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July 2010

Online at <https://mpra.ub.uni-muenchen.de/26671/>

MPRA Paper No. 26671, posted 15 Feb 2012 15:54 UTC

The Causal Relationship between Private and Public Investment in Zimbabwe

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Abstract.

The study examines the relationship between private and public investment in Zimbabwe utilizing yearly time series data for the period 1970 to 2007. Emphasis is placed on the direction of causality and the effect of the two types of investment on each other. The paper constructs empirical models for both private and public investment, based on the flexible accelerator theory. Private investment is found to be cointegrated with public investment. A cointegration approach and VEC model are employed to assess the short run relationship existing between public and private investment. The relationship between private and public investment is found to be insignificant and the direction of causality found to be unidirectional. The results support the notion that private investment precedes public investment.

Key words: Private Investment, Public Investment, Causality, Flexible Accelerator Theory, Zimbabwe.

Introduction

The recent situation of the Zimbabwe economy can be considered as one of African economic disaster in which a country full of economic potential, severely undermined its prospective due to mismanagement and political instability, passing from one of the African strongest economies to the world worst. Between the period of 2000 to 2007, the national economy contracted by 40%, inflation soared to over 66,000%, agricultural output dropped by 51%, industrial production shrunk by 47% whilst foreign investment evaporated with the consequence of the drastic reduction of the output per capita of about 40%. The circumstances became distressed with the imposition of sanction by western nations.

During this period, the shares of investment respect to GDP witness a reduction of about -80 %, from 25% of GDP of the 1990s to -15% of 2004, with disastrous consequences such as capital loss, which is one of the leading driving forces for the decline in investment in Zimbabwe. Capital loss associated with investment risk can arise from three causes: macroeconomic instability, loss of assets due to non-enforceability of contracts; and physical destruction of infrastructure caused by armed conflicts (Hernandez-Cata (2000), Easterly and Levine (1997)).

This paper seeks to analyse public and private investment behavior in Zimbabwe for the period spanning from 1970 to 2007, taking into account the effects of the IMF-supported economic structural adjustment program (ESAP), the 1998 crisis (when Zimbabwe's real GDP started to decline) and to verify if private and public investment complement each other as assumed by various studies and to what extent. The basis of the study will be the assumption that private investment and public investment complement each other and also that public investment is essential for private investment to be possible.

Pervious empirical studies on the effects and existing inter-linkages between aggregate private and public investment have generally followed two main approaches. The first approach is the use of national aggregates as explanatory variables for the topic under review. The second approach entails using individual firm and/or industry-specific explanatory variables to explain investment behavior. Most of these studies have used time series analysis with a few opting for panel data analysis. The flexible accelerator model has been the most popular among the models used to estimate investment behavior. The accelerator model was propounded by Clark (1917). However, it has been less preferred as a model because of its stringent assumptions and an

adjustment coefficient of investment equal to unity. The accelerator model with an adjustment coefficient equal to unity was rejected in tests by Kuznets, Tinbergen, Chenery, Koyck and Hickman (Jorgenson, 1971). The flexible accelerator model is used as an alternative in most investment studies.

The literature on the impact of public investment on private investment in developing economies gives inconsistent results on whether it complements or crowds out private investment. Applying several pooled specifications of a standard investment model to a panel of developing economies for 1980 to 1997, Erden and Holcombe (2005) find that public investment complements private investment. . they also run the same empirical models on a panel of developed economies, public investment crowds out private investment in developed economies. The results show that in a number of important ways, private investment in developed economies is influenced by different factors than private investment in developing economies. Ahmad and Qayyum (2008) make mention of Aschauer(1989), Greene and Villanueva(1991), Munnell (1992), Shafik (1992), Oshikaya (1994), Ramirez (1994), Ghura and Goodwin (2000), Mamatzakis (2001) and Rashid (2005) as having investigated and found a positive relationship between the two types of investment

Pereira (2001) tests the effects of public investment on the evolution of private investment in the United States. Use of an impulse response analysis associated with vector auto-regressive (VAR) estimates is made. The empirical results suggest that at the aggregate level, public investment crowds in private investment.

It should be noted that the effect of public investment on private investment in Zimbabwe has had conflicting results as investigated by Jenkins (1998) and Ndovorwi (1997). Jenkins (1998) concludes that in the long run aggregate public investment has either an ambivalent role or plays no role at all in determining private investment expenditure. On the other hand, Ndovorwi (1997) concludes that public infrastructural investment is positively related to private investment in the long run.

Ndovorwi investigates the impact of public policy on private capital formation in Zimbabwe. Private investment is regressed on public investment, bank credit to the private sector, inflation rate, output growth rate and lagged private investment. In the short run, Ndovorwi gives the

impression that public investment, whether infrastructural or non-infrastructural crowds out private investment. The extent to which infrastructural investment crowds out private investment is found to be very insignificant. It is worthwhile to note that Ndovorwi uses annual data for the years 1980 to 1990, which is decomposed into quarterly form using interpolation. Interpolation normally leads to a loss of degrees of freedom in the estimation process. The extent of the loss depends on the interpolation method employed. On the other hand, Jenkins (1998) makes use of annual data for the years 1969 to 1990 as she assesses the long run and short run determinants of private investment. Both Jenkins (1998) and Ndovorwi (1997) make use of error correction models to arrive at their results.

In a nearly similar study to Ndovorwi's for Turkey, Chhibber and van Wijnbergen (1992)¹, found out that, with a three year lag, an increase in the share of infrastructure investment in public investment has a positive impact on private investment. Mataya and Veeman (1996) analysed the investment behaviour in Malawi's private and public goods sectors between 1967 and 1988, taking into account partial liberalisation and contractionary fiscal and monetary policies associated with the IMF-supported ESAP. A Granger causality test is employed to assess whether one way causality or two way causality exists between private and public investment. A two-way causality is found to exist between the two types of investment. The effect of private investment on public investment and vice versa is established as a positive relationship. However, their results suggest that public investment is not influenced by expected output. Contractionary fiscal and monetary policies had a negative effect on public investment and a negative effect on private investment. A study of the same nature as that of Malawi by Mataya and Veeman (1996) has not been done for the case of Zimbabwe and part of their study objectives have been adopted in this study.

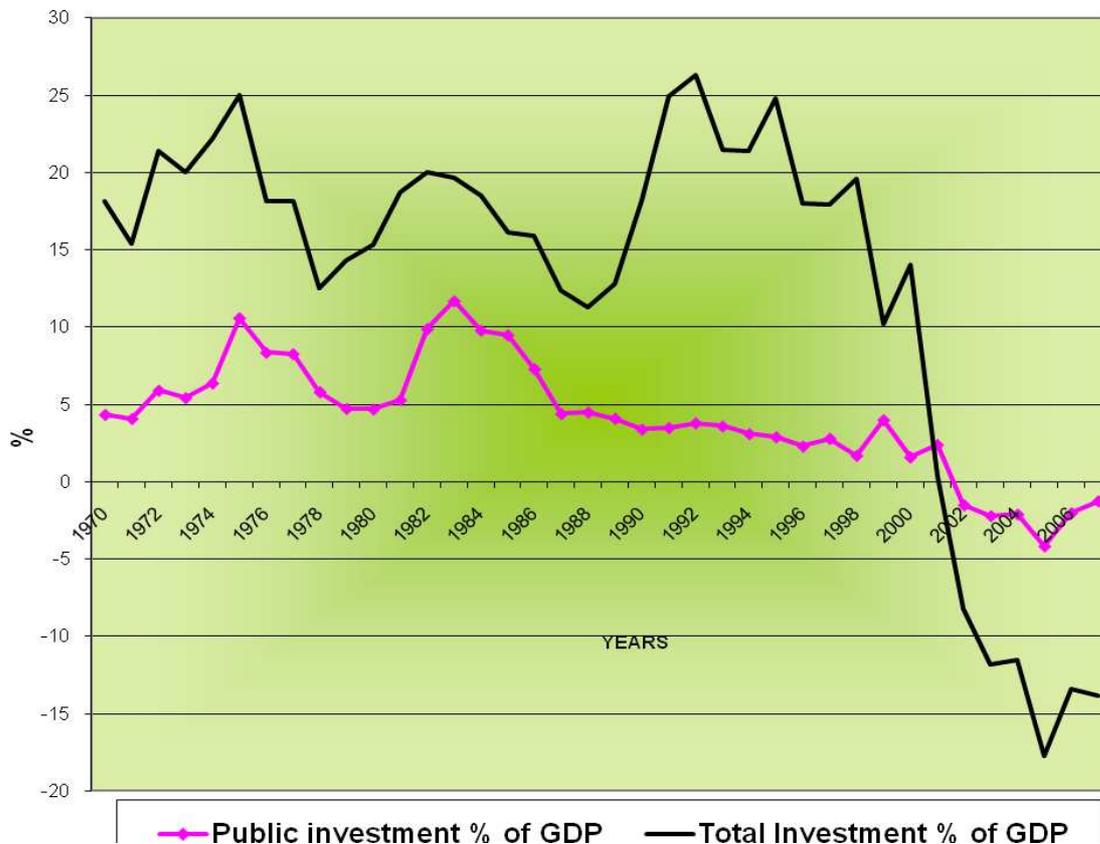
Of the literature cited, the impact of public investment in developing economies gives inconsistent results on whether it complements or crowds out private investment. Also, there is a fair share of the studies that suggests a direction of causality that runs from public investment to private investment, and also studies that support a two-way direction of causality between the

¹ For a discussion on their paper and some related developing country studies see Chhibber, A., Dailami, M. and Shafik, N. (Editors) (1992). *Reviving Private Investment in Developing Countries: Empirical Studies and Policy Lessons*, North Holland, Washington DC

three types of investment. The literature review cited only three studies for Zimbabwe as very few studies have been conducted in Zimbabwe pertaining to the relationship between private investment and public investment.

The Pattern of Investment in Zimbabwe

From 1970, public investment was on an upward surge until 1975 where it reached an all time high of 10.6% of GDP during the pre-independence era. During this period, public investment averaged around 5 percent of GDP. This was well below the average recorded by private sector investment during the same period, of approximately 13.5 percent. However, it was acknowledged that public investment, *ceteris paribus*, was supportive of private sector investment through the creation and improvement in infrastructure, which was a necessary condition to economic development and growth in Zimbabwe. Throughout the 1970s, several major infrastructural developments were carried out. However, the liberation struggle played a significant part in lessening the extent to which these developments aided the private sector. Ever since 1976, public investment expenditure has been on a relatively downward trend (see figure I). However it surged in 1980 up until 1987 then it reverted to its downward spiral again. The increase in public investment for the period 1980 to 1987 can be attributed to the programmes embarked upon by the government. These involved the reconstruction of the economic infrastructure that had been destroyed during the war of liberation, the expansion of the education system and health services particularly in the rural areas. Primary school enrolment rose from 1.2 million in 1980 to 2.2 million in 1989, while enrolment in secondary school rose from 74,000 to 671,000 during the same period (Zwizwai, Kambudzi and Mauwa, 2004). In 1987 public investment hit the below 5% levels and never recovered ever since.

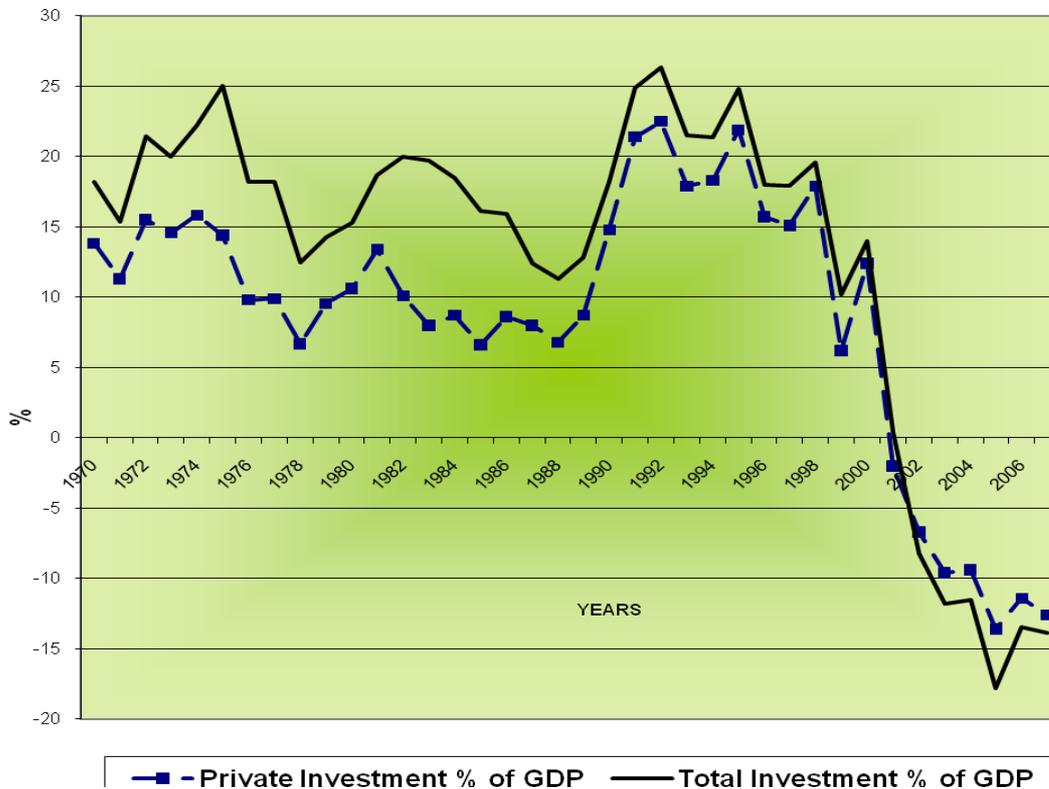


Source: CSO, IMF, OECD, World Bank

Figure I: Public Investment and Total Investment – Annual Percentage Change 1970 - 2007

From 1991, public investment began to rapidly decrease haphazardly as can be evidenced by Figure I below. This may be attributed to the ESAP which had contractionary effects on public expenditure though it never mentioned explicitly if public investment was to be treated in the same manner as public expenditure.

Changes in total investment are best mirrored by changes in private investment as can be deciphered by looking at Figure II. The share of public investment only surpassed that of private investment from 1983 to 1985. For the pre-independence period (1967-1980), private investment as a percent of GDP averaged around 12 percent. In the prescribed period private investment hit an all time low of around 7% only to gradually increase to 13.5% in 1981. Private investment performance worsened thereafter. During the period 1982 to 1990, private investment, as a ratio to GDP, averaged approximately 9 percent.



Source: CSO, IMF, OECD, World Bank

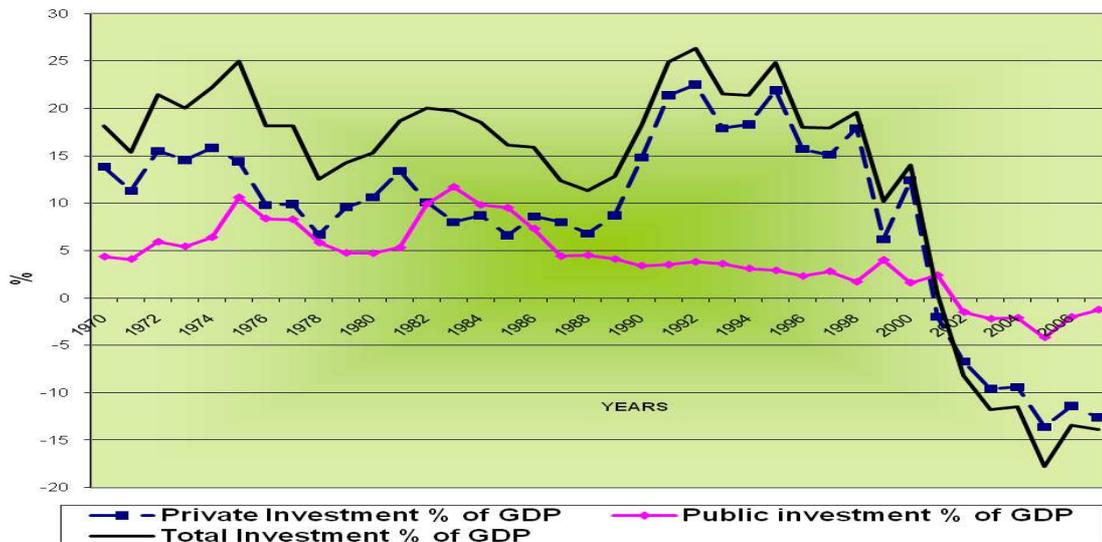
Figure II: Private Investment and Total Investment – Annual Percentage Change

The disturbing trend, in terms of the steady decline in private investment, which began in 1981 and ended in 1990, resulted in a marked decline in overall investment. The slump in private sector investment since 1981 is a reflection of how the Zimbabwean economy has been affected by the uncertainties brought about by the socialist tendencies of the government. After the implementation of ESAP (in 1991) private investment levels surged upwards to above 15% of GDP only to retract from 1997 onwards (see Figure III). However, the trends on annual percentage changes in both private and total investment give a somewhat different prognosis (Figure II). Though the percentage contribution of private investment to GDP increased over the period 1991 to 1996, the rate of change has been steadily decreasing. The volatility of this decrease has been inflated since 1998.

As the share of private investment increased in 1991, the share of public investment started to marginally decrease. Real GDP had been on an upward trend since 1970 only to retract in 1998

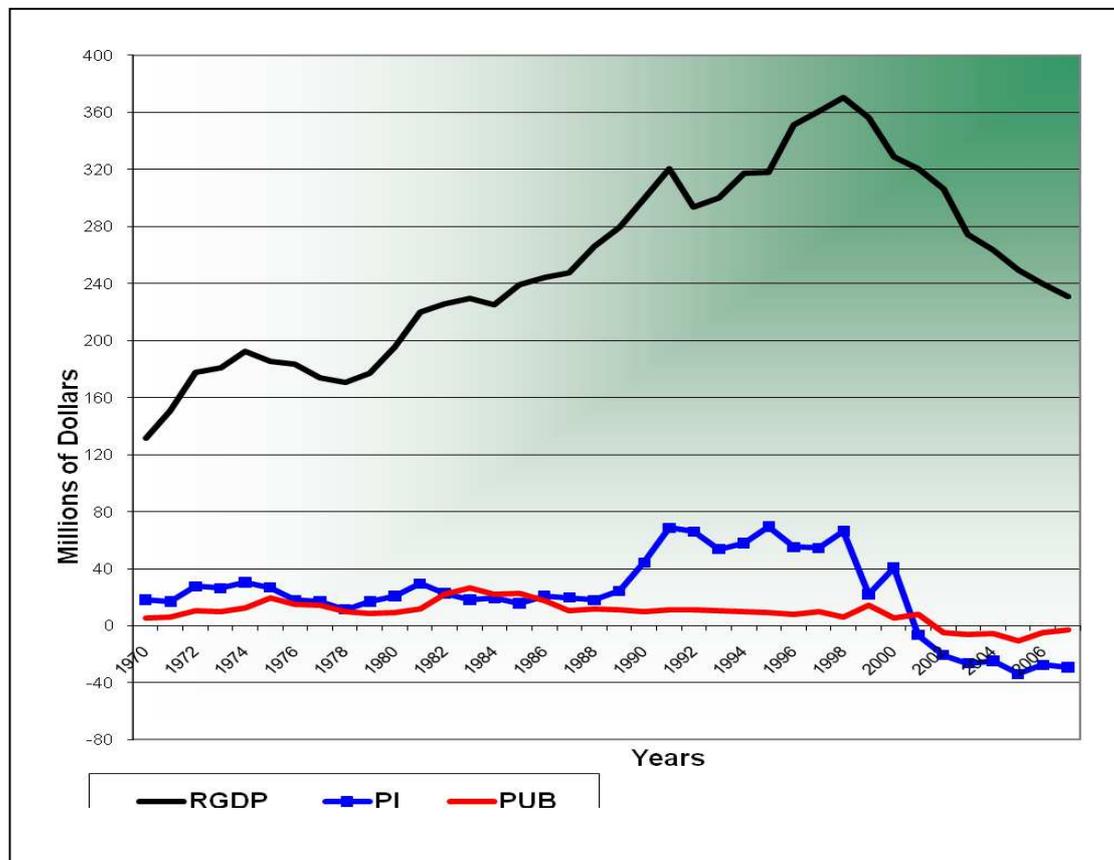
from whence it took a downward trend. This decline may be explained by the fall of the Zimbabwe dollar, uncertainty linked to the land reform exercise, the subsequently overvalued exchange rate and a plethora of other economic and social factors.

The 1998 crisis (economic instability) changed the demand structure. From 2001 onwards, total investment expenditure declined substantially, as a result of the macroeconomic imbalances existing in the economy. In particular, private investment has been negative since 2001.



Source: CSO, IMF, OECD, World Bank

Figure III: Percentage Contribution of Investment to GDP 1970 - 2007



Source: CSO, IMF, OECD, World Bank

Figure IV: Real GDP, Private Investment and Public Investment

Methodology

Use of the flexible accelerator model is made to come up with the regression model and additional factors that determine private and public investment are subsequently added in. After estimation of the models, the question of whether changes in private investment precede changes in public investment rather than as assumed in this study and in most studies, is addressed. This is done through the use of Granger Causality test.

The idea in the formulation of the models to be estimated is that public and private investment follow the flexible accelerator hypothesis. The formulation is a variant of the neoclassical flexible accelerator model discussed by Ramirez, M.D (1994) and, Mataya, C.S and Veeman,

M.M (1996).The flexible accelerator model postulates that the desired capital stock K_t^* is proportional to the level of expected output Y_t^* .

$$K_t^* = \alpha Y_t^* \dots\dots\dots 1$$

where K_t^* is the capital stock that the private sector desires to have in period t , and Y_t^* is the expected level of output in period t .

The actual stock of private capital is assumed to adjust to the difference between the desired stock in period t and the actual stock in the previous period $t - 1$:

$$\Delta PI_t = \beta (PI_t^* - PI_{t-1}) \dots\dots\dots 2$$

Or $PI_t = \beta PI_t^* + (1 - \beta) PI_{t-1} \dots\dots\dots 3$

β - coefficient of adjustment where $0 \leq \beta \leq 1$

If $\beta = 1$ then there is instantaneous adjustment of capital stock to its desired level otherwise if $\beta = 0$ no adjustment takes place at all.

ΔPI_t -change in the actual private investment between 2 periods, that is, net private investment.

In gross terms, the gross private investment (GPI) is given by

$$PI_t^* = \Delta K_t^* + \lambda K_{t-1}^* \dots\dots\dots 4$$

That is change in the actual capital stock, ΔK_t^* , in a period plus replacement investment λK_{t-1}^* , where λ is the rate of depreciation of the private capital stock.

Since $\Delta K_t^* = K_t^* - K_{t-1}^*$ then

$$PI_t^* = K_t^* - K_{t-1}^* + \lambda K_{t-1}^* \dots\dots\dots 5$$

Using lag operator notation

$$PI_t^* = [1 - (1 - \lambda)L]K_t^* \dots\dots\dots 6$$

where L is the lag operator and is defined as, $LK_t^* = K_{t-1}^*$, inverting equation 5, we can relate the stock of private capital to the level of gross private investment

since $\Delta PI_t = \beta(PI_t^* - PI_{t-1})$ from 2

$$\Delta PI_t = \beta[1 - (1 - \lambda)L]K_t^* - PI_{t-1} = PI_t - PI_{t-1} \dots\dots\dots 7$$

$$PI_t = \beta[1 - (1 - \lambda)L]K_t^* + (1 - \beta)PI_{t-1} \dots\dots\dots 8$$

Substituting for K_t^* as given in equation 1 gives us

$$PI_t = \alpha\beta[1 - (1 - \lambda)L]Y_t^* + (1 - \beta)PI_{t-1} \dots\dots\dots 9$$

Therefore, we can use equation 9 to specify desired gross private investment not only as a function of the desired level of real output but also of a number of variables such as the output gap, present and lagged values of public investment, dummy variables to deal with the qualitative factors of this study. This encompasses the dummy variables for SAP and the financial crisis which started in 1990 and 1998, respectively.

Therefore, the equation to be estimated for the private investment equation will be:

$$PI_t = \alpha\beta[1 - (1 - \lambda)L]Y_t^* + \beta a_1 GAP_t + \beta a_2 SAP_t + \beta a_3 FC_{it} + \beta z_i \sum_{i=1}^n PUB_{t-i} + (1 - \beta)PI_{t-1} + \varepsilon_t$$

This result is arrived at after substituting the extra variables in equation 6 and by substituting the resulting equation in equation 2 to get the above empirical model.

To estimate the desired output Y_t^* moving averages of the lagged values of real output will be used where the forecasted values of the regression are used as expected output. Furthermore, the level of depreciation for both private and public investment will be arbitrarily set as 10 percent.

Heller (1975) as quoted in Mataya and Veeman (1996) takes the approach to understanding the public investment as assuming that the behaviour of the public sector reflects the actions of a set of public decision makers giving the example of a Council of Ministers. Taking the stance that the public decision maker arrives at his decision taking the same steps as taken by the private investor(as above) with the exception of an allowance for autonomous investment we get the following model:

$$PUB_t = \rho + \alpha\beta[1 - (1 - \lambda)L]Y_t^* + \beta a_1 GAP_t + \beta a_2 SAP_t + \beta a_3 FC_t + \beta h_i \sum_{i=1}^n PI_{t-i} + (1 - \beta)PUB_{t-1} + \mu_t$$

where ρ is the autonomous public investment, β - coefficient of adjustment where $0 \leq \beta \leq 1$, λ - is the rate of depreciation of the public capital stock, α - the optimal capital-output ratio or the accelerator coefficient, Y_t^* - the desired output at time t will be estimated in the same way as stipulated in the private investment case above (moving averages), SAP_t - dummy variable for the Structural adjustment program which is equal to 1 from 1990 to 1997 otherwise it is equal to zero, FC_t - dummy variable for the economic instability (1998-crisis) which is equal to 1 from 1998 to 2007 otherwise it is equal to zero, PI_t - the level of private investment at time t , PUB_{t-1} - the lag level of public investment, μ_t - is the white noise error term.

The models to be estimated are then ,

$$PI_t = \alpha\beta[1 - (1 - \lambda)L]Y_t^* + \beta a_1 GAP_t + \beta a_2 SAP_t + \beta a_3 FC_t + \beta z_i \sum_{i=1}^n PUB_{t-i} + (1 - \beta)PI_{t-1} + \varepsilon_t$$

$$PUB_t = \rho + \alpha\beta[1 - (1 - \lambda)L]Y_t^* + \beta a_1 GAP_t + \beta a_2 SAP_t + \beta a_3 FC_t + \beta h_i \sum_{i=1}^n PI_{t-i} + (1 - \beta)PUB_{t-1} + \mu_t$$

where ε_t and μ_t are the error terms for the private investment and public investment equation respectively. Also, the general to specific method will be used to determine the appropriate number of lagged values of public investment and private investment that have significant effect on private and public investment, respectively.

Estimation and Analysis of Results

In the first instance, the use of unit root tests is made so as to check the stationarity for our data. These were conducted using the Augmented Dickey-Fuller tests. The null hypothesis being tested is that the relevant series is not stationary against the alternative that the series is stationary. The test results of the variables is shown in Table 1.

Table I : Unit Root Test Results

VARIABLE	t- ADF	1% Critical	5% Critical	10% Critical	LEVEL
PI	-1.681	-2.462	-1.699	-1.311	I(3)*
PUB	-1.809	-2.462	-1.699	-1.311	I(3)**
GAP	-4.343	-2.438	-1.690	-1.306	I(0)***
DC	-1.725	-2.438	-1.690	-1.306	I(0)**

***, ** and * indicates significance at the 1%, 5% and 10% level of significance, respectively.

For there to be cointegration in a set of variables, all the variables included in a model should be integrated of the same order. Therefore, since private investment and public investment are integrated of the same order, this might signify the presence of cointegration in the variables and as such a cointegration test is employed.

In addition, to assess the deterministic trends in the data, a summary of the cointegration tests under all five models in the Johansen methodology was used. The output displays the log likelihood and the information criteria under lag structure.

Table II: Information Criteria

Lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-272.433				57330.2	16.6323	16.6628	16.723
1	-228.515	87.835	4	0.0000	5106.7	14.2137	14.3046	14.4851*
2	-223.011	11.009	4	0.026	4678.87*	14.1219*	14.2744*	14.5753
3	-220.653	4.7156	4	0.318	5211.98	14.2214	14.435	14.8563
4	-215.933	9.439	4	0.051	5066.22	14.1778	14.4524	14.9941
5	-210.015	9.8361*	4	0.043	4911.58	14.1221	14.4578	15.1198

The study adopts the Schwartz's Bayesian Information criterion (BIC) to the Akaike Information Criterion (AIC). The main reason being that the AIC is biased towards selecting an over parameterised model and the BIC has superior large sample properties and is asymptotically consistent. In using of these information criteria as a model selection guide, one should select the model with the smallest information criterion. From Table II above, the BIC is lowest at lag 1. The next step is to check for cointegration. Johansen and Juselius (1990) developed two variants of the reduced rank tests for determining the cointegration space. According to the Johansen test, we cannot reject the hypothesis that our model has one cointegration vector.

The presence of cointegration entails the use of an ECM to capture the effect of short run changes in our variables as they adjust to the long run model. In the long run private investment is cointegrated with public investment.

The estimated VEC Model is given in Appendix 1. The VEC model shows that in the short run, private investment is best explained by itself, public investment and the stability of the economy. Public investment, on the other hand is dependant on private investment, the output gap, its past values and the stability of the economy. The Vector Error Correction Models gives an implication of private investment preceding public investment.

One of the objectives of this study focused on the direction of causality between public investment and private investment. The table below gives these results for the period under study.

Table III : Summary of Granger Causality Test

Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Probability
PUB does not Granger Cause PI	37	1.65	0.2111
PI does not Granger Cause PUB		7.94	0.0019
Lags: 3			
Null Hypothesis:		F-Statistic	Probability
PUB does not Granger Cause PI		1.16	0.3441
PI does not Granger Cause PUB		3.32	0.0367
Lags: 4			
Null Hypothesis:		F-Statistic	Probability
PUB does not Granger Cause PI		0.88	0.4910
PI does not Granger Cause PUB		3.93	0.0156

For 2 lags, there is a 21.11% probability of accepting the null hypothesis of public investment granger causing private investment. This is a high enough probability to reject the alternative hypothesis. Therefore, the conclusion is that public investment does not precede private investment for all lag specifications. The benchmark for probability-level assessments is the 10% level of significance. If the probability levels listed above are greater than 10% then we accept the null hypothesis otherwise we reject. For the alternative null hypothesis, the probability of rejection of the null hypothesis is high enough to conclude that private investment granger causes public investment. For example, for the case of 2 lags, the probability of rejection of the null hypothesis is 99.81%. Results show that over the whole period under study, 1970 to 2007, private investment granger causes public investment. In other words, private investment precedes public investment.

The results conform with the predictions of the VECM, that is, the presence of unidirectional causality from private investment to public investment. There is a unidirectional causality which is not consistent with both theoretical and empirical literature and my expected results².

The Long Run Dynamics

The Private Investment Model

The estimation results of the long run private investment are given in the table 5 below.

² One would say it is not unusual given the long run relationship between our 2types of investment. A closer look at Figure 4 (under section one) would show that both public investment and private investment had diverging linear trends with the former not being comparatively volatile.

Table IV : Private Investment Model Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PUB	-0.8706088	0.5369627	-1.62	0.116
DC	0.0833284	0.0287733	2.90	0.007***
GAP	0.2126394	0.1489083	1.43	0.164
SAP	0.8258642	8.403473	0.10	0.922
FC	-34.22387	9.842311	-3.38	0.002***
PI(-1)	0.7142927	0.12070726	5.92	0.0000***
PUB(-1)	1.209462	0.5964194	2.03	0.052*
PUB(-2)	-1.017016	0.4796002	-2.12	0.043**
R-squared	0.8696			
Adjusted R-squared	0.8310			
F-statistic	17.79221			
Prob(F-statistic)	0.000000			

***, ** and * indicates significance at the 1%, 5% and 10% level of significance, respectively.

Substituted Significant Coefficients:

$$PI_t = 0.286DC - 1.017PUB_2 - 34.22FC + 1.209PUB_1 + 0.714PI_1$$

Therefore Beta=0.2858³, alpha=0.2915

Except for public investment, all the variables in the long-run equation have the expected signs. Private investment appears to be responsive to desired capital. The coefficient of desired capital is significantly different from zero at the 5% level of confidence and it is large. This probably reflects how significant expected future demand has been to private investors. That even comparatively low expectations are significant in explaining the long-run trend suggests that high expectations of desired capital would be very important for increasing the rate of private investment.

The economic instability of 1998 appears to be a significant deterrent to private investment. It increases the uncertainty of the environment in which private investors are operating and underlines the harm done by the vagueness of the government towards private investors.

The previous year's investment expenditure is an important determinant of the current year investment expenditure. About 29 percent of the difference between the desired capital in the current year and the actual capital investment in the previous year is corrected for in the current year. In other words, the adjustment coefficient Beta is predicted by the model to be approximately 0.28⁴.

The lagged values of public investment are significant in explaining private investment and appear to have differing effects on private investment in the long run. The one year lagged value is positively related while the two year lagged value is negatively related to private investment. This phenomenon may be explained by the 'fire-fighting strategies'⁵, followed by the government in dealing with the ever worsening economic climate in Zimbabwe. Since the advent of

³ It is 0.286 of Desired Capital(DC) since $DC = \alpha Y_t^*$, the value of beta is calculated from the coefficient of Private Investment (PI).

⁴ The actual stock of private capital in a single year is assumed to adjust to the difference between the desired stock in period t and the actual stock in the previous period $t-1$. See section 3.1.1.

⁵ A term we use to explain the use of, mainly, monetary policy and monetary authorities in dealing with Zimbabwe's economic woes. This is despite the fact that economic theory and practise has found monetary aggregates to be most effective when dealing with short run shocks to the economy. Also, the term takes into account the financing of most of the public investment through increased government domestic borrowing and the ever-increasing budget deficit.

economic instability in Zimbabwe, the government has been dealing with economic problems on an as-they-appear-basis. Higher lag public investment values were found to be insignificant hence the exclusion.

What is, in many ways, most interesting about the long-run model is the variables that are *not* significant. The received wisdom about investment in Zimbabwe is that it is positively related to public investment with some degree of crowding out being postulated. However, the model shows a rather conflicting result⁶. The long run model tends to confirm the results of the VECM and the Granger causality tests, public investment does not play any part in the determination of private investment expenditure.

The dummy variable for ESAP gives us the expected sign, positive. However, its insignificance can be explained by the notion that ESAP mainly focused on government expenditure as a control variable. Private investment being taken as a spill over effect of the policy adopted. Therefore, ESAP might not have been directly related to private investment. The output gap (since it is insignificant) gives the implication that aggregate demand has an ambivalent effect on private investment. Since 1998, Zimbabwe has been in a recessionary gap, that is, positive output gap. The presence of a recessionary gap signals that the economy is in the depressed part of the trade cycle. Resources are either unemployed or, if employed are being underutilized. Many factories, and their employees, will be working short time, and many others will be fully unemployed (Lipsey and Chrystal, 1997). These circumstances can be taken to be true for the Zimbabwean case and have affected the significance of the output gap in determining private investment expenditures in the long run.

⁶ Though significant, the coefficient of public investment is negative. This implies that public investment activities are actually detrimental to private investment. The extent of this negative effect we shall not focus on it since the coefficient of the variable might be overstated. Overstated through the inclusion of its lagged values. Excluding the lagged values confirms my fears, the coefficient of current period public investment decreases to 0.31 and is still negative and rather becomes insignificant. Also, the study results are similar to the empirical studies by Chhiber and Van Wijnbergen (1988) and Rossiter (2002) who report a negative effect of public investment on private investment (Ouattara, 2004). Also, Oshikoya (1994) found that for the case of Tanzania, public investment had a negative effect on private investment.

4.3 Public Investment Model

For the long run public investment equation, results show comparatively a slightly different picture. Table 6 gives the results and the model statistics.

Table V: Public Investment Model Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.77753	3.82712	1.51	0.143
PI	-0.03352	0.0530911	-0.63	0.533
DC	-0.0064006	0.0183273	-0.35	0.730
GAP	0.0729478	0.0460368	158	0.125
SAP	-4.746233	2.350526	-2.02	0.053*
FC	-6.02682	3.082352	--1.96	0.061*
PUB(-1)	0.6415888	0.1211405	5.30	0.0000***
PI(-1)	0.2162538	0.0565622	3.82	0.001***
PI(-2)	-0.1113825	0.0528704	-2.11	0.045**
R-squared	0.8677			
Adjusted R-squared	0.8286			
F-statistic	16.62695			
Prob(F-statistic)	0.00000			

***, ** and * indicates significance at the 1%, 5% and 10% level of significance, respectively.

Substituted Significant Coefficients:

$$PUB_t = -4.746SAP_t - 6.027FC_t + 0.216PI_1 - 0.111PI_2 + 0.642PUB_{1t}$$

Public investment like private investment is explained by the first two lagged values of private investment. Also, the relationship between current year public and private investment is still insignificant and relative positive. As expected, ESAP and the unstable economic conditions starting 1998 had a negative effect on public investment expenditure. From 1998 onwards, public investment expenditure decreased at a higher level as compared to the ESAP period. The output gap is insignificant as an explanatory variables of public investment behaviour. Also, desired capital is definitely ruled out as an explanatory variable.

Conclusion

The study principally investigated the relationship between private investment and public investment with an assessment of the effect of the ESAP and unstable economic environment of 1998. The results from the unit root tests indicated that that the variables were integrated of the same order. Cointegration tests indicated one cointegrating equation, therefore, the use of a VECM model. The results from the VECM suggest that, in the short run, private investment is best explained by its lagged values while public investment is best explained by its lagged values and private investment to a particular extent. The flexible accelerator model was employed for both the private and public investment models. In the long run, macroeconomic instability was found to have inhibited both private and public investment. ESAP had a negative effect on public investment. However, the results from the Pairwise Granger Causality tests suggest that private investment granger causes public investment. These results do not entirely conform to the hypothesis of the study. The main reasons for this that can be raised are the rather abnormal conditions that existed in Zimbabwe during and after the economic instability. Also since these two types of investment are explained by other factors other themselves, the unexpected results act as a confirmation of this finding.

Given the irreversible nature of investment, private investors are reluctant to commit large sums of money on fixed investment when there is widespread uncertainty in the social and economic environment of Zimbabwe (as noticed by the negative effect economic instability had on private investment). Therefore, the government of Zimbabwe should aim to improve the existent

economic environment through better and increased credibility in policy formulation and implementation. High inflation rates are an open indicator of *macroeconomic instability*, which has been proven to have adverse effects on investment. The hyperinflation in Zimbabwe increased the risk-ness of longer-time sustainable investment.

More of public expenditure has been current in nature and more of the public investment expenditure was in replacement investment. This particular trend must be broken if Zimbabwe is to foster economic growth through increased private investment. At least a positive net investment should be achieved by the government. In addition, Granger causality tests showed private investment preceding public investment which shows that the government is not in control. The government needs to bring a turn around to this relationship if it will be in control of the economic future of Zimbabwe. It also needs to make these two types of investment complements rather than substitutes given the state of the economy at the moment. ESAP was a success in reducing public investment expenditure but there is need to formulate and implement policies which focus entirely on both types of investment. The formulation and implementation of policies which assume a particular relationship between particular economic variables without plausible econometric or mathematical backup should be avoided.

However, should the government have continued to reduce the public investment expenditure during the ESAP era? I do not think so. As can be evidenced by this study and particular studies in industrial economics, below minimal public investment expenditure may have played a significant part as a deterrent to private investment in Zimbabwe⁷. For example, Fafchamps et al., (1998) gives an example of how manufacturing firms in Zimbabwe need to hold high levels of inventories due to unreliable delivery of inputs tied to *poor transportation infrastructure*. Hence government needs to play a facilitator role as a provider of most of the public services that private investors need. The study results show that public investment ended up being preceded by private investment.

⁷ For other African studies see Pradhan (1996), for the case of Uganda see Reinikka and Svensson (1998), for Nigeria see Lee and Anas (1991). These studies give the notion that developing countries have had below minimal levels of public investment expenditure.

However, the study cannot break away from the conclusion that, until the fiscal and the monetary authorities are also encouraged to formulate policies that foster macroeconomic stability, the look for a sustainable surge in private investment will not materialize.

This study has shown some of the potential of fiscal policy as a tool for achieving other goals other than the restoration of macroeconomic balance. In particular, the specification and testing of the impact of public policy on private investment needs careful study. The eclectic approach of this study, which applies theory to the mechanisms prevalent in Zimbabwe, shows promise for elucidating the role of public policy in influencing private investment.

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APPENDIX

Estimated Vector Error Correction Model

	Coef	Std. error	Z	P(z)
D_PI				
Ce1	-0.847648	0.0357963	-2.37	0.018
LD_PI	-0.3142891	0.1706266	-1.84	0.065
LD_PUB	0.9249344	0.5269514	1.76	0.079
SAP	-0.9209692	7.991809	-0.12	0.908
FC	-27.7031	9.995586	-2.77	0.006
GAP	0.0829308	0.1590216	0.52	0.602
MGDP	0.0485575	0.0556485	0.87	0.383
Constant	0.0881653	11.38983	0.01	0.994
D_PUB				
Ce1	-0.0195533	0.010683	-1.83	0.067
LD_PI	0.181262	0.0509216	3.56	0.0000
LD_PUB	0.1026899	0.1572628	0.65	0.514
SAP	-3.34407	2.385067	-1.40	0.161
FC	-6.422671	2.983072	-2.15	0.031
GAP	0.103962	0.0474582	2.19	0.028
MGDP	0.0159715	0.0166077	0.96	0.336
Constant	-0.3822026	3.39917	-0.11	0.910