Determinants in the Composition of Investment and Structures in Uganda

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Abstract

Using a unique data set that disaggregates equipment and structure components of capital formation, the paper examines how investment could respond to changing macroeconomic events. To do this, a stylized analysis of the performance of investment in equipment and structures over the period 1981/82 to 2005/2006 is presented. The findings show that the private investment component was sensitive to changes in relative prices. The analysis does not adequately support the existence of a low elasticity of substitution between the structure and equipment components of aggregate investment, as theory would suggest. However, when the data are disaggregated between public and private investment, a more plausible result is obtained in which the elasticity of substitution is somewhat higher for the private sector and correspondingly lower for the public sector. There is also evidence that higher risk in the economy tended to discourage long-term commitment to structures. Increases in aid flow led to a rise in the price of structures (with a large non-tradable investment good component) relative to that of equipment. The increase in structures prices was, therefore, consistent with propositions in boom sector literature. In particular, increased aid flow tended to positively impact on investment in structures relative to equipment, which is consistent with the observed significant levels of donor resources channelled by the government towards social infrastructure projects.

Key words: *Investment, equipment, structures, construction booms, relative prices.*

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1. Introduction

The focus of most studies has been on the traditional determinants of aggregate investment performance in African economies (Asante, 1996, Ghura, 1997 and Serven, 1998). However, the unique response of investment in equipment and structures to various shocks has not been adequately investigated. This study contributes to work in this area by drawing on Uganda's experience and the work by Collier and Gunning (1996), which suggests that decomposing investment data into equipment and structures may be important in analysing the response of aggregate investment to macroeconomic events that may take place in an economy.

In Uganda's case, some of the macroeconomic shocks arose from the impact of international developments. These exogenous events were partly related to the evolution of export and import prices. Indeed, it is conceivable that compositional changes in investment could be related to absolute changes in the income of agents that follows an improvement or deterioration in export prices. An improvement in export earnings leads to an increase in the real exchange rate, making machinery and equipment cheaper, while a fall in export receipts increases the price of equipment relative to investment in structures. This line of reasoning suggests that compositional shifts in investment could be related to changes in relative prices. Another important factor concerns aid inflow from abroad. In a dependent economy, aid increases the amount of tradable goods in the economy, pushing the relative price of non-tradable goods up and shifting resources away from tradable investment (Arellano, 2002).

During the period under review, the movements in relative prices of the main components of gross domestic product (GDP), namely consumption and investment, reflected changes in these macroeconomic shocks. Aid inflow allowed a rapid increase in government consumption and public construction expenditure. The unit price of government consumption rose at a significantly faster rate compared to that of private consumption. Because of the escalation in public construction costs, part of the nominal increase in spending on public construction projects was absorbed by price increases. In addition, the rising cost of public construction also increased construction costs for the private sector. Private construction costs replicated the upward trend of public construction costs, suggesting that the increase in public expenditure could have driven up the cost of investment for the private sector. A sizeable part of government expenditure that may explain the rise-in-costs trend was externally funded (Ministry of Finance Planning and Economic Development, 2002. Moreover, the pattern of government reconstruction expenditure is important in relation to the composition of investment because government spending on reconstruction dominated the post-war recovery efforts

in the country. Literature suggests that government reconstruction expenditure tends to be non-tradable intensive. The non-tradable bias suggests that the pattern of government expenditure could have resulted in differential shares of equipment and structures in aggregate investment over the period in question (Harrigan, 1999).

In summary, analysis suggests that compositional shifts in aggregate investment were related to changes in relative prices. Furthermore, the evolution of these relative prices was sensitive to the macroeconomic shocks in the economy. Some of these events included the changes in export prices and aid flows, which affected the real exchange rate. The results show differential responses embedded in aggregate investment, for example the composition of private investment was more sensitive to relative prices than public investment. It is also shown that public and private investments have very different intensities of equipment and structures. The different intensities are a result because of the compositional shifts in investment that occurs during Dutch disease-type shocks. In particular, during construction booms, the costs of construction are driven up. The other source of influence on the composition of investment was related to changes in country risk profiles over time. Country risk tended to affect the long-run composition of aggregate investment by discouraging long-term commitment to structures.

Motivation of study

The main objective of this study was to establish how the composition of investment in Uganda was affected by relative prices of its components and also to investigate how some important macroeconomic events might affect the composition of investment. For example, Adam and Bevan (2004) argue that if a positive macroeconomic event is associated with an aid inflow, there are important productivity and distributional effects that could occur in the economy that policy should not ignore. In particular, this study indicates that if the productivity effects of public expenditure are skewed towards the non-tradable sector, higher growth rates in exports, total output as well as aggregate real incomes could be recorded.

In addition, Puyana (2000) indicates that an event such as an export boom which generates dramatic increases in foreign exchange earnings and wages in some sectors may cause exchange rate and other distortions in the economy as a whole. Some of the changes that occur may include a decrease in the competitiveness of other sectors and inducing policy responses that are difficult to reverse once the positive macroeconomic shock has subsided. Furthermore, it has been argued that increasing aid also carries macroeconomic risks of increased inflation and exchange rate appreciation. However, McKinley (2005) suggests that the impact of aid depends on how the increased flows are "spent" and "absorbed". In particular, if the increased government spending is focused on public investment and capital goods imports, the negative impact of increased flows could be attenuated.

The impact of macroeconomic shocks may also felt through the behaviour of the government. If the appreciation of the exchange rate is associated with higher recurrent government spending on non-tradable or higher household consumption during a favourable shock, then the sustainability of such increased spending after the boom is a critical issue for policy (Mogotsi, 2002). As the composition of the investment will

respond to relative prices, it implies that policy should be designed to counter some of the negative effects of positive macroeconomic shocks.

Furthermore, it has been argued that the composition of net imports has an impact on growth prospects. If the imports are capital goods, growth could be accelerated. Indeed, success stories in economic development seem to involve countries that have promoted their traded goods sector aggressively (Van Wijnbergen, 1984). Indeed, it is well known that technological progress is faster in the traded non-sheltered sectors of an economy than in the non-traded sector (Balassa, 1964). The latter statement suggests that it seems to matter whether structures or equipments dominate aggregate investment in a country. If most of the economic growth results from learning-by¬doing-induced technological progress embedded in the traded goods sector, any decline in this sector could permanently lower income per head (Hahn and Matthews, 1965). This study is therefore important and relevant.As investment is one of the most critical components of economic growth, it implies that the higher the investment, the faster and more rapid the country's modernization would be because it is investments that sustain economic growth.

Study objective and hypotheses

The main objectives of this study is to link the composition of investment to relative prices and then indicate that the changes in the relative prices result from key macroeconomic events that hit the economy over the period under review. The underlying basis of the study is that decomposing investment data into equipment and structures is important in analysing investment behaviour. In the light of this assumption, the following hypotheses are specially investigated in the models:

(i) The ratio of structures to investment in equipment is a function of their relative prices.
(ii) Events in the economy specifically increase aid inflow and international export prices affect relative investment prices via the real exchange rate.
(iii) The composition of private investment is more sensitive to changes in relative prices than the composition of public investment.
(iv) Government and private investment have different intensities for equipment and structures.

Structure of study

The remainder of the study is organized as follows: Section 2 presents background information on macroeconomic and investment performance. Section 3 examines relevant literature regarding the behaviour of investment in equipment and structures in response to macroeconomic shocks. Section 4 documents the empirical results and presents emerging conclusions.

2. Uganda's investment story

From 1986, the Ugandan economy has undergone a commendable post-conflict recovery.1 Annual real GDP growth averaged 6.1% between 1986/87 and 2001/02, with growth recorded at 7.3% a year for the boom period 1992/93– 1996/97. Largely as a result of this strong economic growth, the incidence of poverty in Uganda was reduced from 56% of the population in 1992, to 44% in 1997 and 31% in 2006. There are a number of distinct phases in the economic recovery effort. Initially, in 1986/87 to 1991/92, the steady improvement in security in most areas of the country provided the momentum for increased work efforts and utilization of agricultural land for production. Although investment remained low, it had picked up substantially from the period of civil strife.

The phase covering 1992/93–1996/97 was marked by strong macroeconomic stabilization and the liberalization of key sectors of the economy. The sectors that experienced liberalization were the foreign exchange market, coffee sector and banking sector. Following a boom in world coffee prices, earnings for Uganda's principal export product increased remarkably. The return of many members of the exiled Asian community and other, mostly educated, Ugandans who had fled the country during the Amin and Obote regimes also contributed to the economic recovery during this period, with much needed human capital, entrepreneurship and physical investment becoming available.

The more recent phase covers the period between 1997/98 and 2005/06. This last phase was characterized by greater focus on poverty reduction programmes and increased donor assistance. Under the Ugandan Poverty Eradication Action Plan (PEAP), donor inflows, net of debt service, increased by 5.1 percentage points of GDP, reaching 11.5% of GDP in 2004/05, with flows of direct budget support rising from 2.9% of GDP in 1996/97 to 5.8% of GDP. At the same time, government spending increased from 1996/97, by 6.9 percentage points of GDP, to 24.2% of GDP in 2005/06. The PEAP was complemented by further structural adjustment, including privatization and restructuring of utility sectors, tax reform, and liberalization of international capital account transactions. The banking system was also strengthened through enhanced supervision. However, during this period Uganda's terms of trade deteriorated substantially as world coffee prices fell by over 70%, leading to a sharp decline in export earnings.

The Ugandan economy recorded remarkable growth rates over the period 1986/87 to 2005/06. However, more recent macro-level data present mixed results regarding the performance of the economy. In constant 1997/98 prices, private investment stagnated at an average of about 12%of GDP over the period 1992/93 to 2005/06. The average annual rate of growth of private investment fell from 17.7% in 1992/93–1996/97 to 10.3% over the period 1997/98-2005/06. Much of the growth in investment in the earlier

period was related to the rehabilitation of the capital asset base and was a response to prudent macroeconomic policies. Among the key factors underpinning domestic as well as external sector performance was the freeing of the current and capital accounts in the 1990s, as well as the liberalization of trade. The improved investment climate and the privatization process contributed to the inflow of foreign capital into the economy. The removal of foreign exchange controls and pursuance of prudent fiscal and monetary policies also promoted economic performance. Private agents managed to access foreign savings through either borrowing (debt) or greater foreign ownership of local enterprises (equity) and net private transfers to improve productivity significantly as well as finance the property boom. Uganda received substantial amounts of aid during the period under review. According to the African Development Indicators (2005), aid as a percentage of gross national income increased from 9.2% in 1980 to a peak of 26.2% 1992. Over the period 1995 to 2004 aid averaged 11.8% of gross national income. In per capita terms, it rose to US$8.9 in 2004. Some of these increased aid inflows from donors were used to fund reconstruction expenditure. Part of the response to managing these inflows has been an increase in foreign exchange reserve cover to six months of imports of goods at the end of the 2005/2006 fiscal year from only 2.2 months cover in1991/92.

The construction boom seems to be amplified by the confidence expressed in the sustained economic growth that the country witnessed. Indeed, the evolution of gross construction output over the last 11 years shows that total construction grew by 9.8 % on average. The construction of commercial buildings expanded by 12.7% per annum, and that of residential buildings by 4.9%. In terms of composition, the share of commercial buildings increased from 36% at the beginning of the period to 52% in 2005/06. There was also pressure for construction prices to rise. By 2005/06, public construction prices had risen by 93.7% above the levels recorded in 1997/98. The rising costs of public construction were also followed by an increase of 61.3% in private construction prices over the same period. The general tendency of construction prices to increase appeared to be driven by the rapid increase in demand for construction inputs that followed the improved political and investment climate after 1986. Indeed, the construction boom came on the back of high economic growth rates and relatively high rental prices. There were also a number of qualitative influences that could have impacted on the housing and property market. These qualitative influences included institutional changes, foreign exchange market liberalization and demographic factors that boosted the demand for residential and commercial buildings. Indeed the influx of new participants in the market for housing was a key factor in explaining the asset boom.

Evidence from aggregate data shows that gross fixed capital formation was dominated by increases in private commercial and residential buildings. In constant price terms, the growth in construction tended to exceed the expansion in investment in equipment from 1986/87. The increase in private transfers in the balance of payments in the last decade could partly have financed the construction boom. Since 1986/87, the construction component of investment has grown by 11.5% per annum compared to an average growth rate of 10.2% per annum recorded for total fixed capital formation, an indication that the property boom may not be increasing the capital stock in a sustainable fashion to ensure long-term expansion of the real economy.

Table 1 provides some indicative macroeconomic numbers, which are important for our analysis. For example, two episodes of improvement regarding the terms of trade can be identified and linked to improvements in realized international coffee prices.

Table 1: Some investment indicators and price indices 1994/95 – 2005/06

Indicator	1994/95	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
Real GDP growth	10.9	4.7	8.2	5.4	5.0	6.3	4.7	5.5	6.6	5.3
Inflation rate	6.1	5.8	0.2	5.8	4.5	2.0	5.7	5.0	8.0	6.6
Total investment as % of GDP (cp)	16.7	15.6	19.1	19.2	17.7	18.9	20.1	22.0	21.0	24.6
Private investment as % of GDP (cp)	11.8	10.8	12.9	13.0	12.2	13.7	15.4	16.8	16.4	19.6
Public investment as % of GDP (cp)	4.9	4.8	6.2	6.1	5.5	5.3	4.7	5.2	4.6	5.0
Realized coffee price	164.2	100.0	87.2	65.5	41.1	28.8	37.5	47.6	61.1	87.8
Real exchange rate	109.5	100.0	111.9	113.7	122.2	112.1	127.3	141.8	137.0	141.0
Price of public construction	72.3	100.0	119.1	133.2	153.8	154.7	170.8	184.2	177.4	193.7
Price of private construction	82.9	100.0	106.5	115.8	127.5	127.6	137.9	145.3	148.0	161.3
Price of government consumption	74.6	100.0	107.0	113.5	122.9	135.2	144.5	151.4	155.2	159.7
Price of private consumption	84.0	100.0	98.7	103.3	109.7	104.9	114.4	120.9	131.3	138.4
Price of exports	98.3	100.0	107.7	107.2	113.0	108.5	121.4	133.0	130.6	151.3
Price of imports	64.6	100.0	114.7	125.5	140.7	137.4	154.0	167.8	156.1	174.6
Terms of trade	152.0	100.0	93.9	85.4	80.3	78.9	78.8	79.3	83.7	86.7

(cp) denotes current prices
Source: Bank of Uganda, Annual Report 2005/06, Uganda Bureau of Statistics, Statistical Abstracts, and Background to the Budget 2003/04, 2004/05 and 2005/06.

The first period was from 1982/83 to 1986/87 when the international coffee price exceeded US$2 per kg, and the second episode from 1993/94 to 1994/95 was also linked to the increase in the international coffee prices. The improvement in the export prices in 1994/95 represented a level of prices that were 64.2% higher than the prices realized in 1997/98. The real exchange rate index was also more appreciated in 1994/95 during the coffee price boom compared to the period 1998/99 to 2005/06 when export prices were lower. The real exchange rate index depreciated by 41% over the period 1997/98 to 2005/06, coinciding with a period in which terms of trade declined by 14%. The price indices of the main components of GDP, namely private consumption and private construction, show a rapid increase. The index for private consumption has risen at very moderate rates over the last decade, at an average of 4.7% per annum. The unit prices of government consumption have risen at an annual average rate of 7.3% over the last 11 years, faster than the average increase in private consumption over the same period.

Investment in equipment and structures

Table 2 shows the levels of gross fixed capital formation in real and nominal values. At constant 1997/98 prices, the share of fixed capital formation to GDP at market prices has increased marginally to 16.6% between 1997/98 and 2005/06, from 15.7% during the period of high growth between 1992/93 to 1996/97 and 14.5% in the earlier period. However, the composition of investment between public and private appears to have been transformed. Between 1986/87 and 1991/92, public investment was equivalent to an annual average of 6.8% as a ratio to GDP while private investment was 7.6%of GDP. Between 1997/98 and 2005/06, private investment averaged 12.5%of GDP, nearly three times the level of public investment which was recorded at 4.1%of GDP.

Public investment in equipment (machinery and vehicles) when measured at constant 1997/98 prices fell from 2.5%of GDP in 1986/87 – 1991/92 to 1.4% of GDP in 1997/98 – 2005/06. The decline in public investment was mainly due to the completion of some large investment projects that were undertaken previously, such as the construction of the Kiira dam and installation of power generating units, rehabilitation of Entebbe Airport and the construction of roads. The share of structure investment of GDP has generally tended to dominate. Investment in structures increased from an average of 8.8%of GDP during the period between 1986/87 and 1991/92 to an average of 10.9%of GDP between 1992/93 and 1996/97 and further to 12.3% of GDP between 1997/98 and 2005/06. If indeed the conjunction is true that the bias in aggregate investment towards structures is an optimal reaction to the nature of the macroeconomic events, then casual evidence suggests that this period can be analyzed to help explain differential performance between the two classes of investment. The role of export receipts and capital inflow in this process appears to be paramount.

Table 2: Investment as share of GDP

Item	Period average			
	1982/83 - 1985/86	1986/87 - 1991/92	1992/93 - 1996/97	1997/98 - 2005/06
			Current market prices	
Fixed capital formation	12.4	12.5	16.4	19.8
of which – Public	3.7	5.1	5.0	5.3
Private	8.6	7.4	11.5	14.5
Structures	9.5	7.8	10.8	14.3
of which – Public	2.6	3.2	3.7	3.5
Private	6.8	4.7	7.2	10.8
Equipment	2.9	4.7	5.6	5.5
of which – Public	1.1	1.9	1.3	1.8
Private	1.8	2.7	4.3	3.7
			Constant market prices	
Fixed capital formation	11.0	14.5	15.7	16.6
of which – Public	4.3	6.8	4.8	4.1
Private	6.6	7.6	10.9	12.5
Structures	7.0	8.8	10.3	12.3
of which – Public	2.6	4.3	3.6	2.7
Private	4.4	4.5	6.7	9.6
Equipment	4.0	5.6	5.4	4.3
of which – Public	1.8	2.5	1.2	1.4
Private	2.2	3.1	4.2	2.9

Source: Uganda Bureau of Statistics, Statistical abstracts, 1984-2006, and Republic of Uganda, Background to the Budget 2003/04 – 2005/06

Table 3 provides growth rates of gross fixed capital formation at constant 1997/98 prices. Investment growth was quite low during civil strife and in some years negative growth was registered. The growth in total investment declined substantially to an average of -0.1% per annum during the 1982/83–1985/86 period. This was, however, followed by a dramatic recovery to an annual rate of 10.1%, largely driven by public-sector investment in construction. The government's contribution to growth in construction was higher than the private sector as government embarked on the rehabilitation of structures that had stalled and those that had been destroyed during the civil strife. Investment continued to grow in the next phase (1992/93 to 1997/98) at an average annual rate of 13.4% as the private sector's investment in both construction and machinery and equipment picked up to averages of 19.0% and 13.6% in response to market reforms implemented by the government. In the period 1997/98 to 2005/06, investment growth averaged 8.9% as the government focused on social expenditure in line with the PEAP. Private sector investment growth averaged 10.3% in 1997/98– 2005/06 compared to 17.7% in the previous period. Investment in private construction continued to thrive with an annual growth rate at an average of 12.1% per annum, compared to 1.2% annual growth for the public sector.

Table 3: Investment at constant prices, percentage growth rates

Item	Average growth rate			
	1982/83 - 1985/86	1986/87 - 1991/92	1992/93 - 1996/97	1997/98 - 2005/06
Fixed capital formation	-0.1	10.1	13.4	8.9
of which – Public	-4.5	15.2	5.1	4.9
Private	3.2	8.4	17.7	10.3
Structures -3.4	11.8	14.1	9.7	
of which – Public	-9.8	23.4	5.9	1.2
Private	0.5	7.6	19.0	12.1
Equipment 6.1	7.4	13.6	7.6	
of which – Public	4.2	4.4	4.1	14.4
Private	10.0	10.2	17.4	5.8

Source: Uganda Bureau of Statistics, Statistical Abstracts, 1984 – 2006, and Republic of Uganda, Background to the Budget 2003/04 – 2005/06.

Investment deflators: Structures and asset prices

The deflator for investment in structures has shown sustained increases between 1982/83 and 2005/06. Understanding the evolution of these prices is important in assessing the links that may exist between macroeconomic events, risk and structure expenditure. Macroeconomic shocks related to foreign remittance booms have been documented to lead to high rates of structure expansion because both household wealth and consumption increase. Moreover, in economies where there are rising perceptions about future growth in incomes, higher private investment could lead to pronounced expenditure on structures.

International evidence tends to show that unbalanced asset price developments, especially in property prices, have resulted in macroeconomic disruptions and stress on the financial system. The financial sector was not put under stress because the boom was partly financed by foreign savings and private transfers. Private transfers2 increased at an average rate of 7% per annum over the last 12 years, from 1993/94 to 2005/06. Indeed, the Ugandan construction boom comes on the back of high growth rates of the economy and relatively high rental prices. There are also a number of qualitative influences that could have impacted the market for structures in the country. These influences include fiscal reforms, institutional reforms, foreign exchange market liberalization and demographic factors. All these influences boosted the demand for residential and commercial buildings. Indeed, the influx of new participants in the market and the desire to meet the pent-pup demand for housing that occurred during years of civil strife when there was limited construction are key factors in explaining the asset boom.

Table 4 tracks the evolution of the price indices of the main components of fixed investment. It shows that the average growth rates of the investment deflators have tended to moderate from the peak levels recorded in 1986/87-1991/92 to mainly single-digit levels from 1997/98 to 2005/06. It shows that in the more recent period of 1997/98–2005/06, public construction prices rose by 9.5%, compared to the increase of 6.6% recorded over the period 1997/98–2005/06. Movements in the costs of public

construction were also followed by increases in the private construction prices over the same period. The general tendency of the structure prices to increase appears to be driven by the rapid increase in demand for construction inputs that followed the improved political and investment climate after 1986/87. The increased demand for construction inputs exerted pressure on the supply of inputs in the construction sector. Indeed, these developments mirror the changes in the share of construction in total GDP.

Table 4: Average growth rates of investment deflators, 1997/98=100

Item	Average growth rate			
	1982/83-1985/86	1986/87-1991/92	1992/93-1996/97	1997/98-2005/06
Fixed capital formation	75.3	110.8	7.8	7.0
of which – Public	87.1	118.1	6.4	9.0
Private	68.7	109.0	8.5	6.5
Structures	76.3	107.8	8.8	6.6
of which – Public	84.7	119.2	6.6	9.5
Private	71.1	107.7	10.1	5.9
Equipment	83.0	116.2	6.1	8.2
of which – Public	98.1	118.8	6.1	8.2
Private	74.9	114.4	6.1	8.2

Source: Uganda Bureau of Statistics, Statistical Abstracts, 1984 – 2006, and Republic of Uganda, Background to the Budget 2003/04 – 2005/06

3. Macroeconomic events and investment

This section reviews studies that specifically assist in understanding what might cause compositional shifts in aggregate investment, especially with regard to agents' responses to macroeconomic events that hit an economy. Macroeconomic shocks affect relative prices and could yield different responses in the performance of investment in equipment and structures. Given this background, the critical issue becomes one of delineating factors that determine allocation of investment spending between equipment and structures. It is to some of these practical issues that this section now turns.

In the Dutch disease theory, an income shock has two effects, namely relative price and spending effects. In this theory, an improvement in terms of trade increases the price of an exportable item. The price increase not only alters the export item's relative price, it also affects its relative profitability. The key point is that the resulting increase in income to agents leads to higher expenditure on both tradable and non-tradable goods. In a small open economy, which faces exogenously given tradable goods prices, the resultant higher demand for tradable goods is met by higher imports without any price change. However, the higher demand for non-tradable goods whose prices are determined by domestic supply and demand leads to an increase in their prices as well as their profitability. The spending effect tends to raise the relative prices of non-tradable goods to tradable goods, that is it appreciates the real exchange rate. Depending on the relative magnitude of the relative price and spending effects, and the factor intensities, the non-tradable sector may expand or contract (Jayasuriya, 1999). However, the diminished relative profitability of the tradable goods sectors, which are unaffected by the export price increase, unambiguously leads to their contraction.

An increase in spending income can also emanate from an exogenous capital inflow. Some of these inflows are in the form of aid and private remittances (Azam and Shahabuddin, 1999). In the case of a massive inflow of aid, this has been shown to increase the amount of tradable goods in the economy, which pushes up the relative price of non-tradable goods and shifts resources away from tradable investment. Aid shifts resources towards the non-tradable sector, causing the tradable sector to reduce in relative size, even if the amount of resources available for consumption increases (Arellano, 2002).

Conversely, an analysis of construction booms assumes that agents have access to well-functioning capital markets and correctly anticipate temporary shocks. Under this framework, the permanent income hypothesis would predict that such shocks lead primarily to savings rather than expenditure. The implication of this statement is that

the spending effect in Dutch disease literature would be minor. A significant effect would be mainly in the asset markets. The resulting increased savings can be held in many forms depending on the range and characteristics of available assets.Therefore, factors such as the nature of the domestic financial system and the capital market, the exchange regime, the nature of controls on foreign asset acquisition and the degree of integration of the domestic and world capital markets become important. In many developing countries, private agents are constrained in their capacity to acquire foreign assets and domestic financial markets are insulated, to varying degrees, from the world markets (Jayasuriya, 1999: 234). In these circumstances, higher savings resulting from a positive shock, perceived as being temporary, would be directed towards acquisition of domestic assets, including non- tradable capital goods such as buildings. In Dutch disease literature, increased spending leads to higher prices of non-tradable consumer goods and services. In construction booms, higher demand for assets leads to an increase in prices of non- tradable assets such as buildings and generates a construction boom. To the extent that parts of the savings are deposited in the domestic financial sector, there will be downward pressure on domestic interest rates; such deposits will facilitate easing of liquidity constraints and, consequently, investment is encouraged.

The theory of construction booms combines the Dutch disease desegregation of goods as tradable and non-tradable with an intertemporal analysis. Here, the construction sector is the major beneficiary of the external shocks. A resulting construction boom is much more pronounced than the primary export boom that produced it. The line of argument is that since capital is partly non-tradable, its price rises due to an increase in investment. Because individuals can hold foreign assets, they can protect the real value of the windfall savings and return these when capital prices have fallen. It is, therefore, optimal to continue investing domestically after the end of the commodity boom. This argument gives a central role to foreign assets. In their study of the Kenyan coffee boom, Bevan, Collier and Gunning (1999 indicate that it led to a massive increase in the demand for non-tradable capital goods, giving rise to a construction boom. The reason why windfall savings must be translated to investment plans is simple: it is easier to increase purchases of tradable capital goods rapidly because these can be imported. It is more difficult to increase the purchases of non-traded capital, largely because land must be purchased and buildings designed before they can be gradually constructed. According to Ghanem (1999), the Ivorian cocoa and coffee boom led to a construction boom with an appreciation of the real exchange rate and a rise in the price of non-tradable investment goods relative to non-traded consumption goods.

One important implication of the above studies is that as commodity booms result in a higher relative price of non-tradable capital goods, substitution effects will favour investment in equipment. Therefore, it is possible for a construction-type boom to result even if capital is sector-specific. This is because the spending effect raises the marginal productivity of capital in the production of non-tradable consumption goods. The same effect is true even when investment needs the services of non-tradable capital goods. It is argued that during investment booms there will be a bias towards equipment. This bias arises because structures require time to plan and construct and, generally, must compete for limited non-tradable goods. However, equipment can be imported (Collier and Gunning, 1999 b). According to this view, investment in equipment is more effective

in generating growth than stimulating investment in structures. Again, evidence from Cameroon suggests that if investment is skewed heavily towards structures, it reduces the overall return on investment (Devarajan, 1999). The reduction is in part because structures lack the growth externalities of capital equipment and mainly because the unit cost of structures rises.

Political economy literature places emphasis on the role of government during periods in which there is massive reconstruction of the economy. Government spending may provide services, which are productive, either because they enhance private production or because they are a different utility to private agents.This alters the pattern of demand and may, as a consequence, alter the relative price of non-tradable goods. The high share of structures during investment booms may be due to the disproportionate involvement of the public as this kind of investment is frequently infrastructure. Investment might be undertaken by the government, which may choose low return infrastructure projects. In Africa, this kind of response has been uncovered in Malawi (Harrigan, 1999). The income boom resulted in an immediate increase in the demand for non-traded capital goods. The increase in the demand for non-traded capital goods was much larger than that for traded capital goods, hence implying that a construction boom occurred in the public sector. However, most of the projects were poorly chosen ones with low rates of return and so did little to increase the economy's permanent income.

4. Methodology

Aggregate investment demand can be viewed in terms of a composite aggregate made up of equipment and structures. The total aggregate investment (*I*) can be defined in terms of a constant elasticity of substitution (*CES*) function of the form:

$$I = A\left[\delta I_S^{-\rho} + \left(1 - \delta I_E^{-\rho}\right)\right]^{-1/\rho} \tag{1}$$

The restrictions on the CES are that the technological variable is A > 0 and delta is distributed as $0 < \delta < 1$. The representative agent then chooses investment in structures (I_S) and investment in equipment (I_E) to minimize the cost of accumulating the aggregate. If the total funds available for investment equal *S* , let the budget constraint be

$$P_S I_S + P_E I_E = S \tag{2}$$

The variable (P_S) is the price of investment in structures while (P_E) is the price of investment in equipment. This leads to a first order condition that describes the optimal combination of structures and equipment.

$$\left(\frac{I_S}{I_E}\right) = \left[\frac{\left(1 - \delta\right)}{\delta}\frac{P_S}{P_E}\right]^{\theta} \tag{3}$$

where $\theta = \dfrac{1}{1+\rho}$ = the elasticity of substitution.

Taking log Equation 3, the composition of investment is stated as determined by changes in relative prices. However, there are other factors such as investment, its lag, risk, export prices, aid and import prices that affect the composition of investment.

These other factors are captured by variable (X_i) . In addition, an error term is added

to indicate that the specified equation does not nest all the factors that drive the changes in composition of investment. These modifications are captured in the equations that follow, staring with Equation 4.

$$\ln\left(\frac{I_S}{I_E}\right) = \delta_0 + \theta_1 \ln\left[\frac{P_S}{P_E}\right] + \theta_2 \ln\left(X_i\right) + \varepsilon \tag{4}$$

Using the above framework and with appropriate justification, it is then possible to add variables to Equation 4 in order to test a number of related propositions.

Following Equation 4, the ratio of structures to equipment $\left(\frac{I_S}{I_E}\right)$ can be modelled as a function of their relative prices , $\left[\frac{P_S}{P_E}\right]$ the overall change in investment $(\Delta I)_t$ its lag $(\Delta I)_{t\text{-}1}$ nd the evolution of risk.

It is expected that an increase in the price of structures should lower the share of investment in structures at the aggregate investment level and increase the share of equipment. It is also important to investigate whether as investment increases, a larger share goes towards acquisition of equipment-type goods. Consistent with this idea is the argument that during investment booms, there is a tendency for bias towards equipment, particularly because equipment is more effective in generating growth compared to structures (Van Wijnbergen, 1984). The rationale for analysing risk is associated with the idea that agents could be less committed to long-term structures in an environment of risk. It is important to answer the question of whether compositional shifts in investment in favour of structures could reflect changes in an economy's risk profile. More fundamental is the fact that the level and composition of gross fixed capital formation by type, such as in buildings, machinery and equipment enable us to show that a construction boom can be amplified if agents have confidence in the sustained economic growth that is underpinned by a lower risk score.

$$\log\left(\frac{I_S}{I_E}\right) = \beta_0 + \beta_1 \log\left[\frac{P_S}{P_E}\right] + \beta_2 \Delta\log\left(risk\right)_t + \beta_3 \Delta \log I_t + \beta_4 \Delta \log I_{t\text{-}1} + \varepsilon_{et} \tag{5}$$

where $\beta_1 < 0, \beta_2 < 0, \beta_3 > 0, \beta_4 > 0$

A number of propositions can also be tested using variants of Equation 4. Export boom literature (Ghanem, 1999; Bevan, Collier and Gunning; 1999) which suggests that changes in investment could also be related to the absolute magnitude of macroeconomic events that hit an economy. The first proposition that can be tested is that the relative price events in the economy are affected by external events, which have an impact on the real exchange rate. Some of these events include export prices (W_{cp}), aid flow (aid) and import prices (P_m):

$$\log\left[\frac{P_S}{P_E}\right]_t = \gamma_0 + \gamma_1 \Delta \log\left(W_{cp}\right)_t + \gamma_2 \Delta \log\left(aid\right)_t + \gamma_3 \Delta \log\left(P_m\right)_t + \varepsilon_{rpse} \quad (6)$$

where $\gamma_1 > 0,\ \gamma_2 > 0,\ \gamma_3 < 0$

The rationale for including export prices, aid and import prices is also theoretically grounded. An increase in export prices should favour investment in equipment rather than investment in structures while a rise in import prices tends to favour investment in structures relative to equipment. Higher aid inflow is expected to positively affect investment in nontraded structures relative to equipment (Arellano, 2002).

The second proposition that can be tested is that the composition of investment in private and public reflects the existence of differing sensitivities to the evolution of relative prices. To investigate this hypothesis two equations are estimated, one for private and the other for public investments as a function of relative prices.

$$\log\left[\frac{PR_S}{PR_E}\right] = \pi_0 + \pi_1 \log\left[\frac{P_S}{P_E}\right]_t + \pi_2 \Delta \log\left(I\right)_t + \pi_3 \Delta \log\left[\frac{PR_S}{PR_E}\right]_{t\text{-}1} + \varepsilon_{pr} \quad (7)$$

$$\log\left[\frac{GO_S}{GO_E}\right]_t = \psi_0 + \psi_1 \log\left[\frac{P_S}{P_E}\right]_t + \Delta\, \psi_2 \log\left(I\right)_t + \psi_3 \Delta \log\left[\frac{GO_S}{GO_E}\right]_{t\text{-}1} + \varepsilon_{go} = \quad (8)$$

Where $\pi_1 < 0$, $\pi_2 > 0$, $\pi_3 > 0$ and $\psi_1 < 0,\ \psi_2 >,\ \psi_3 > 0$.

$\left[\frac{PR_S}{PR_E}\right]_t$ is the ratio of structures to equipment in private investment and $\left[\frac{GO_S}{GO_E}\right]_t$ the ratio of structures to equipment in government investment, $\left[\frac{P_S}{P_E}\right]_t$ is the relative price of investment and *I* is the total investment in the economy.

There are strong rationales for estimating these two equations separately. First, it is important to test whether the elasticity of substitution is different for the private and the public sectors. It is also argued that relative prices are not binding in defining the investment decision for the public sector. This alludes to the fact that public investment is driven by factors other than the profit motive, which seems to be the main factor for private sector investment. It is also important to test the effect of change on investment to the composition of investment for both private and public sectors. Literature seems to favour the idea that as investment increases, a larger share goes towards acquiring assets in the form of equipment. Indeed, this idea has been used as a confirmation as to why windfall savings must be translated into investment plans because it is easier to increase purchases of tradable capital goods rapidly through importation. However, it is more difficult to increase the purchases of non-traded structures, mainly because land must be purchased and buildings designed before they can be gradually constructed. It is important to test these ideas by using available data.

5. Empirical results

Data and characteristics

A theoretical and empirical review suggests a number of testable propositions regarding the behaviour of structures and investment in equipment. The models estimated in this section attempt to investigate the composition of investment, the impact of relative prices, the different sensitivities of private investment with regard to prices of structures and equipment, as well as the role of equipment investment in productivity growth. The models are estimated using annual data over the period 1981/82 to 2004/2005. The data were obtained mainly from institutional publications such as Bank of Uganda's annual and quarterly economic reports. The Ministry of Finance Planning and Economic Development provided data from Background to the Budget and the Uganda Bureau of Statistics' data were obtained from its statistical series. Publications of international financial institutions such as the African Development Bank, International Monetary Fund and the World Bank were also consulted. Three measures of risk were employed namely economic and financial ratings from the international country risk guide published by the PRS group, as well as debt stock at the end of the period as a percentage of GDP. It is the latter measure that generated plausible results, which are reported in the paper. Annex Table A1 provides the variable used, the sources and definitions.

Before turning to the actual estimation of the equations, the properties of the underlying data were examined. Annex Figure A1 shows the development of the key variables used in the regression analysis over the period 1982/83 to 2004/05. Most of the variables appeared to have followed some trend although it is not possible to conclusively decide visually whether the trends depicted imply that the variables are not stationary. Testing for stationarity was therefore done to ensure that the variables used in the regressions were not subject to spurious correlation.

The Augmented Dickey-Fuller (ADF) test was employed to test for unit roots in the data. Annex Tables A2 and A3 summarize the results of the stationarity tests and the variable descriptive statistics. With the exception of the three ratios for investment in structures to investment in equipment comprised of the aggregate ratio, the private sector ratio and the government's ratio, along with the prices of exports and imports of goods, all other variables were stationary. The non-stationary variables were found stationary after differencing and are employed in the regressions after differencing. Having established the order of integration, and transforming the non-stationary variables into stationary ones, regression estimates were effected using ordinary least

squares (OLS). In the estimated regression equations, all lags indicated in Equations 5, 6 and 7 were excluded. In addition, the variables for import and export prices were not log transformed as indicated in the equations but were entered in their raw form. This manner of implementation was motivated by the fact that the log transformation more or less made the variables stationary but highly correlated. Differencing the variables without the log transformation equally caused the variables to be stationary but reduced the correlation significantly. This made it possible to run a single regression equation in which both variables were part of the explanatory variables.

The empirical implementation also attempts to address the endogeneity of the relative price in the investment equations. As investment in structures is non-tradable, the price of structures will be a function of the level of investment demand, creating a bias in the estimation of coefficients of the model. Equations 5, 6 and 7 are also estimated by the instrumental variables method using the lagged values of relative prices as instruments and the results are reported in Tables 5, 6 and 7.

Composition of investment equation

Following the framework outlined in the methodology section, Equation 5 helps us to capture some of the determinants of the composition of investment. The ratio of structures to equipment is a function of their relative price structure to equipment, the overall change in investment, its lag and the evolution of risk. However, the ratio of structure prices to equipment prices is endogenous, which renders the OLS estimates biased and inconsistent. In addition to the OLS estimate for Equation 5, an instrumental variables (IV) regression is also estimated in which the instrument is the lagged value of the ratio of structures prices to equipment prices. Also included in the instrument list is a constant and the first difference of the log of total fixed capital formation. The OLS and instrumental variable regression results are shown in Table 5.

While the sign of the coefficient suggests that an increase in the price of structures could lower the share of investment in structures at the aggregate investment level, the coefficient is insignificant. It should be noted that the coefficients are broadly similar, in the OLS regression it is 0.17 while in Equation 4 it is 0.18. The negative coefficient for the effect of change on investment to the composition of investment suggests that as investment increases, a larger share goes towards acquiring assets in the form of equipment. This finding is consistent with the argument that during investment booms there is a tendency for bias towards equipment, particularly because equipment is more effective in generating growth compared to structures. Closely associated with this is the finding that higher risk in the economy is likely to favour investment in equipment relative to structures. Agents could be less committed to long-term structures in an environment of risk. The recent increase in structures reflects the reduction in risk that occurred over the period under review.

Equation 5 is also estimated with the dependent variables in levels given the low p-value obtained from the unit root test confirming that the variable is I(1). The estimates obtained for the coefficients of the exogenous variables are significantly larger. Moreover, the Durbin-Watson statistic is quite low, suggesting the presence of strong first-order autocorrelation. The results of the regression are therefore not presented. In

addition, financial and economic measures of risk were highly correlated with some of the exogenous variables and are therefore not used.

Table 5: Determinants of composition of investment

Variable	DLOG (structures investment/ Variable equipment investment)	
	OLS estimates	IV estimates
Constant	0.0784**	0.0794**
	0.0366	0.0366
LOG (structures prices/ equipment prices)	-0.1711	-0.1817
	0.1114	0.1144
DLOG (total fixed capital formation)	-0.6207**	-0.6215**
	0.2719	0.272
DLOG (risk)	-0.0826*	-0.0741*
	0.274	0.2749
R-squared	0.3063	0.306
Adjusted R-squared	0.1839	0.1835
S.E. of regression	0.1323	0.1324
Durbin-Watson stat	2.1853	2.1902

The sample period is 1981/82 to 2004/05.
** indicates significance at 5% level, * at the 10%level.
Source: Regression results computed by the author.

Determinants of investment prices

Equation 6 in the Simple Analytical Model section can be employed to test the proposition that the relative price events in the economy are affected by external events, which have an impact on the real exchange rate. Some of these events include the export prices, aid flows and import prices. The results are shown in Table 6.

Exploring the sensitivity of the prices for investment in structures relative to equipment or commodity prices, it is evident that rising import prices tend to favour investment in structures relative to equipment. On the other hand, the regression estimates also suggest that increasing export prices favour investment in structures compared to investment in equipment. However, this is counter-intuitive as it is expected that there would be increasing investment in equipment relative to structures as export prices rise. This finding, however, is consistent with the fact that Ugandan exports are predominantly primary goods or goods in their raw form with little or minimal processing. Over 50% of total exports are primary agricultural commodity exports, with packed fish comprising the largest share of the semi-processed items. In addition, the trade balance has been in deficit and has continued to grow over time, reaffirming the importance of imports to the economy. This could also partly explain why the coefficient for export prices is negative and not significant in the regression equation. The coefficient for aid flows is positive, suggesting that increasing aid flows have tended to positively affect investment in structures relative to equipment. Indeed, a lot of donor aid was channelled by the government towards infrastructure projects. The social programmes that attracted some of the donor funding were in the education and health sectors.

Table 6: Estimates for the effect of export and import prices on structures and equipment

Variable	LOG (structures prices/equipment prices)
Constant	0.1952** 0.0708
D (export prices of goods)	-0.0033 0.0058
DLOG (aid)	0.4139* 0.2321
D (import prices of goods)	-0.0119** 0.0056
R-squared	0.3346
Adjusted R-squared	0.2172
S.E. of regression	0.2498
Durbin-Watson stat	1.0749

The sample period is 1981/82 to 2004/05.
** indicates significance at 5%level, * at the 10%level.
Source: Regression results computed by the author.

Sensitivity of private and government investment

The third proposition tested is that the composition of investment between the private and public sectors reflects the existence of differing sensitivities to the evolution of relative prices. To investigate this hypothesis, two equations, one for private and the other for public investments as a function of relative prices, are estimated. The first equation uses the ratio of structures to equipment in private investment and the second equation employs the ratio of structures to equipment in government investment as the dependent variables. As in the earlier models, the relative price of investment and the total investment in the economy are employed as explanatory variables. However, the ratio of structures prices to equipment prices is endogenous in Equations 7 and 8 as well as in Equation 5. This renders the OLS estimates biased and inconsistent. In addition to OLS estimates, IV regressions were implemented in which the instrument is the lagged value of the ratio of structures prices to equipment prices. Additional instruments include a constant and the first difference of the log of total fixed capital formation. The results for both OLS and IV regressions are shown in Table 7.

Disaggregating public and private investment yields a more plausible result, namely that the elasticity of substitution is somewhat higher for the private sector and correspondingly lower (approximately zero) for the public sector. Both the OLS and IV estimates show that an increase in the price of structures relative to equipment prices results in a lower share of investment in structures relative to equipment in the case of the private sector investment component. However, in the public sector, the relative price is not as significant for the investment decision. This alludes to the fact that for public investment, it is factors such as social benefit equitable distribution of resources and poverty alleviation rather than the profit motive that are binding.

The negative coefficient for the effect of change on aggregate investment to the

composition of investment for both private and public sectors suggests that as investment increases, a larger share goes towards acquiring assets in the form of equipment. This finding is similar to what is observed in the case of total investment and generally reaffirms the higher potential for investment in equipment to generate wealth faster relative to investment in structures, irrespective of the investing sector.

Table 7: OLS and IV estimates for the effect of prices on investment in structures

Variable	DLOG (private structure investment/private equipment investment)		DLOG (public structure investment/public equipment investment)	
	OLS estimates	IV estimates	OLS estimates	IV estimates
Constant	0.1016**	0.1047**	0.0049	0.0042
	0.0393	0.0395	0.058	0.0581
LOG (structures prices/ equipment prices)	-0.3038**	-0.3343**	0.0494	0.056
	0.1093	0.1125	0.161	0.1655
DLOG (total fixed capital formation)	-0.7955**	-0.8106**	-0.2084	-0.2052
	0.2944	0.2953	0.4339	0.4343
R-squared	0.3883	0.386	0.0192	0.0192
Adjusted R-squared	0.3272	0.3246	-0.0788	-0.0789
S.E. of regression	0.1484	0.1487	0.2187	0.2187
Durbin-Watson stat	2.0148	1.9971	1.962	1.9559

The sample period is 1981/82 to 2004/05.
** indicates significance at 5%level, * at the 10%level
Source: Regression results computed by the author.

6. Conclusions

An analysis of data suggests that macroeconomic shocks have a critical role in aggregate investment. Some of the macroeconomic shocks were driven by the inflow of foreign resources that were used to supplement domestic consumption, both in the private and public sectors. The level and composition of gross fixed capital formation by type, such as in buildings, machinery and equipment, also shows that the construction boom was amplified by the confidence expressed in the sustained economic growth that the country witnessed. Higher demand for assets due to positive macroeconomic events led to increases in the prices of non-tradable structures and generated a construction boom. Evidence suggests that some increases in investment have at times occurred for acquisition of equipment-type assets. Equipment acquisition is consistent with the argument that during investment booms there may be a tendency for bias towards equipment, particularly because equipment is more productive compared to structures. Private investment behaves as theory suggests because in the equation that disaggregates private and public investments there is a low elasticity of substitution between structures and equipment components of aggregate investment. This suggests the need to investigate private investment behaviour, possibly with longer data sets. When the data are disaggregated between public and private investment, a more plausible result is obtained where the elasticity is somewhat higher for the private sector and correspondingly lower for the public sector. The results also suggest that in periods associated with higher risk in the economy, long-term commitment to structures is discouraged.

Exploring the sensitivity of the prices for investment in structures relative to equipment, it is evident that rising import prices tend to favour investment in structures rather than equipment. Increases in aid flows tended to have a positive impact on investment in structures rather than equipment. A higher number of structures was indeed consistent with the fact that a significant amount of donor flows went into infrastructure projects. As expected, an increase in the price of structures relative to equipment prices results in a lower share of investment in structures relative to equipment in the case of private sector investment. However, in the case of the public sector, relative prices are not binding in defining the investment decision. This alludes to the fact that public investment is driven by other factors such as social benefit, equitable distribution of resources and poverty alleviation rather than the profit motive, which seems to be the main factor for private sector investment. The negative coefficient for the effect of change on investment to the composition of investment for both private and public sectors suggests that as investment increases, a larger share goes towards acquiring assets in the form of equipment. This

finding confirms why windfall savings must be translated into investment plans as it is easier to increase purchases of tradable capital goods rapidly through importation. However, it is more difficult to increase the purchases of non-traded structures, mainly because land must be purchased and buildings designed before they can be gradually constructed.

Notes

1. Reinikka and Collier (2001) refer to Uganda as a role model for post-conflict recovery for a low-income country.

2. Figures on private transfers are the Bank of Uganda's estimates based on data from commercial banks and forex bureaux.

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Annex

Table A1: Variable definitions and sources

Definition		Source	Remarks
	Total investment	UBOS	Constant 1997/98 prices
EI	Equipments investment	UBOS	Constant 1997/98 prices
SI	Structures investment	UBOS	Constant 1997/98 prices
P_E	Price of equipment investment	UBOS	1997/98=100
P_S	Price of structures investment	UBOS	1997/98=100
PR_E	Private investment in equipment	UBOS	Constant 1997/98 prices
PR_S	Private investment in structures	UBOS	Constant 1997/98 prices
GO_E	Government investment in equipment	UBOS	Constant 1997/98 prices
GO_S	Government investment in structures	UBOS	Constant 1997/98 prices
aid	Aid inflows	World Bank	Aid inflow as a proportion of GDP
P_m	Price of imports	UBOS	1997/98=100
P_x	Price of exports	UBOS	1997/98=100
drisk_1	External debt stock at end of period as percentage of GDP	Bank of Uganda, World Bank	
eisk_2	Economic risk	International country risk guide	Published by PRS group
fisk_3	Financial risk	International country risk guide	Published by PRS group

UBOS is the Uganda Bureau of Statistics, Background to the Budget and Statistical Abstracts, various issues.
Source: Compiled by the author.

Table A2: Descriptive statistics of variables used for regression estimates

Variables	Mean	Median	Maximum	Minimum	Std. Dev.	Obser-vations
DLOG (investment in structures/investment in equipment)	0.0178	0.0201	0.2718	-0.3396	0.1465	21
LOG (structure prices/ equipment prices)	0.1013	0.0233	0.8381	-0.1512	0.2823	21
DLOG (investment) 0.0669	0.0470	0.3562	-0.0765	0.1113	21	
D (export prices of goods)	5.1958	5.2936	27.6144	-14.6650	10.0246	21
D (import prices of goods)	7.0687	8.5389	31.0233	-12.8699	10.2434	21
DLOG (aid)	0.0174	0.0282	0.5406	-0.3321	0.2464	21
DLOG (risk)	0.0215	0.0360	0.2667	-0.2263	0.1168	21

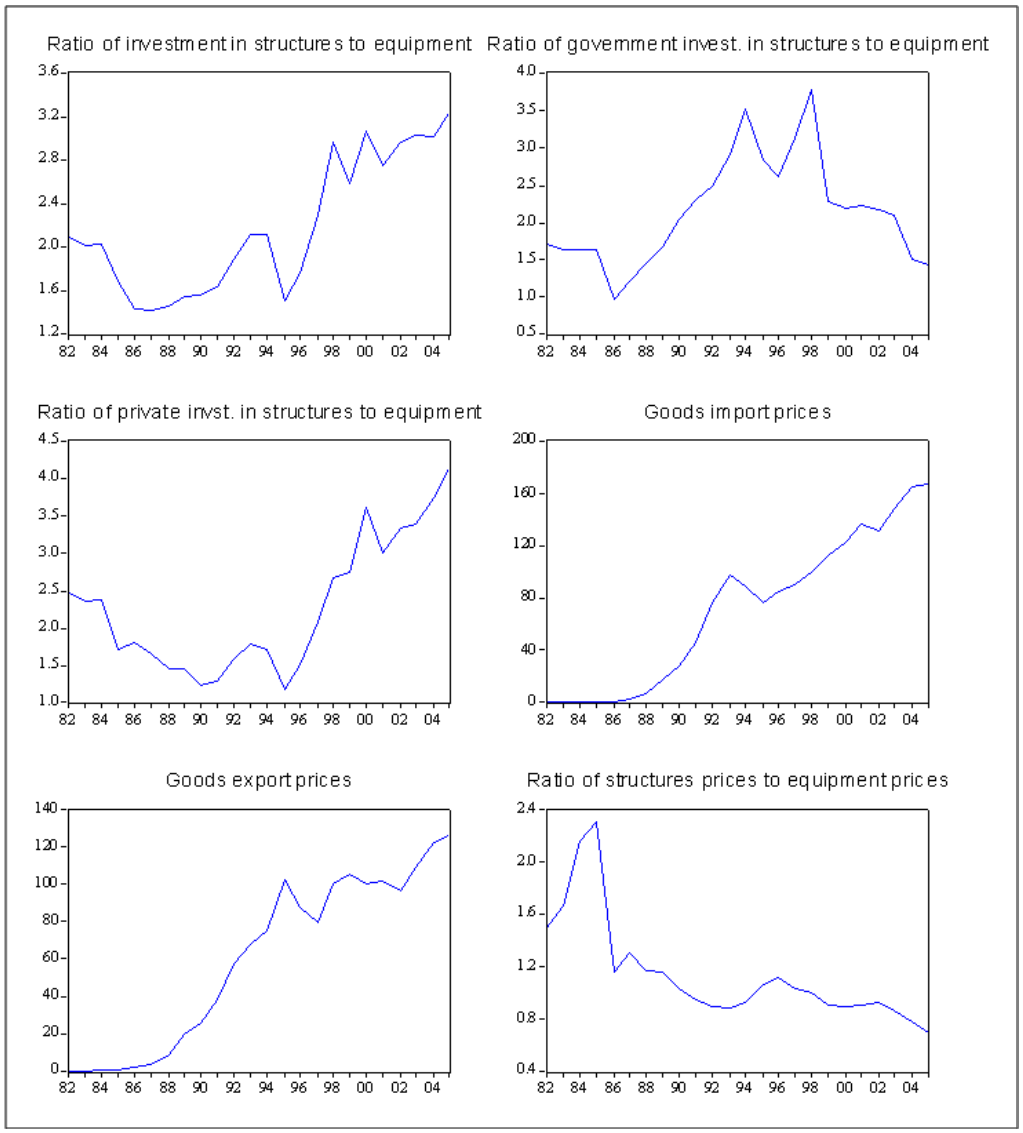
Source: Computed from UBOS and BOU data.

TableA3: Testing for unit roots

Variable	Lag length	ADF test statistic	Prob.*
LOG (structure investment/ equipment investment)	1	-2.8848	0.1856
DLOG (structure investment/ equipment investment)	0	-4.2362	0.0035**
LOG (structure prices/equipment prices)	3	-4.1394	0.0201**
DLOG (risk1)	0	-3.1990	0.0352**
DLOG (total fixed capital formation)	0	-3.6696	0.0124**
Export prices of goods	0	-2.0474	0.5461
D (export prices of goods)	0	-4.5472	0.0018**
Import prices of goods	1	-3.4954	0.0647*
D (import prices of goods)	1	-3.5429	0.0169**
DLOG (aid1)	0	-3.9683	0.0071**
LOG (private structures investment/ private equipment investment)	0	-1.7710	0.6854
DLOG (private structures investment/ private equipment investment)	0	-4.2171	0.0037**
LOG (public structures investment/ public equipment investment)	0	-0.9965	0.9249
DLOG (public structures investment/ public equipment investment)	0	-4.4370	0.0023**

The sample period is 1981/82 to 2004/05.
** indicates significance at 5% level, * at 10% level.
Source: Computed from UBOS and BOU data.

Figure A1: Developments among key variables used for regression analysis



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