text{EMPLOYMENT})$$

Showing the constant term of 0.02 and coefficients of 0.04, -0.26 and -0.82 for FDI, EXPORTS, and EMPLOYMENT respectively.

### 4.1 ESTIMATION PROCEDURE

#### 4.1.1 Time series analysis

Time series data is usually associated with the problem of non-stationarity of variables. Non-stationarity implies that time series has time varying mean, variance and covariance. Running regressions on non-stationary variables may lead to spurious regression results and therefore, make statistical inference of little practical relevance. Results that are spurious are 'nonsense' and depict non-sense correlation among the time series. In other words, a spurious correlation is a large correlation coefficient that does not reflect correlation per se but is due to a common trend that the variables exhibit over time. Variables that show such trends over time are influenced by the same factors during the same time periods. An exception however is when the variables are cointegrated. Any set of non-stationary time series data that is cointegrated will give non-spurious regression results.

Spurious regression results obtained from the regression of non-stationary variables exhibit bias in the estimation of the population mean and population variance. This is so because they don't have a mean to which they revert to in the long run. These results show means that increases and approaches infinity with time (Gujarati, 2003).

It follows therefore, that the regression of non-stationary variables doesn't depict any meaningful economic relationship among variables. It is for this reason that the use of non-stationary variables

is avoided from this investigation as they lead to spurious results. This case however is not applicable in the case of cointegrated variables. Such a case necessitates the use of error correction model (ECM) because it encompasses other models within it (ibid).

### 4.3 Testing for stationarity

The testing methods used to determine whether or not the time series variables are stationary include the Dickey-Fuller test (DF), the Augmented Dickey-Fuller (ADF) and the Phillips-Parron (PP). These tests procedures are aimed at finding out if the variables in a model are stationary or testing the order of integration through unit root tests. The DF test is a test against the null hypothesis that there is a unit root series integrated of order one {i.e., I(1)}. The test equation is of the form:

$$\Delta X = \alpha_0 + \rho X_{t-1} + \alpha_1(t) + \varepsilon_t$$

The equation of the ADF, which is a special case of a DF test because of the augmentations in terms of lags of Xt, takes the form:

$$\Delta X_t = \alpha_0 + \rho X_{t-1} + \alpha_1(t) + \sum_{i=1}^k \beta_i \Delta X_{t-1} + \varepsilon_t$$

These tests use the t-statistics on the coefficients of the lagged explanatory variable and the results arrived at are compared to the critical t-values. The critical values are obtained from the Dickey-Fuller distribution table.

The Augmented Dickey-Fuller test was performed on all the variables and the results of the tests are tabulated in the table below (i.e. table 2). These tests were conducted at 5% level of significance. Using the econometric package E-views 3.1, the optimal lag length was automatically chosen. From the results, the variables are integrated of order one meaning they become stationary after differencing once, i.e. I(1). The DF and the ADF tests demand that the null hypothesis be rejected. The null hypothesis under consideration is that there is a unit root for all the variables. Addition of

augmentations to the tests is thought to have weakened the tests as most of the lags of the ADF were found to be insignificant.

Table 1:

Unit Root Test Statistics of Variables in Levels (at 5% significance level)

VARIABLES	ADF(lags)	ORDER OF INTEGRATION
Log(GDP)	-2.452528	I(1)
Log(FDI)	-4.100949*	I(1)
Log(EXPORTS)	-1.887442	I(1)
Log(EMPLOYMENT)	-1.311813	I(1)

Critical values (1%) -3.6661

(5%) -2.9627

(10%) -2.6200

The critical values were obtained from the EVIEWS 3.1 Econometric package and the unit root test includes the intercept term

\* means that the variable was stationary at 1%; and no star means that the variable was not stationary at any of the critical values.



Table 2:

Unit Root Test Statistics of Variables in First Differences (at 5% significance level)

VARIABLE	ADF(lags)	ORDER OF INTEGRATION
Log(GDP)	-4.090648*	I(0)
Log(FDI)	-10.67011*	I(0)
Log(EXPORTS)	-5.693050*	I(0)
Log(EMPLOYMENT)	-3.992971*	I(0)

Critical values (1%) -3.6752  
(5%) -2.9665  
(10%) -2.6220

-The ADF test statistics reported here were derived from ADF tests that were run on one lag only

\* means that the variable was stationary at 1% ,5% and 10% and there was no need to do the second differentiation.

The results above show that the log of GDP, log of FDI, log of EXPORTS and log of EMPLOYMENT are stationary at 1%, 5% and 10% after first difference and this validates our assumption that all the variables are stationary which is also in line with econometric theory that states that most variables would exhibit stationarity after differencing once. The converse implies that macroeconomic variables would likely be stationary (Enders, 1995).

#### 4.4. Test for Multicollinearity

It is vital to check for multicollinearity because if present, the results obtained would be imprecise. The method that was used to check for multicollinearity was the Auxiliary regression approach. In this case each explanatory variable was regressed on the remaining explanatory variables. The coefficients of determination ( $R^2$ ) from the auxiliary regressions were thus obtained and compared to the overall  $R^2$  in the model 0.256584, and the table below shows the  $R^2$  from the auxiliary regressions.

TABLE 3 COEFFICIENT OF DETERMINATION ( $R^2$ )

REGRESSAND	COEFFICIENT OF DETERMINATION ( $R^2$ )
FDI	0.003625
EXPORTS	0.000762
EMPLOYMENT	0.003314

Overall R-squared 0.176831

The first column shows the regressands of the auxiliary regression. The actual outputs for the auxiliary regressions are given below;

According to Klein's rule of thumb, if the coefficients of determination from the auxiliary regressions are less than the overall  $R^2$ , then multicollinearity is not a serious problem.

#### 4.5. Heteroscedasticity Test

Testing for heteroscedasticity in the model is important because its presence will lead imprecise results and the usual confidence interval and hypothesis testing procedure may give misleading results. The test was done using the White heteroscedasticity test procedure. The chi-square value observed for the white Heteroscedasticity in the model was 5.235094 and the critical chi-square value at 5% level of significance and 6 degrees of freedom was 12.5916. This, therefore, indicates that there was no heteroscedasticity because the observed chi-square value does not exceed the critical value.

We do not reject the null hypothesis that there is no autocorrelation, positive or negative

Autocorrelation if present may lead to inefficient linear and unbiased estimators relative to those free of autocorrelation. As a result the usual t, F and the  $X^2$  may not be valid. Thus it is important to check if the model under consideration does not exhibit autocorrelation. When testing for autocorrelation in the model the Durbin-Watson d-test was used. The d-value obtained from the model estimation was 1.578. In order to determine the acceptance as well as the rejection regions for the d-statistic requires obtaining the lower limit ( $d_L$ ), upper limit ( $d_U$ ), as well as  $4-d_U$  and  $4-d_L$ . The rejection region includes the region between 0 and  $d_L$  showing positive autocorrelation as well

as  $4-d_L$  and 4 being a region of negative autocorrelation. The region between  $d_u$  and  $4-d_u$  is the region of acceptance.

The values obtained were;  $d_L = 1.006$ ,  $d_U = 1.421$ ,  $4-d_U = 2.579$  and  $4-d_L = 2.994$  with number of explanatory variables (k) equal to 3 and 30 observations. The observed d-statistic (2.171237) lies in the region between  $d_u$  and  $4-d_u$ , thus indicating the absence of positive or negative autocorrelation in the model and we do not reject the null hypothesis that there is no autocorrelation, positive or negative

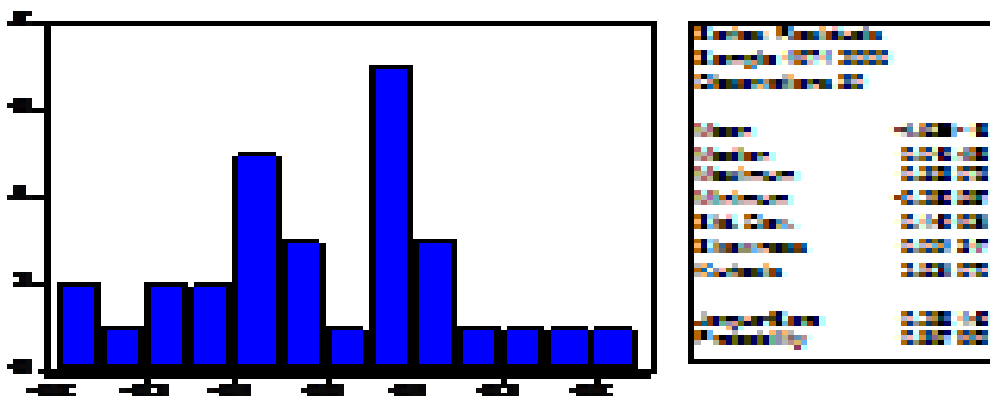
## 4.6. CHOW TEST

The year 1991 was used in carrying out a Chow Breakpoint Test and the results showed that the F-statistic was 0.722143 and the Probability was 0.586068. Furthermore the Log likelihood ratio was 3.700988 and it's Probability of 0.447982. In this context with the Null hypothesis that there was structural instability after the change of government from 1991 we failed to reject it because the p value is insignificant ( $p > 5\%$ )

## 4.7. Jarque-Bera test of normality

The Jarque-Bera test of normality was done in order to establish whether the error term was normally distributed. This was important because a normally distributed error term is one of the conditions required for performing subsequent diagnostic tests. The results that were obtained are as shown below;

Figure 1: Jarque-Bera test of normality



Application of the Jarque–Bera test shows that the JB statistic is about 0.283145, and the probability of obtaining such a statistic under the normality assumption is about 87 percent. Therefore, we do not reject the hypothesis that the error terms are normally distributed. Alternatively, the skewness value of 0.001317 and Kurtosis value of 2.524070 are closer to the normally distributed variable with skewness and kurtosis values of 0 and 3, respectively. Note that, the sample size of 30 observations might not be sufficient enough.

#### 4.8. TEST FOR MODEL MIS-SPECIFICATION.

One of the most important elements of modeling is meeting the correct characteristics of a model in relation to relevant theory; that is, must make good economic sense. In this case the test used was the Ramsey-RESET (regression specification error test) Test. This test is concerned with the specification errors, which include omitting relevant variables, including irrelevant variable, incorrect functional form and correlation between explanatory variables and residuals. The null hypothesis is that the model is correctly specified against the alternative that it is mis-specified. The results obtained were:

F-statistic      0.416915

Probability.    0.83466

The Ramsey Reset test for misspecification gives an F-statistic 0.416915 with a probability of 0.83466. This result indicates that the model is correctly specified because we fail to reject the null hypothesis of no misspecification because of the high probability (83%) of obtaining such an F-statistic, thus indicating that the model is correctly specified. In addition, the Akaike and Schwartz Information criteria are both very low with values of -1.909574 and -1.735046 respectively indicating that the model is ok.

## CHAPTER FIVE

### 5.0 DISCUSSION AND INTERPRETATION OF RESULTS.

The model comprised the repressors of the first difference (foreign direct investment, exports and employment) which explain about 25.7 percent of the variations of economic growth in Zambia.

The coefficient of the logarithm of foreign direct investment (FDI) has a positive value of 0.0434 indicating a positive relationship between FDI and economic growth as expected. FDI has a t-statistic of 1.537329 showing that the influence of FDI on economic growth in Zambia is insignificant at the 5% level of significance. This therefore means that percentage changes in FDI had no influence on percentage changes in GDP (economic growth) during the period 1970 to 2000. This shows consistence with the study conducted by Carkovic and Levine (2005) who utilized General Method of Moment (GMM) to observe the relationship between FDI and economic growth. In their study, they use data for 1960 to 1995 for a large cross-country data set, and found that FDI inflows do not exert influence on economic growth directly nor through their effect on human capital, despite FDI having a positive relationship with economic growth.

In the same sense, the coefficient for employment was -0.8274 with a t-statistic 1.2001 in absolute terms. This also showed that influence of labour on economic growth was insignificant at the 5% level of significance. The percentage changes in employment (labour) had no impact on the percentage changes in GDP indicating that GDP growth was irresponsive to the changes in employment within the relevant period.

Considering exports, the coefficient for exports is negative and statistically significant at 5% level with a t-value of 2.333. These results indicate that the elasticity of GDP growth with respect to exports is about 0.26, suggesting that if exports appreciated by 1%, on average, the GDP declined by about 0.26% in the period 1970 to 2000. Therefore, GDP growth is responsive to changes in exports. However, the responsiveness is inelastic as it is less than 1.

## 6.0 POLICY IMPLICATIONS AND RECOMMENDATIONS

However, despite the study showing that foreign direct investment has a positive but somewhat insignificant impact on economic growth during this study period, recent developments have shown that FDI has significant impact on economic growth with results showing a positive impact on economic growth in Zambia for the period 1970 to 2000. Therefore, as a policy implication, based on the findings from this study and recent developments, suggestions are that in order to achieve economic growth, Zambia should take an integrated approach to reforming its fiscal framework in such a way that both local and foreign investment is encouraged, improving the business environment and developing a stronger fiscal base. This would lead to economic growth because of the positive relationship that exists between the two variables.

The implication of the relationship between exports and economic growth in our study is that an expansion of exports has led to a decrease in economic growth. Because our export variable was an integration of all exports, it is difficult to point out particularly which of the exports have led to this phenomenon. This is a call for further research. In order then to enhance the association between exports and economic growth in Zambia, the diversification of exports sector away from primary commodities especially non-traditional exports should be scaled up; the need for strategic supportive domestic policies such as strengthening transport, transit arrangements and custom administration, harmonizing policies and standards, addressing technical barriers to trade thus helping those lucrative export sectors that might not be able to cope with the wave of globalization is important.

A stable exchange rate is a must in maintaining good economic performance, as movements in the exchange rate may produce negative impacts on the export sector and consequently economic growth.

### 6.1 Areas of further studies.

The negative relationship between exports and economic growth in Zambia found by the study may also pave way for other research. Particularly other areas of study may be examining the impact of structure change in exports on economic growth, impact of export diversification on economic growth or sector-led growth in Zambia.

## 6.2 CONCLUSION

In conclusion, this study ran a model of the determinants of economic growth in Zambia during the period of 1970 to 2000. The findings for this study were that economic growth was determined by foreign direct investment. The elasticity of economic growth to changes in foreign direct investment was 0.14% while the elasticity of economic growth to changes in exports and employment were 0.25 and 0.82 respectively. Therefore, this study confirms that foreign direct investment have an impact on economic growth in Zambia. The influence of FDI on economic growth in this study could be attributed to recent developments in the financial market of Zambia which have seen an increase in financial transactions that affect the interest rates such as the purchase of government bonds and treasury bills.

## **REFERENCES**

- [1] Appleyard, D.R. and A.J. Field Jr. (2001). *“International Economics.”* Edited by P. Shensa and E. Strathmann, NY.
- [2] Bende-Nabende, A., and Ford, J.L., (2001). *“FDI, Policy Adjustment and Endogenous Growth: Multiplier Effect from a Small Dynamic Model for Taiwan, 1959-1998,”* *World Development* 26(7), 1315-1330.
- [3] Bengoa, M., and Sanchez-Robles, (2003). *“FDI, Economic Freedom, and Growth: New Evidence from Latin America,”* *European Journal of Political Economy* 19, 529-545.
- [4] Borensztein, E., de Gregorio, J., and J-W Lee (1998). *“How does foreign direct investment affect economic growth?”* *Journal of international Economics* 45, 115-135.
- [5] Carkovic, M., and R Levine, (2005). *“Does Foreign Direct Investment Accelerate Economic Growth?”* Choe, J.I., 2003, *Do Foreign Direct Investment and Gross Domestic promote Economic Growth?”* *Review of Development Economics*, 7(1), 44-57.
- [6] Darrat A.F., Kherfi S. and Soliman M. (1986), *“FDI and Economic Growth in CEE and MENA Countries: A Tale of Two Regions”*, 12th ERF’s Annual Conference, Cairo.
- [7] Easterly, W, (2001). *“Growth implosions, debt Explosions and my Aunt Marilyn: do Growth Slowdowns cause public debt crisis?”* The World Bank.
- [8] Gujarati D.N.(2004). *Basic econometrics: the McGraw-Hill companies.*
- [9] Keong, C.C, Yusop, Z and V Liew, (2002) *“Export-Led Growth Hypothesis in Malaysia: An Investigation Using Bound Test.”* *Sunway Academic Journal* 2. In Moran, T. H., E. M. Graham and M. Blomström. *Does Foreign Direct Investment Promote Development?* Institute of International Economics, Washington DC.
- [10] Paschalis A, (2009). *Determinants of economic growth: the view of the experts.* Department of Planning and Regional Development, School of Engineering, University of Thessaly.
- [11] Reis, A., (2001). *“On the Welfare Effects of Foreign Investment,”* *Journal of International Economics* 54, 411-427.
- [12] Reizman, R.G., P.M. Summers and C.H. Whiteman, (1996): *“The engine of growth or its handmaiden? A Time series assessment of Export Led growth”*, *Empirical Economics* 21, 77-113.
- [13] Rodrik, D, (2003). *“Growth Strategies”:* *National Bureau of Economic Research.*



- [14] Tavakoli, A, (2004) *“The Effects of Foreign Direct Investment and Imports on Economic Growth: A Comparative Analysis of Thailand and The Philippines (1970-1998),”* *Journal of Developing Areas* 39(2), 79-100.
- [15] Vu, T. B., Gangnes, B., and Noy, I., (2006). *“Is Foreign Direct Investment Good for Growth? Answers Using Sectorial Data from China and Vietnam.”* Unpublished.
- [16] World Bank (2001), *Global Development Finance*, World Bank, Washington DC.
- [17] World Bank (2003) *“Zambia: Industrial Policy and Performance.”* *World Bank Independent Management Consulting Services Regional case studies on access to the European Union market for Goods and Services: Zambia Country Report*. COMESA: Lusaka

## Appendix

### OUTPUTS FOR UNIT ROOT TESTS APPENDIX

#### 1.1.1 Augmented Dickey-Fuller Test for GDP

The ADF Test statistic found was -2.452528 and the critical values were -3.6661 at 1% significant level, -2.9627 and -2.6200 at 5% and 10% significant levels respectively

#### 1.1.2 Augmented Dickey-Fuller Test for FDI

The ADF test statistic was found to be -4.100949 and the critical values were -3.661, -2.9627 and -2.6200 at 15, 5% and 10% significant levels

#### 1.1.3 Augmented Dickey-Fuller Test for Exports

The ADF Test statistic was -1.887442 and the critical value at 15, 5% and 10% significant levels obtained were -3.6661, -2.9627 and -2.6200

#### 1.1.4. Augmented Dickey-Fuller Test for Employment

ADF Test Statistic was -1.311813 and 1% Critical Value\* -3.6661 , 5% Critical Value -2.9627 and 10% Critical Value -2.6200.

#### 1.1.5. First Augmented Dickey-Fuller Test for GDP

GDP 1<sup>ST</sup> DIFF

ADF Test Statistic	-4.090648	1% Critical Value*	-3.6752	5% Critical Value	-2.9665
10% Critical Value	-2.6220				

#### 1.1.6 First Augmented Dickey-Fuller Test for Employment

UNIT ROOT 1<sup>ST</sup> EMPLOYMENT

ADF Test Statistic	-3.992971	1% Critical Value*	-3.6752	5% Critical Value	-2.9665
10% Critical Value	-2.6220				

## 1.2.1. Regressand Exports

Dependent Variable: D(EXPORTS)				
Method: Least Squares				
Date: 09/01/13 Time: 20:09				
Sample(adjusted): 1971 2000				
Included observations: 30 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.034844	0.051810	-0.672533	0.5070
D(FDI)	0.005870	0.049651	0.118223	0.9068
D(EMPLOYMENT)	0.090298	1.211437	0.074538	0.9411
R-squared	0.000762	Mean dependent var		-0.034275
Adjusted R-squared	-0.073256	S.D. dependent var		0.268601
S.E. of regression	0.278266	Akaike info criterion		0.374159
Sum squared resid	2.090660	Schwarz criterion		0.514279
Log likelihood	-2.612392	F-statistic		0.010290
Durbin-Watson stat	2.102993	Prob(F-statistic)		0.989767

## 1.2.2. Regressand FDI

Dependent Variable: D(FDI)				
Method: Least Squares				
Date: 09/01/13 Time: 20:15				
Sample(adjusted): 1971 2000				
Included observations: 30 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.037844	0.202311	-0.187059	0.8530
D(EXPORTS)	0.088142	0.745561	0.118223	0.9068
D(EMPLOYMENT)	1.351877	4.687651	0.288391	0.7752
R-squared	0.003625	Mean dependent var		-0.029739
Adjusted R-squared	-0.070180	S.D. dependent var		1.042339
S.E. of regression	1.078295	Akaike info criterion		3.083278
Sum squared resid	31.39344	Schwarz criterion		3.223398
Log likelihood	-43.24918	F-statistic		0.049118
Durbin-Watson stat	2.352039	Prob(F-statistic)		0.952154

## 1.2.3. Regressand Employment

Dependent Variable: D(EMPLOYMENT)				
Method: Least Squares				
Date: 09/01/13 Time: 20:38				
Sample(adjusted): 1971 2000				
Included observations: 30 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.008376	0.008140	1.028918	0.3126
D(FDI)	0.002272	0.007877	0.288391	0.7752
D(EXPORTS)	0.002278	0.030567	0.074538	0.9411
R-squared	0.003314	Mean dependent var		0.008230
Adjusted R-squared	-0.070514	S.D. dependent var		0.042720
S.E. of regression	0.044201	Akaike info criterion		-3.305497
Sum squared resid	0.052751	Schwarz criterion		-3.165378
Log likelihood	52.58246	F-statistic		0.044895
Durbin-Watson stat	1.404866	Prob(F-statistic)		0.956170

## 1.3.1 Regression

Dependent Variable: D(GDP)				
Method: Least Squares				
Date: 08/31/13 Time: 12:17				
Sample(adjusted): 1971 2000				
Included observations: 30 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.019125	0.029729	0.643315	0.5257
D(FDI)	0.043447	0.028261	1.537329	0.1363
D(EXPORTS)	-0.255446	0.109514	-2.332537	0.0277
D(EMPLOYMENT)	-0.827417	0.689441	-1.200127	0.2409
R-squared	0.256584	Mean dependent var		0.019779
Adjusted R-squared	0.170805	S.D. dependent var		0.173893
S.E. of regression	0.158348	Akaike info criterion		-0.724482
Sum squared resid	0.651923	Schwarz criterion		-0.537656
Log likelihood	14.86723	F-statistic		2.991230
Durbin-Watson stat	1.577777	Prob(F-statistic)		0.049188

## 1.4.1. MULTICOLLINEARITY TEST

Dependent Variable: D(GDP)				
Method: Least Squares				
Date: 08/25/13 Time: 21:09				
Sample(adjusted): 1971 2000				
Included observations: 30 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.019125	0.029729	0.643315	0.5257
D(FDI)	0.043447	0.028261	1.537329	0.1363
D(EXPORTS)	-0.255446	0.109514	-2.332537	0.0277
D(EMPLOYMENT)	-0.827417	0.689441	-1.200127	0.2409
R-squared	0.256584	Mean dependent var		0.019779
Adjusted R-squared	0.170805	S.D. dependent var		0.173893
S.E. of regression	0.158348	Akaike info criterion		-0.724482
Sum squared resid	0.651923	Schwarz criterion		-0.537656
Log likelihood	14.86723	F-statistic		2.991230
Durbin-Watson stat	1.577777	Prob(F-statistic)		0.049188

## 1.4.2. HETEROSCEDASTICITY

White Heteroskedasticity Test:				
F-statistic	0.810335	Probability	0.572602	
Obs*R-squared	5.235094	Probability	0.514034	
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Date: 08/27/13 Time: 18:30				
Sample: 1971 2000				
Included observations: 30				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.026067	0.007555	3.450258	0.0022
D(FDI)	0.002463	0.006718	0.366704	0.7172
(D(FDI))^2	-0.000557	0.003205	-0.173945	0.8634
D(EMPLOYMENT)	0.161835	0.201701	0.802354	0.4306
(D(EMPLOYMENT))^2	-3.881440	2.649039	-1.465226	0.1564
D(EXPORTS)	-0.015799	0.023146	-0.682587	0.5017
(D(EXPORTS))^2	0.021997	0.049192	0.447169	0.6589
R-squared	0.174503	Mean dependent var		0.021731
Adjusted R-squared	-0.040844	S.D. dependent var		0.027286
S.E. of regression	0.027838	Akaike info criterion		-4.123893
Sum squared resid	0.017823	Schwarz criterion		-3.796947
Log likelihood	68.85840	F-statistic		0.810335
Durbin-Watson stat	2.171237	Prob(F-statistic)		0.572602

### 1.4.3. AUTOCORRELATION

White Heteroskedasticity Test:				
F-statistic	0.810335	Probability		0.572602
Obs*R-squared	5.235094	Probability		0.514034
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Date: 08/27/13 Time: 18:30				
Sample: 1971 2000				
Included observations: 30				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.026067	0.007555	3.450258	0.0022
D(FDI)	0.002463	0.006718	0.366704	0.7172
(D(FDI))^2	-0.000557	0.003205	-0.173945	0.8634
D(EMPLOYMENT)	0.161835	0.201701	0.802354	0.4306
(D(EMPLOYMENT))^2	-3.881440	2.649039	-1.465226	0.1564
D(EXPORTS)	-0.015799	0.023146	-0.682587	0.5017
(D(EXPORTS))^2	0.021997	0.049192	0.447169	0.6589
R-squared	0.174503	Mean dependent var		0.021731
Adjusted R-squared	-0.040844	S.D. dependent var		0.027286
S.E. of regression	0.027838	Akaike info criterion		-4.123893
Sum squared resid	0.017823	Schwarz criterion		-3.796947
Log likelihood	68.85840	F-statistic		0.810335
Durbin-Watson stat	2.171237	Prob(F-statistic)		0.572602