# 1. Introduction

## 1.1 Background information on Uganda

Uganda is a landlocked country in East Africa with a total area of about 241 000 square km, of which 18 per cent consists of inland water-bodies, mainly fresh-water lakes. About 80 per cent of the land is plateau with fertile soils suitable for agricultural production. There are two mountain ranges, both over 1500 m above sea level, covering about 2 per cent of the land area: the Rwenzori group in the southern tip of the country bordering Rwanda and Zaire, and Mt Elgon in the east bordering Kenya. Appendix 1 includes a map of Uganda with some of these physical features.

Since Uganda is located along the equator, it experiences equatorial climate with a temperature of about 21°C to 30°C all year round. Rainfall is highest in the area bordering Lake Victoria. On average, the country receives over 1250 mm of rainfall per year, except in the north and parts of the south-west, which receive less than 750 mm. There is generally one dry season and one wet season. In the south, the dry season is from July to August whereas, in the north, the dry season stretches from December to March, and in the north-east, about October to March.

In 1991, Uganda's population was about 16.5 million and was divided between more than 30 tribes, each speaking English, the official language, and different indigenous languages, with about 50 per cent of the population less than 16 years of age (MFEP 1994a). More than 90 per cent of the population in Uganda live in the rural areas where agriculture and related activities are the principle means of livelihood. The income per-capita in 1990 was estimated to be US$ 140 (World Bank 1993a).

## 1.2 Historical overview of agriculture in the Ugandan economy

### 1.2.1 Structure of agriculture

Agriculture is by far the most important sector of the economy. It is the source of virtually all food, employs some 85-90 per cent of the labour force, contributes about 98 per cent of export earnings, 60 per cent of the gross domestic product, over 40 per cent of government revenue (Barton and Wamai 1994) and is a source of a large part of the purchasing power for non-agricultural consumer goods and services in the economy. Food crop production accounted for an average of 71 per cent of the agricultural output for the two years 1989-91, with livestock and others only 17 per

cent. Export production was only 5 per cent of the agricultural GDP (World Bank 1993a).

Agriculture in Uganda may be broadly divided into fisheries, forestry, livestock, food-crop, and cash-crop production. The major cash crops produced are coffee, cotton and tea, which are the traditional exports, and tobacco and sugar-cane, whereas the food crops include mainly maize, beans, bananas (*matooke*) and finger millet. Groundnuts, sesame (simsim), sweet-potatoes, sorghum, potatoes, cassava (tapioca/yuca) and various horticultural crops are also grown, and some, such as pineapples, bananas, avocados and vanilla, are exported. These exported crops, as well as maize, beans and oil-seeds, primarily sesame, have emerged as non-traditional agricultural exports, especially within the past ten years.

The predominant mode of agricultural production is smallholder mixed farming and land holdings are, on average, about 3 ha. This non-monetary subsistence sector constitutes about 44 per cent of total output (Barton and Wamai 1994). The economy depends heavily on smallholder peasant production of both cash and food crops. However, only about one-third of the subsistence output is marketed whereas all the export production is marketed (World Bank 1993a).

### 1.2.2 Agriculture in the Ugandan economy

Agriculture influences economic growth directly through its contribution to gross domestic product (GDP). Consistent and competent economic management, and excellent performance in the agricultural sector, in the 1960s led to a 4.8 per cent annual growth in real GDP, and thus an increase in real per-capita income (Adkisson 1989). The sector was able to supply the domestic economy adequately and generate a surplus of agricultural products for export. Export earnings more than covered the import needs and a current account surplus was maintained. Recurrent revenue increased faster than recurrent expenditure, and helped to finance the development efforts. Van Buren (1995) stated that, in the 1960s, agriculture contributed about 57 per cent of GDP (comprising both subsistence and monetary agricultural production), and accounted for about 96 per cent of export earnings, and nearly two-thirds of government revenue.

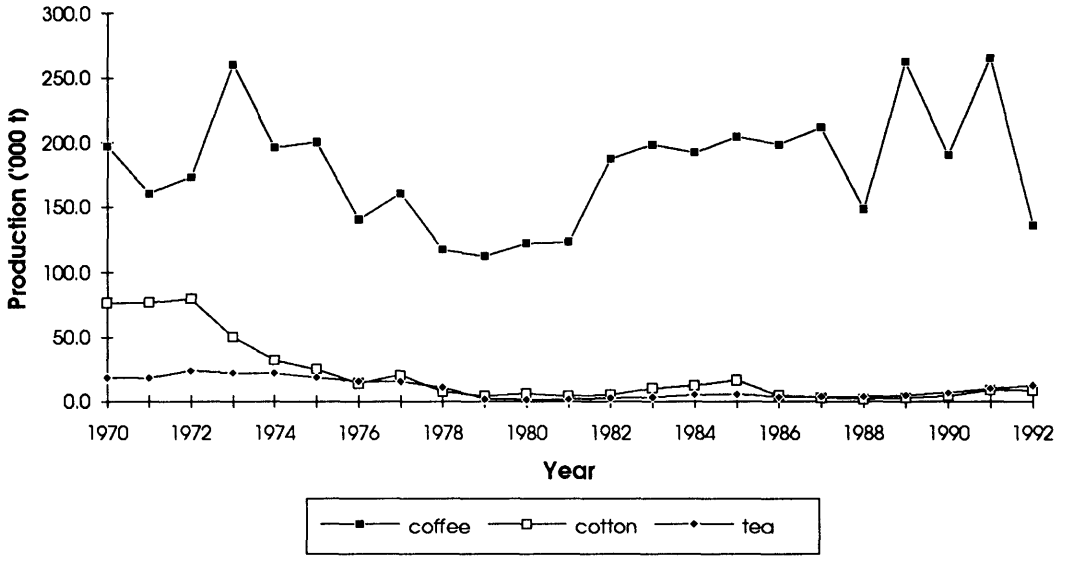
Adkisson explained that, during the 1970s, gross mismanagement and political instability undermined the productive capacity of the economy, causing GDP to decline at an annual rate of 0.2 per cent. According to Kyesimira (1979), the dire state of the economy was, to a large extent, due to the expropriation of foreign firms and the

expulsion of the Asians in 1971. In the 1960s, these Asians had formed the majority of the commercial sector. However, other factors such as the political situation, poor planning and mismanagement, corruption and nepotism, and the forced exile of thousands of citizens, especially the elite and academics, also had a detrimental influence on the economy (Kabwegyere 1986). As a result, agricultural activity was depressed, output of the export crops was drastically reduced, and all sectors performed extremely poorly. By the end of 1972, as shown by Walker (1995), all Western aid to Uganda had ceased, a coherent development policy no longer existed, and the infrastructure of the country had been allowed to deteriorate.

Agricultural growth was 9 per cent in 1972 but 6.2 per cent in 1973. By 1974, output had fallen by 12 per cent then, in 1975, by 20 per cent (Kyesimira 1979). Furthermore, import costs rose steeply, resulting in a shortage of foreign exchange and, consequently, low levels of capital inflow. Meanwhile, the economy was also shaken by the oil price shocks of 1973 and 1979, and the collapse of the East African Community in 1977. As a result, the Ugandan economy was severely weakened, inflation escalated, and a large share of economic activity was diverted to the black (parallel) market. Between 1976 and 1979, the economy was operating at its most basic level. Carroll (1990) noted that total exports fell from 350 000 metric tonnes (t) per year in the late 1960s to less than 120 000 t per year in 1980. The GDP dropped by 18.8 per cent, and inflation rose to around 260 per cent per year (Barton and Wamai 1994).

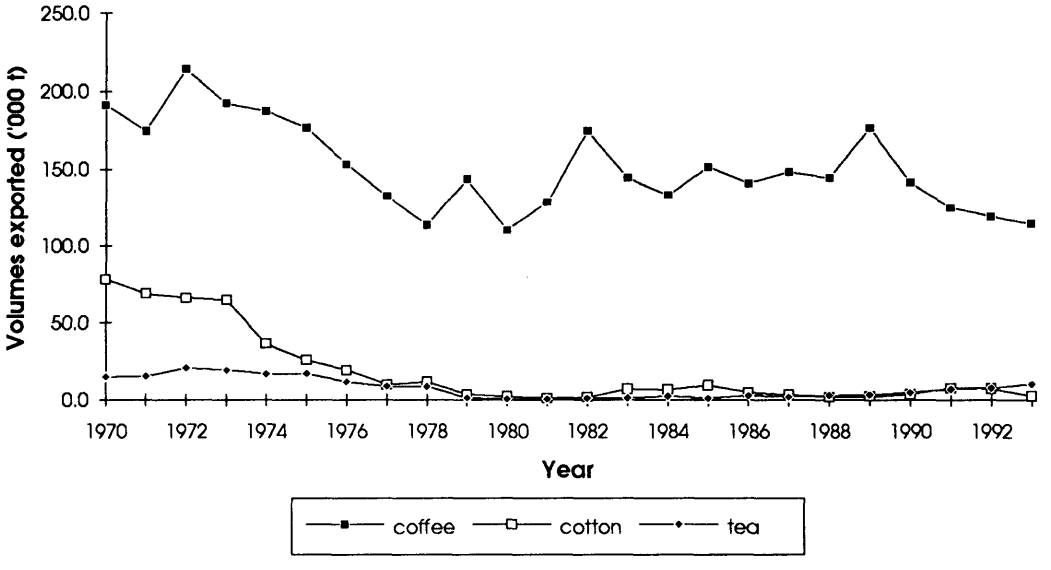
During the period 1980-85, economic recovery programs instituted under the structural adjustment programs aimed at, among other things, providing greater encouragement and protection to foreign investors, reconstructing and rehabilitating the dilapidated infrastructure and institutions, and strengthening the main export commodity sectors (Van Buren 1995). However, because of the activities of an indisciplined army, continued political instability resulting from guerilla warfare, and the difficulty of eradicating the legacy of corruption and terror, the then government was unable to formulate consistent policies (Walker 1995). In addition, Carroll (1987) claims that poor fiscal management and economic disorder were other causes of the poor economic performance. Consequently, agricultural output and exports declined (see Figures 1.1 and 1.2), and growth was hampered.

**Figure 1.1: Production of coffee, cotton, and tea in Uganda, 1970-92**




Sources: CMB, LMB and UTA, and MFEP.

**Figure 1.2: Volumes exported of coffee, cotton, and tea from Uganda, 1970-92**




Sources: CMB, LMB and UTA, and MFEP.

After President Museveni came to power in January 1986, the Rehabilitation and Development Program for 1987/88 - 1990/91 was announced. As a result of the program, emphasis was placed on the rehabilitation of infrastructure and productive sectors, and on the reduction of inflation (MFEP 1992). These objectives were achieved through export promotion (by reviving the traditional exports and boosting the non-traditional exports), reform of the agricultural policy (to increase the efficiency of production and restore incentives to the producers) and domestic investment promotion. In response to the encouragement of the non-traditional exports, extensive use of barter agreements began in 1987 (Van Buren 1995). Maize and beans, in particular, were bartered for machinery, equipment or other essential imports.

Van Buren (1995) noted that, due to reductions in the production of the major export crops, the agricultural sector output declined by 9.6 per cent during 1986. Even though production levels recovered in 1987/88, export earnings declined in 1989/90 due to low export crop prices. The collapse of the international coffee prices in 1989 had an adverse effect on national economic performance, as shown by the fall in output during 1991/92 (see Figure 1.1).

A mid-term structural adjustment program for 1991/92 - 1994/95 was instituted to modify the Rehabilitation and Development Program. The strategies included, among others, development and diversification of the export base, and investment promotion (MFEP 1992). The implementation of this program resulted in improved agricultural sector output and export earnings. In 1993/94, agriculture contributed over 36 per cent of the total GDP, and over 60 per cent of total export earnings (MFEP 1994a).

In spite of the falling contribution of agriculture to GDP, from 57 per cent in the 1970s to 36 per cent in 1993, the development of the whole economy is still heavily dependent on the performance of the agricultural sector. Agriculture will continue to be the mainstay of the economy for a long time to come (Jamal 1987; MFEP 1992; MFEP 1994a).

## 1.3 Importance of coffee, cotton and tea

Coffee is by far the most important export crop, followed by cotton and tea. Carroll (1984) states that coffee and cotton accounted for about 40 per cent of all monetary income earned from agriculture in the period 1982-84. The cultivation of coffee, cotton, and tea provides a major source of income and employment to a large percentage of the labour force. Associated transport and marketing activities, as well

as processing tasks such as coffee pulping and hulling, cotton ginning, and work in tea factories, offer additional employment opportunities.

Coffee, cotton, and tea exports make a major contribution to foreign exchange earnings. Foreign exchange earnings are a key to the economic growth of Uganda (Hecox 1989; MFEP 1992; World Bank 1991, 1993a & 1993b). Figure 1.3 depicts the percentage contribution of these commodities to foreign exchange earnings. About 60 per cent of export earnings in 1972 came from coffee, 20 per cent from cotton and 7 per cent from tea. The value of commodity exports in 1972 was 150 per cent of merchandise imports. The booming exports in the early 1970s resulted in a surplus trade account. By 1987, coffee made up 97 per cent of the export earnings, but cotton had fallen to 1.3 per cent and tea to 0.6 per cent. By 1990, coffee contributed only 70 per cent of exports, but cotton and tea had slightly increased; another category, the non-traditional exports, had emerged and contributed to 17 per cent of export earnings (World Bank 1991). However, the total export volume was reduced and made up only 31 per cent of the merchandise imports. On the whole, it is clear that coffee, cotton and tea were important foreign exchange earners between 1970 and 1992.

These crops are also a major source of government finance through taxes and levies on exports. In the 1960s, nearly two-thirds of government revenue was financed mainly by export duties on coffee, the principal export (Kyesimira 1979).

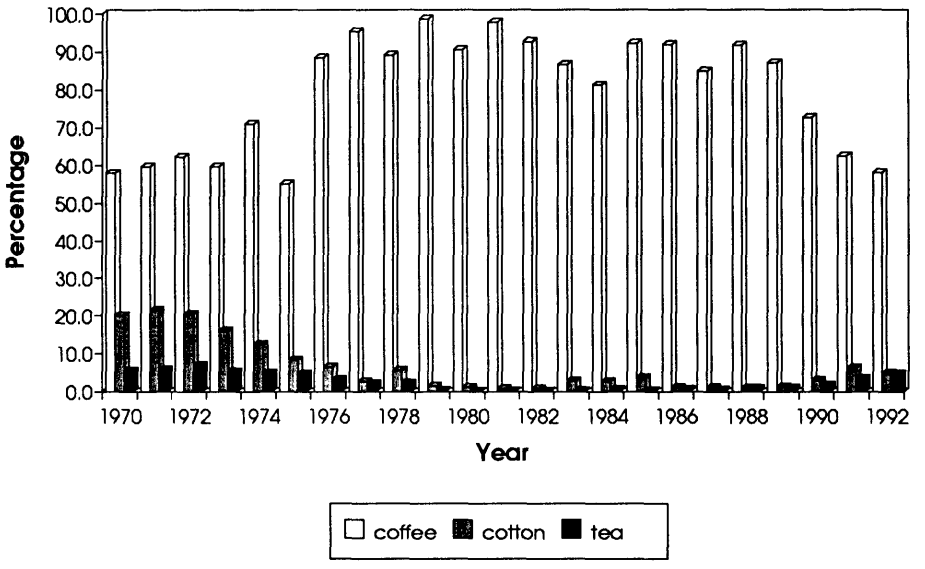
Export crop production stimulates the growth of the financial sector through the use of various banking services, such as credit and savings by farmers, traders and exporters. Virtually all the coffee and tea produced in Uganda is exported; the exports earn foreign exchange and encourage investment in the domestic economy.

Overall, therefore, it is clear that coffee, cotton and tea exports have been and remain central to the growth of the Uganda economy, yet the growth of the agricultural and export sector has been constrained by different government policies, wars, and political instability. It is against this background that the problem of the study can be stated.

## 1.4 Statement of the problem

The success of any economic reforms that are undertaken by a government depend on the achievement of the goals set for different sectors of the economy. One of the major thrusts behind the economic reforms of the Ugandan governments have been to create an environment conducive to export promotion, through primary commodity expansion and export diversification. Efforts to promote exports have mainly been through encouragement of the traditional agricultural exports of coffee, cotton and tea.

**Figure 1.3: Percentage contribution of coffee, cotton, and tea to foreign exchange earnings, 1970-92**

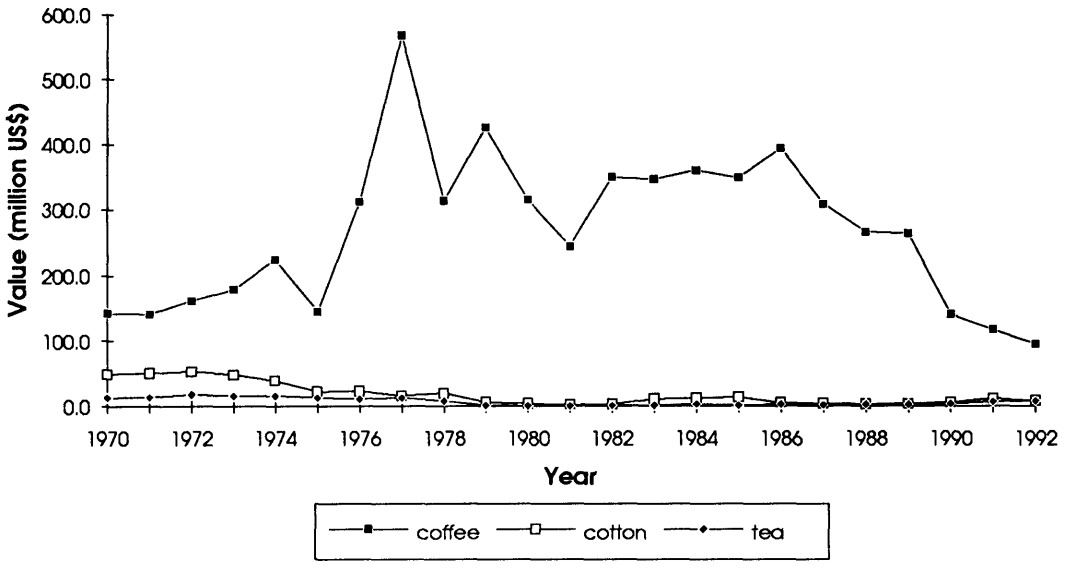



Sources: CMB, LMB and UTA, and MFEP.

However, as seen in Figures 1.1 and 1.2, the production and export volumes of coffee, cotton and tea show a generally declining trend. Even for the years when production and export volumes increased, export earnings remained the same or even declined due to low world prices. Since Uganda is a small exporter and, as such, a price taker in the world market, the value of these traditional exports fell (see Figure 1.4). Uganda thus has had to diversify her exports, especially during the late 1980s and into the 1990s (World Bank 1991; MFEP 1992). Exports have been diversified to include maize, beans, vanilla, and horticultural crops.

Agricultural exports have been the major means of earning essential foreign exchange to finance the development of other sectors of the economy. Export promotion is still claimed to be the major thrust for economic growth and development in Uganda, even though policies to achieve agricultural self-sufficiency and protect infant industries have been pursued to varied degrees (World Bank 1991; MFEP 1992 and 1994a). Carroll (1984) and MFEP (1992) stated that rehabilitation of the agricultural sector was a priority of the government, including revival of exports, consolidation of food supplies, and diversification into non-traditional agricultural exports.

**Figure 1.4: Value of coffee, cotton, and tea exports, 1970-92**




Sources: CMB, LMB and UTA, and MFEP.

An important measure of price incentives to farmers is the purchasing power of earnings from their crops in terms of production inputs and a basket of consumer goods commonly required by the farm family. If the purchasing power of the farm produce, which is the main source of income to the farm family, is reduced, then the farmer's standard of living and production incentive for the commodity is adversely affected also. Farmers in such a situation mainly shift to the production of other crops which offer relatively higher purchasing power. Maize, beans, plantains (*matooke*), sesame and millet are crops that are potential competitors with the traditional export crops, coffee, cotton and tea, for the productive resources of the farmers. Observing the trends in the crops prices between 1972 and 1980, Jamal (1987) noted that food crop prices had increased 20-25 times, whereas export crop prices had increased less than sixfold and, consequently, production of export crops had decreased. Mismanagement of the economy in the 1970s led to rising inflation and black-marketing, especially of coffee, and this made the recorded official exports even lower (Jamal 1987).

This decline in production and exports could be explained by several factors including, the types of economic policies instituted by the Uganda governments, and the international economic environment. The exchange rate of the Uganda shilling (Ushs) against other world currencies, and the various trade policies pursued, are important factors that may have affected the agricultural price incentives and, therefore, the production of coffee, cotton and tea. The trade policies would have had a direct effect on domestic prices, whereas the exchange rate policies would have had an indirect effect on agricultural prices through changes in the value of the commodities, which affects income.

There have been some empirical studies that have analysed the consequences of the trade and exchange rate policies on agricultural price incentives. These include Balassa (1977), Oyejide (1986) in Nigeria, Tshibaka (1986) in Zaire, Bautista (1987) in The Philippines, Krueger, Schiff and Valdés (1988) in about 16 developing countries, and Dorosh and Valdés (1990) in Pakistan. The present study will build on these previous studies to analyse the situation in Uganda but with an emphasis on the traditional agricultural export crops.

## 1.5 Objectives

Based on the foregoing, the major objective of this study is to show the extent to which the various trade and exchange rate policies, pursued by the Ugandan governments over the years 1970-92, have affected the price incentives in the production of coffee, cotton and tea. The objective is achieved by assessing the effects of the changes in the various trade and exchange rate policies in Uganda over these years on the domestic prices of the export crops. A further objective is to draw inferences from the findings and deduce policy implications.

## 1.6 Guiding hypothesis

The above stated objectives lead to the formulation of the guiding hypothesis below:

$H_0$: Trade and exchange rate policies in Uganda over the period 1970-92 have had no effect on price incentives for the production of coffee, cotton and tea.

The a priori expectation is that the trade and exchange rate policies have had a negative effect on price incentives, and have contributed towards the generally declining trend of coffee, cotton and tea exports of Uganda. The different trade and exchange rate policies pursued by Ugandan governments over the period of analysis

are likely to have had different effects on the price incentives. Due to these differences in policies, the results derived and conclusions drawn are expected to be different over the different time periods. Inferences will be drawn from the findings and compared with previous studies in the area; the inferences and comparisons will then be used to deduce policy implications, and thus the objective of the study will have been achieved.

## 1.7 Significance of the study

As shown above, Uganda has relied mainly on the export of coffee, cotton and tea to earn the foreign exchange necessary for the development of other sectors of the economy, and will still have to do so for a long time to come (World Bank 1991; MFEP 1992). It is therefore important to understand the factors that affect the production and export of these three crops.

Because these crops are traded, they are bound to be affected by not only trade and agricultural price polices, but also by the exchange rate and other economy-wide policies. Therefore, it is crucial to assess the impact of both the direct effects of trade and agricultural pricing policies, and the indirect effects of economy-wide macroeconomic policies which affect the real exchange rate. It is particularly important to quantify the indirect effects, because, studies in other countries by Krueger (1992), indicate that the indirect effects of trade, exchange rate and other macroeconomic policies reduced and sometimes reversed the protection, or even worsened the negative protection, provided by agricultural trade policies for some commodities, implying that the actual effects on the price incentives were not as planned.

By adopting the omega free-trade equilibrium approach (to be explained later) to estimating the incidence of protection, the direct and indirect nominal rates of protection are calculated separately and are then used to determine the total effects of trade and exchange rate policies on agricultural price incentives in the production of these export crops in Uganda. A search of the literature failed to uncover any previous study carried out in Uganda, of both the indirect and direct effects of trade and exchange rate policies, based on the omega free-trade equilibrium approach. Therefore, it is hoped that this study will provide useful inputs into the policy-making process in Uganda.

## 1.8 Organisation of the study

Chapter 2 is designed to provide the reader with a profile of the coffee, cotton and tea sub-sectors in Uganda, and a historical overview of the trade and exchange rate policy regimes. Previous studies on the effects of trade and exchange rate policies on agricultural price incentives are reviewed in Chapter 3. In Chapter 4, the analytical framework employed in the study is discussed, and the statistical results are detailed in Chapter 5. Chapter 6 contains the important findings of the study in relation to the objective and hypothesis, and the policy implications of the findings.

# 2. Major export crops and the trade and exchange rate policy regimes of Uganda

## 2.1 Introduction

The production of crops for export was initiated before Uganda gained her independence in 1962. Export of these crops were made possible by the opening of the railway line from Kampala (the capital city of Uganda) to Mombasa (a sea-port on the east coast of Kenya) in the 1930s, and was supported by a strong law and order system which encouraged private traders and entrepreneurs.

Cotton production expanded rapidly during the 1920s and 1930s, and initially dominated exports. However, it was overtaken by coffee in the 1950s. Tea was encouraged during the 1960s, but was never as important as coffee or cotton.

Coffee and cotton is produced by over one million small-scale farmers, whereas tea is grown predominantly on estates. Over the period 1970-92, most of the coffee, cotton and tea produced was exported (88, 89 and 67 per cent, respectively). The remainder of the produce was processed and marketed locally.

## 2.2 Coffee

Coffee is an evergreen shrub or small tree that grows to about 10 m high when wild. Cultivated shrubs, however, are pruned to keep them much shorter. Depending on the variety, trees begin to bear fruit three to five years after planting. Two types of coffee are grown in Uganda, namely robusta (*Coffea canephora*), accounting for 94 per cent of output, and arabica (*Coffea arabica*), accounting for only 6 per cent. The latter is grown mainly on the slopes of Mt Elgon. Robusta coffee, however, is grown mainly in the areas immediately north and west of Lake Victoria (see Appendix 1) where the average annual temperature is 26°C and the rainfall is 1000-1750 mm. As a result of such favourable climatic conditions, Uganda has the potential to be a low-cost competitive producer of coffee. Robusta coffee is indigenous to Uganda and is grown in mixed stands with bananas and other subsistence food crops.

Coffee became increasingly important in the 1950s. It has since then been the largest foreign exchange earner, and continues to dominate the monetary sector. The major importers of coffee from Uganda are the UK, USA, Japan and West Germany.

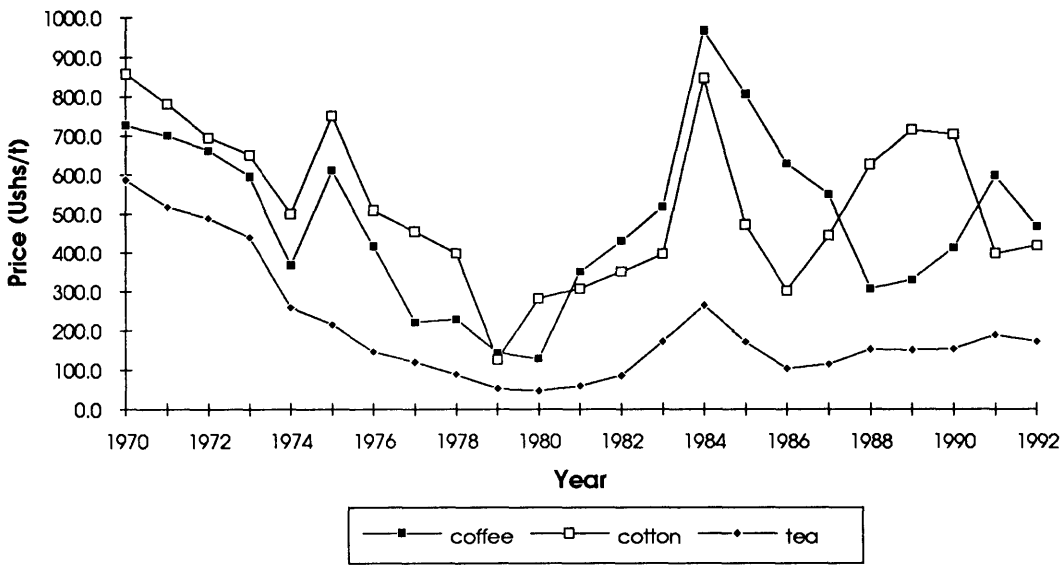
The institutional structure of the coffee industry in Uganda has historically been such that coffee progresses from the smallholder through primary societies to co-operative unions and finally to the Coffee Marketing Board (CMB). The passage of the Coffee Marketing Act in 1969 established the CMB as the sole purchaser and exporter of coffee. In 1991, the Coffee Act was repealed and the CMB was re-constituted as a public limited company. United Exporters Services (UNEX) was formed from five co-operatives, and by mid-1992, UNEX handled 10 per cent of the coffee exports and CMB, 90 per cent (World Bank 1993a). In 1991, the Uganda Coffee Development Authority (UCDA) was formed with the responsibility for policy-making, regulation of coffee trade, and research into, and development of, the coffee sector.

Farmgate prices have been established by the government since before independence in 1962. In addition to setting farmgate prices, the government established processing and marketing margins in the coffee industry prior to 1991. As shown in Figure 2.1, real domestic prices have been falling, reaching their lowest in 1980 with the fall of the Idi Amin regime. However, under the structural adjustment program efforts of the early 1980s, the farmgate price for coffee gradually rose and production responded to this increase in price. Since 1984, the farmgate price of coffee has been allowed to decline relative to the prices of the early 1970s, but it rose again in 1988-92.

Contrary to the trend in domestic prices, international prices have mostly been above the real 1970 prices as shown in Figure 2.2. International prices were high when domestic prices were low and, consequently, substantial income-earning opportunities were lost. Although coffee production and exports were high in the 1970s, they fell steadily between 1973 to 1981 due to mismanagement and neglect of the coffee plantations (World Bank 1993). As a result, Uganda was unable to benefit fully from the high international coffee prices in 1976 and 1977.

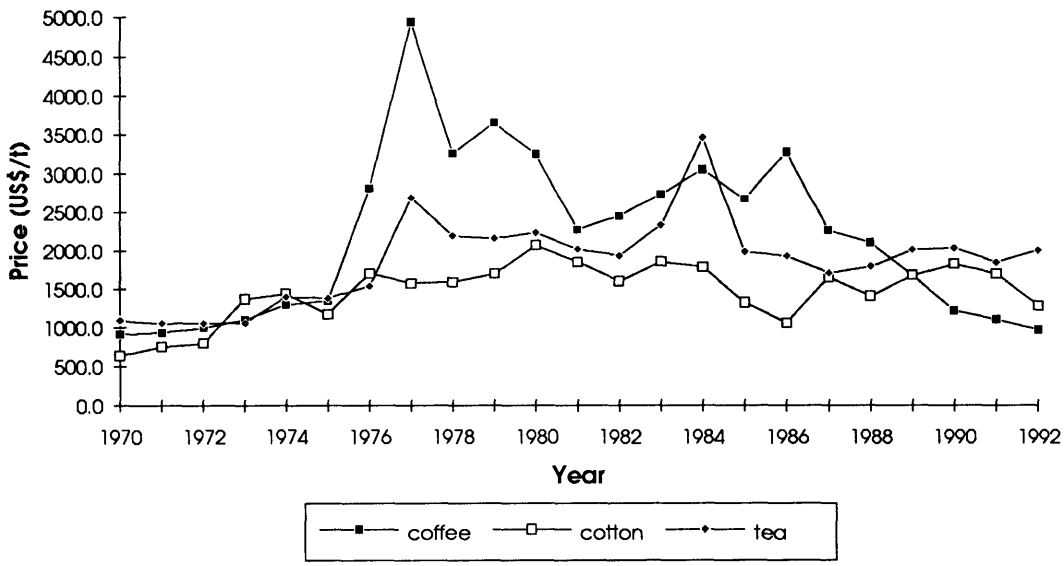
Coffee prices were monitored by the co-operative unions, acting as buyers and hullers for the CMB. The price was supposed to permit smallholders to cover their costs of production. However, the prices were held at low levels or arbitrarily adjusted in line with macroeconomic circumstances. The non-adjustment of the domestic price in an environment of 150-300 per cent annual inflation, starting in 1986, resulted in a serious loss of real value. A crop budget analysis in September 1991 indicated that the farmgate price of robusta coffee in 1991 was about 210 Ushs/kg, which is about half the average costs of production. Prices higher than this are needed to provide incentives for investment in renewing the stock of coffee trees (World Bank 1993a).

**Figure 2.1: Real domestic prices of coffee, cotton, and tea, 1970-92**




Sources: CMB, LMB and UTA, and MFEP.

**Figure 2.2: World prices of coffee, cotton, and tea, 1970-92**




Source: IFS.

Another step in the liberalisation of the coffee industry was taken in March 1991 when coffee exporters were permitted to convert their earnings at the market rate of exchange, and the farmgate price of coffee was allowed to be determined in the market. The government continued to set the minimum price (World Bank 1993a). However, the last link in the chain of government control, the export tax, was still operative. Until 1991, with all marketing and processing margins fixed by the government, the difference between the receipts received from the export of coffee and the government set price, remained with the government. Thus the marginal tax was about 100 per cent. After July 1991, a 5 per cent tax was levied on coffee exports only if the realised price exceeded a threshold, set initially at 1.05 US$/kg. In addition, the pre-established processing and marketing margins set by the government were terminated. However, export earnings continued to be converted to shillings at the official exchange rate until March 1992, when the government allowed coffee export earnings to be converted at bureau rates, and converted all taxes to a 5 per cent tax on the full realised price. Beginning July 1992, the government removed the 5 per cent tax in an effort to provide better production and export incentives.

Uganda was able to meet her International Coffee Agreement (ICA) export quota from 1982 to 1985. Stocks even built up. However, production and exports were interrupted between 1985 and 1986 by the July 1985 and January 1986 coups, and by continued civil strife and political unrest in the south west of Uganda, the major coffee producing area. Production and exports of coffee gradually expanded thereafter and, by 1987/88, Uganda was again able to fulfil her ICA quota and also supply additional exports to non-ICA countries. Van Buren (1995) suggested that this increase in exports was enhanced by the transfer of all coffee trade from trucks to rail freight in 1987, which greatly decreased transport costs from Kampala to Mombasa. By 1988, three-quarters of all coffee exports were transported to Mombasa by rail. In 1989, an export volume of 3.1 million bags of coffee was achieved, the highest in fourteen years. After Côte d'Ivoire and Ethiopia, Uganda was the third largest producer of coffee in Africa in 1991 and 1992. Despite this increased production, export earnings declined due to the collapse of the ICA quota arrangements in 1989, and falling world coffee prices (Van Buren 1995).

## 2.3 Cotton

Cotton (*Gossypium*) is grown as an annual crop, in rotation with subsistence crops such as finger millet and groundnuts, mainly in the northern and eastern parts of Uganda where the average annual rainfall is about 750 mm. Most of the cultivation is done in the second rains from July to November, after which there is a long dry season,

from December to March, that is conducive for the opening of pods to reveal the familiar white tufts of cotton. Depending on the climate, cotton grows for approximately fifty days.

Cotton was introduced to Uganda as a commercial crop in 1902. The ginning and marketing of cotton were historically regulated under the Cotton Act, which was revised in 1964, and the Lint Marketing Board (LMB) Act of 1976. Under the Cotton Act, the country was divided into fourteen zones, and an area was allocated to each ginnery which then became a monopoly buyer. Minimum prices were set by the government in agreement with the ginneries, and the cotton industry was regulated, as far as possible, by government dictate. The profits, however, remained in private hands. Seed and cotton lint prices were fixed, and importation or trade in cotton was restricted. Traders in lint and cotton seed had to be licensed by the LMB. This system of controlled marketing and prices to growers lasted up to 1975 when direct sales overseas began (World Bank 1993a). Main customers of cotton from Uganda are the United Kingdom, Germany, Hong Kong and Portugal.

Cotton is grown by smallholder farmers who are formed into groups called primary societies. Primary societies are responsible for the collection and transportation of produce to ginneries. The cotton lint from the ginneries is then transported to the Lint Marketing Board (LMB). All cotton exports were handled by the LMB until 1991 when trade in cotton, both ginning and marketing, was liberalised and the Uganda Cotton Authority established (MFEP 1994c).

Production and exports expanded over the years, reaching peak volumes in the early 1970s when Uganda ranked third among African cotton producers. Cotton has been the second most important export earner since it was overtaken by coffee in the 1960s. However, following the introduction of synthetic fibres, the importance of cotton as a foreign exchange earner has been eroded by low world cotton prices.

Production drastically declined from 467 000 bales in 1970, to a negligible 15 100 bales in 1980. Carroll (1984) explained that the cause of decline was low official prices paid to farmers, and the physical deterioration of the ginneries (where cotton-seed is separated from the lint), due to neglect during Amin's regime. During the 1980s, the government raised real cotton prices substantially in an effort to restore output levels. The result was an increase in the area planted with cotton. By 1985, cotton contributed to 4.1 per cent of total export earnings to Uganda. In 1986, the Emergency Cotton Production Program (ECPP) was initiated by the government. According to Van Buren (1995), the ECPP did not quite achieve the expected targets of cotton output due to low producer prices, unfavourable weather, and continued

political instability and war during 1986-88 in the major cotton growing areas. The derelict state of ginneries meant that stock piles awaited ginning, although the levels of production were low.

The decline in the production of cotton in Uganda between 1970 to 1980 was aggravated by the fact that, due to an increase in the use of synthetic fibres between 1960 and 1975, the world consumption of cotton fell from 68 to 50 per cent of the world fibre market, despite an overall increase in cotton consumption of 2 per cent per year. As a result of this decrease in demand, the world cotton prices fell. However, world consumption stabilised and, since the mid-1970s, has remained approximately 50 per cent of the world fibre market.

International prices of cotton are subject to considerable fluctuations on the world market and may reflect levels of surplus stocks. During the 1980s, world cotton consumption failed to keep pace with growth in production, and the resultant surpluses led to a fall in international prices. The deep trough in international prices in 1986 (Figure 2.2) caused a rapid resurgence in demand for cotton and the substitution of natural for synthetic fibres in North America and Europe. Prices rose and peaked in 1990. Since then prices have fallen due to a record world crop in 1991.

## 2.4 Tea

Tea (*Camellia sinensis*) is an evergreen shrub requiring undulating hills for cultivation and, like coffee, an average annual temperature of 26°C and rainfall of 1000-1750 mm. Tea is mainly grown on the northern shores of Lake Victoria and in the western parts of the country on large plantations. There are also nucleus estate production systems whereby smallholder production is affiliated with the estates, mainly for purposes of tea processing.

Tea output grew rapidly in the 1960s and reached a record total output of 23 376 t in 1972. Before 1972, Uganda was second only to Kenya among African tea producers. Originally, all the tea plantations were foreign-owned, but smallholder tea development was started in the early 1960s and became the responsibility of the Uganda Tea Growers Corporation (UTGC) in 1966. To augment the activities of the UTGC, the Uganda Tea Authority (UTA) was established in 1974 with the sole responsibility of exporting tea and granting export licences. All tea was, subsequently, auctioned through the UTA.

In 1972, all foreign-owned estates were expropriated by the government and given to parastatals and individuals. This change in ownership of the estates led to poor

management and, as a result, production declined each year. The capacity of the UTGC to provide proper collection and processing services declined sharply in the mid-1970s which, together with falling domestic producer prices, led to a reduction in smallholder production (Carroll 1990). Tea exports dropped catastrophically in 1979 when war with Tanzania forced closure of the factories, all of which are in the southwest or west of the country. Uganda lost her reputation for quality black tea in the world market and, by 1980, tea exports were negligible.

In 1980, Mitchell Cotts, a United Kingdom based company, was invited back by the Uganda government to establish a joint venture with the government to own and operate three estates that covered 2310 ha. Accordingly, the Toro and Mityana Tea Company (Tamteco) was formed, with 51 per cent shares owned by the government, to rehabilitate the overgrown tea plantations and the near-derelict factories. In addition, smallholder tea gardens were rehabilitated under the European Development Fund in a three-year project beginning in 1988. The Agricultural Enterprises Limited (AEL), which owns about 2100 ha of estates and seven tea factories, has also been rehabilitated by a Netherlands company (Carroll 1990).

Exports of tea recommenced in 1981 and, by 1984, Uganda was able to derive some benefit from the high international tea prices of late 1983 and 1984 (see Figure 2.2). However, tea accounted for less than one per cent of the total export earnings between 1981 and 1985. Under the adjustment policies pursued in the 1980s, production recovered slightly but, by 1985-86, continued insecurity caused a decline in production and exports in 1986. Sustained recovery did not occur until 1989. This increased output was consolidated in 1991.

Since 1986, policy reforms such as removal of the Uganda Tea Authority monopoly on exports, valuation of the exports proceeds at the market exchange rate, liberalisation of the export marketing, and permission for foreign exchange retention accounts have stimulated production, and hence exports. The tea sector has been able to retain its foreign exchange earnings and exchange them at bureau rates since 1987. There have not been any explicit taxes on the exportation of tea as there have been on coffee.

The main importer of tea from Uganda is the United Kingdom. Other major world importers are the former USSR and Middle East countries. Uganda is a price taker in the world market, and price prospects are not good. According to the World Bank (1993a), the main reason why world prices are low is that producing countries have continued to increase production, in spite of the low international prices, by maintaining domestic price incentives through currency devaluation and by increasing yields.

## 2.5 Exchange rate and trade policy regimes in Uganda

The performance of agricultural exports depends on the policy environment in the economy. The Ugandan economy is small and cannot influence world prices. Since agriculture accounts for a large share of the GDP and exports, two strategic policies are crucial: exchange rate policies and agricultural pricing policies. Agricultural pricing policy is determined by exchange rate and trade policies, and fiscal and monetary policies. These policies have both direct and indirect implications for agricultural pricing policy. Of importance for this study is how the exchange rate and trade policy changes are translated into changes in agricultural prices, and the consequent effects on the price incentives to produce coffee, cotton and tea.

According to Diakosavvas and Kirkpatrick (1990), exchange rate policies have had a significant impact on agricultural performance in developing countries, and their effects have often out-weighed those of other sector-specific policies. Trade policies such as protection of domestic manufacturing and taxation of agricultural exports, and an over-valued exchange rate, together discourage production of agricultural commodities for export.

### 2.5.1 Fixed exchange rate regime, 1970-80

The East African shilling, equivalent to 14 US cents, was introduced in September 1949, and this valuation remained in force until July 1973. Meanwhile, in August 1966, the Uganda shilling (Ushs) was introduced at par with the East African shilling at 14 US cents or 7.143 Ushs/US$. When the United States dollar (US$) was devalued in December 1971, the rate of the Ushs to the IMF Special Drawing Right (SDR) was fixed at 7.755, and with a further devaluation of the US$ in February 1973, the exchange rate became 8.617 Ushs/SDR. In July 1973, the Uganda shilling was revalued by 3.5 per cent to give rise to a new exchange rate of 6.90 Ushs/US$ (8.3241 Ushs/SDR). However, in January 1974, the shilling was restored to its original valuation of 14 US cents and was tied to the US$ (MPED 1983).

In October 1975, the link between the Ushs and the US$ was ended. The shilling's value was then tied to the SDR based on a weighted basket of 16 national currencies at a mid-point of 9.66 Ushs/SDR. The SDR was, at the time, equal to 8.16 SDR/US$. The tying of the Ushs to the SDR thus represented an effective devaluation of 12.5 per cent. Thereafter, the exchange rate against the US$ was adjusted every month, but the fixed relationship with the SDR remained operative. The Uganda shilling was allowed to float in June 1981, and its value quickly fell by about 90 per cent (MPED 1983).

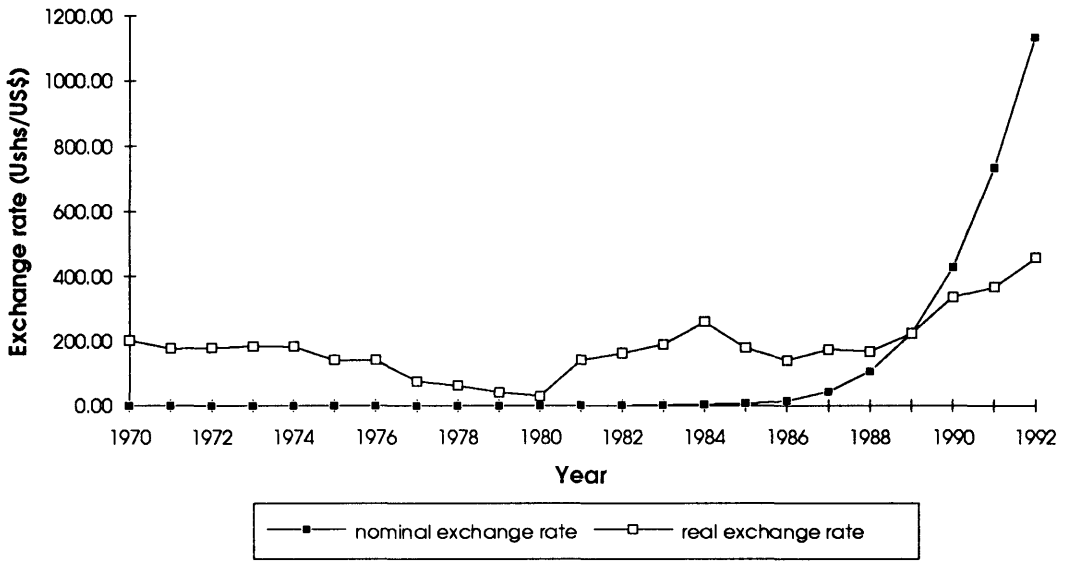
### 2.5.2 Periodic devaluations, 1981-85

Adkisson (1989) explained that the Obote II government launched economic reforms in 1981 to stabilise the economy and revive investment and production by restoring confidence in the Uganda shilling, eliminating price distortions, and improving fiscal and monetary discipline. The government perceived the problem facing Uganda to be the revival of the export sector. The chosen instrument was higher producer prices, and the chosen vehicle for articulating this, devaluation.

During the period 1981-85, several exchange rate regimes were successively pursued. In May 1981, 'Window I', which was a managed float of the exchange rate, was opened. Window I was also the official exchange rate and stood at 8 Ushs/US$ but, by June 1981, the exchange rate had dropped to 77 Ushs/US$. An agreement with the International Monetary Fund (IMF) was signed, with the key component being a 90 per cent devaluation of the Uganda shilling and related price adjustments, specifically on coffee. In August 1982, 'Window II' was opened. Window II was an auction-determined rate introduced at 300 Ushs/US$. At this time, Window I stood at 100 Ushs/US$. By 1984, Windows I and II stood at 292 Ushs/US$ and 326 Ushs/US$, respectively. Windows I and II were merged in June 1984 to form Window III and, thereafter, the exchange rate was determined through auction. The merging of the windows was followed by systematic bidding up of the dollar in a weekly auction by around Ushs 50. By February 1985, within 8 months of merging of the windows, the dollar had reached 570 Ushs/US$ (an increase of 74 per cent) and was still climbing (Jamal 1987). Figure 2.3 shows the trend in the nominal and real exchange rates over the period 1970-92. Since Figure 2.3a does not clearly show the changes in the nominal exchange rate, a logarithmic graph has been drawn (Figure 2.3b) to bring out the pattern of these changes more explicitly.

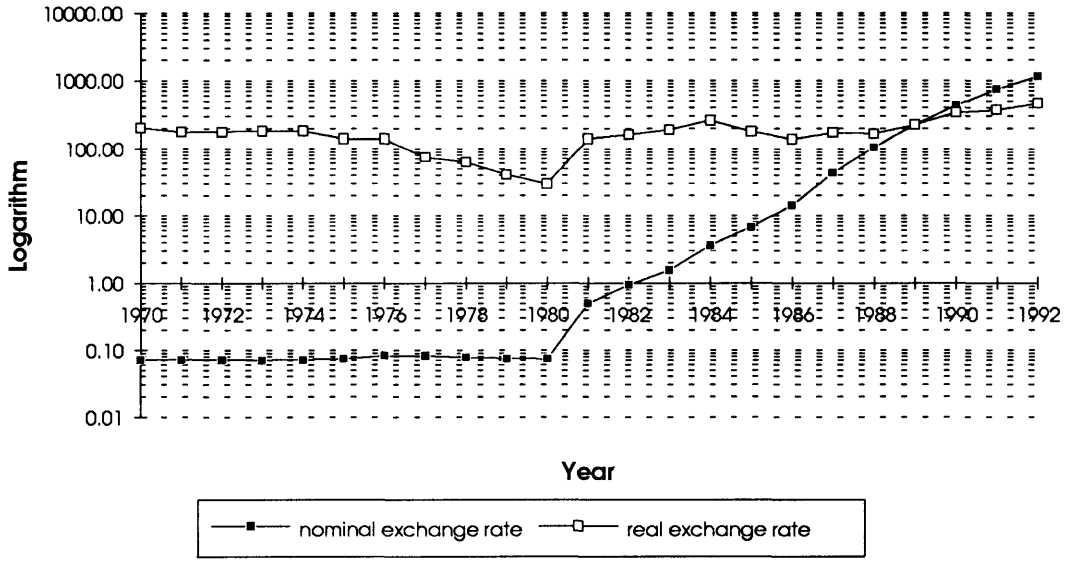
The initial devaluation in 1981 enabled large price increases for the export crops. Export crop prices increased five-fold, practically restoring the parity between export and food crops. As a result, there was a substantial reduction in smuggling and black market operations, GDP grew at an annual average of 5 per cent from 1981 to 1983, and the balance-of-payments improved substantially, due largely to the increase in the coffee export quota. Cotton exports also improved in 1983-84. However, Jamal (1987), Adkisson (1989), and Roberts (1989) concluded that the devaluations and foreign exchange rate auctions were not very successful, and that this progress was short-lived because inflation, an outcome of the exchange rate regime, continued to increase and became an integral part of the economy.

**Figure 2.3a: The nominal and real exchange rates, 1970-92 - Linear scale**




Source: MFEP.

**Figure 2.3b: The nominal and real exchange rates, 1970-92 - Logarithmic scale**



With the establishment of the Agricultural Secretariat in 1982, prices were raised each year to more than compensate for inflation. A system was in place whereby the price of the crop was announced by the Ministry of Agriculture before the onset of the planting season, and farmers responded accordingly. In four years, producer prices increased 30 per cent in real terms. All this happened in the face of declining external terms of trade so that farmers were effectively being given a bigger share of a shrinking fund - a redistribution of income in favour of the farmers. Jamal noted that coffee farmers were the ones who benefited most; cotton farmers did not fare as well due to stagnant output. The country was thus caught up in a spiral of "... devaluation - inflation - high prices - devaluation ..." during the 1981-85 period.

The 1985/86 budget introduced an 11 to 31.5 per cent rise in producer prices for export crops, but as noted by Van Buren (1995), these increases were insufficient to offset the inflation which soared to an average annual rate of 200 per cent in 1986. Figure 2.3b shows the rising rate of the nominal and real exchange rates since 1981.

### 2.5.3 Flexible exchange rate and export promotion, 1986-92

By 1986, the economy was more than ever dependent on imports, and the higher foreign-exchange price was translated into higher prices for consumer goods. Because of Uganda's reliance on imported consumer goods, the floating of the shilling had, by itself, become the source of inflation.

In May 1986, the Museveni government re-introduced a two-tier system of exchange rates with a low priority rate of 1400 Ushs/US$ for basic consumer imports, and a higher market rate of 5000 Ushs/US$ (a 72 per cent devaluation) for all other imports. This measure, designed to encourage exports and to curb the black market, was complemented by a nominal increase in producer prices for coffee and tea. In the 1986/87 budget, the dual exchange rate was abandoned, fixing the shilling instead at the previous 'priority' rate of 1400 Ushs/US$, representing a large revaluation. As a result, the budget deficit tripled. The revaluation of the Uganda shilling was strongly disapproved of by bilateral and multilateral donors (Van Buren 1995).

Under the three-year rehabilitation and development program for 1987/88 - 1989/90 announced in May 1987, the government carried out a currency reform, whereby a 'new' shilling was equivalent to 100 'old' shillings, accompanied by a devaluation of the Uganda shilling in foreign currency terms by 77 per cent, and a conversion tax of 30 per cent on currency and bank deposits held by the public. The estimated rate of inflation at the time was 300 per cent. The new shilling was devalued from

14 Ushs/US$ to 60 Ushs/US$. The exchange rate policy was aimed at maintaining and improving competitiveness in the export sector (MFEP 1992).

In July 1988, the shilling was devalued by 60 per cent so that the exchange rate stood at 150 Ushs/US$ in place of the previous 60 Ushs/US$. The shilling was further devalued and by March 1989 stood at 200 Ushs/US$. The rate on the parallel market fell to 530 Ushs/US$ from 420 Ushs/US$ following the March devaluation (Van Buren 1995).

The revenue from taxes was expected to increase as a result of increased earnings from exports, owing to the devaluation of the shilling, and because of additional taxes on private sector business. The lifting of import duties on raw materials and industrial equipment, and the reduction of interest rates were aimed at encouraging investment in domestic industry (Van Buren 1995).

A new economic recovery policy was launched in 1988 with emphasis on the diversification of the economy away from over-dependence on coffee production and exports. At the same time a more flexible exchange rate policy was pursued. (MFEP 1992). In July 1989, the two-tier foreign exchange rate system was reintroduced. The Bank of Uganda sold foreign exchange to importers at 400 Ushs/US$, undercutting the parallel market rate of about 600 Ushs/US$ at the time. The selling rate was adjusted weekly. There were also producer price increases at this time (Van Buren 1995).

The overall objective of the government was to ensure that a competitive exchange rate, and an efficient system of foreign exchange allocation, was achieved (MFEP 1992). In accordance with the objectives, the liberalisation of the foreign exchange allocation system began in January 1988 with the creation of the Open General Licensing (OGL) system which made foreign exchange available to a limited number of manufacturing firms. To supplement the OGL, the government introduced the Special Import Program (SIP), beginning December 1988. SIP only operated when the supply of foreign exchange was relatively high, and made foreign exchange available to all importers on a 'first-come-first-serve' basis for importation of any products, subject to a common negative list (MFEP 1992). As a result of the divergence between the official exchange rate and the market clearing rate, the OGL and SIP systems have provided implicit subsidies to importers who gained access to them.

The government also took steps to improve export incentives and remove bureaucratic impediments to exports. In December 1988, all exporters of non-traditional export products were granted 100 per cent retention of foreign exchange, thereby implicitly

sanctioning conversion of the proceeds to local currency at the parallel market exchange rate through imports. This scheme was extended to non-coffee exports in March 1989 (MFEP 1992).

Parallel markets for foreign exchange were legalised in July 1990, and forex bureaux markets have grown rapidly since then, making foreign exchange available at the market rates. Official rates have been adjusted as frequently as required to maintain a competitive real effective exchange rate, and to achieve gradual convergence of the official and forex bureaux rates (MFEP 1992).

By the end of March 1991, further devaluations reduced the shilling to 620 Ushs/US$. In February 1992, the OGL and SIP systems were replaced by the foreign exchange auction, with the Bank of Uganda auctioning to the commercial banks (MFEP 1992; Van Buren 1995). Initially this produced a rate of 980 Ushs/US$. By June 1992 the official rate was 1300 Ushs/US$ and by June 1993, the shilling had stabilised and was trading at 1197 Ushs/US$.

### 2.5.4 Agricultural commodity trade policy in Uganda

As seen in sections 2.2 to 2.4, coffee, cotton and tea were marketed, since 1970, through marketing boards, namely the Coffee Marketing Board, Lint Marketing Board and Uganda Tea Authority. These monopolistic marketing boards were government parastatals and, with time, were unable to serve the producers efficiently. Export procedures were cumbersome, and all exports had to be channelled through the marketing boards. The presence of export licences and stringent trade controls acted to stagnate export growth rather than encourage it. The foreign exchange market reforms in the latter half of the 1980s, and the replacement of these previous systems of trade controls, such as the marketing boards, with simple transparent procedures for imports and exports, have helped in liberalising trade.

In 1986, emphasis was placed on efficient import substitution, efficient and sustained investment in export oriented industries, and expansion of markets. These were achieved by trade liberalisation both internally and externally. Internal reforms included regular review and provision of remunerative prices to farmers, restructuring and divestiture of agricultural parastatals to allow competitive production and marketing, and expansion of agricultural services. In addition, diversification of agricultural exports into horticultural crops including pineapples, passion-fruit and avocados, as non-traditional exports, exploration of new markets both overseas and in

the Preferential Trade Area (PTA), and liberalisation of foreign exchange markets, assisted in encouraging export promotion and trade (MFEP 1992).

The continued foreign exchange crisis led to the signing, in May 1987, of a series of barter arrangements with several countries whereby Uganda was supplied with goods and services in return for commodities: mainly coffee, but also cotton, maize, beans and sesame seed. By 1989, there was insufficient agricultural surplus to fulfil commitments. Although it had been hoped that barter arrangements would be a means of diversifying exports, coffee still remains the main export commodity (Van Buren 1995).

Import and export procedures have been eased greatly by replacing licensing (the OGL system where foreign exchange was regularly available to only a limited number of manufacturers) with a certification system. Under the certification system, importers were permitted to import goods without regard to the source of the foreign exchange. The certification system was, therefore, susceptible to rent-seeking behaviour by its holders. Export certificates were introduced in September 1990 and import certificates in November 1991 (MFEP 1992). A holder of an export or import certificate could export or import any good that was not on the negative list, that is, a list that included any good whose export or import was prohibited for environmental, diplomatic, international, health or any other grounds.

Furthermore, the dismantling of the marketing boards between 1986 and 1991 made exporting less cumbersome, and ensured the transparency and predictability of minimal regulation. Liberalisation of agricultural marketing has swept across essentially all agricultural products. In addition to price incentives, there is free movement of produce within the country.

According to statistics from The Economist (1980) and MFEP (1994c), the major buyers of Uganda exports are the USA, 25.1%, the UK, 17.5%, France, 13.1%, the Netherlands, 13.8%, Spain, 12.2%, West Germany, 8.9%, and Italy, 6.9%. The major countries from which Uganda gets her imports are Kenya, 29.6%, the UK, 18.5%, West Germany, 11.3%, Italy, 9.7%, Japan, 7.6%, India, 5.7% and the USA, 4.5%. These are average shares of trade with Uganda over the period 1985 to 1990.

# 3. Literature review

## 3.1 Introduction

The objective of this chapter is to investigate the salient features of the analytical methods that have been employed in different studies on the effects of exchange rate and trade policies on agricultural price incentives. It will be achieved by reviewing studies that have been undertaken in the area.

There are two broad aspects in the measurement of the effects of trade and exchange rate policies on agricultural price incentives: the incidence of protection, measured by an incidence parameter and the equilibrium real exchange rate; and the government policy intervention effects. The latter includes direct and indirect effects. The indirect effects are due to economy-wide macroeconomic and trade policies which affect the real exchange rate; the direct effects are due to agricultural pricing and trade policies. In this review, therefore, these aspects are addressed under different sub-headings.

Figure 3.1 illustrates the options for the choice of method of analysis that were found in the literature reviewed. In the estimation of the equilibrium real exchange rate, there are three options: the omega free-trade equilibrium approach, the real exchange rate equation method, and the elasticities approach. The equilibrium real exchange rate is then used in the estimation of several other policy intervention measures which take into account the direct and indirect effects on agricultural price incentives.

## 3.2 The omega free-trade equilibrium approach

### 3.2.1 Theoretical aspects to the incidence of protection

Mundell (1960) set out many of the basic theorems of international trade within the context of the traditional two-commodity (exportables and importables[1]), two-country, general equilibrium model. He used his model to determine, among other things, the effects of export and import taxes, and productivity changes on international equilibrium and upon relative prices and income.

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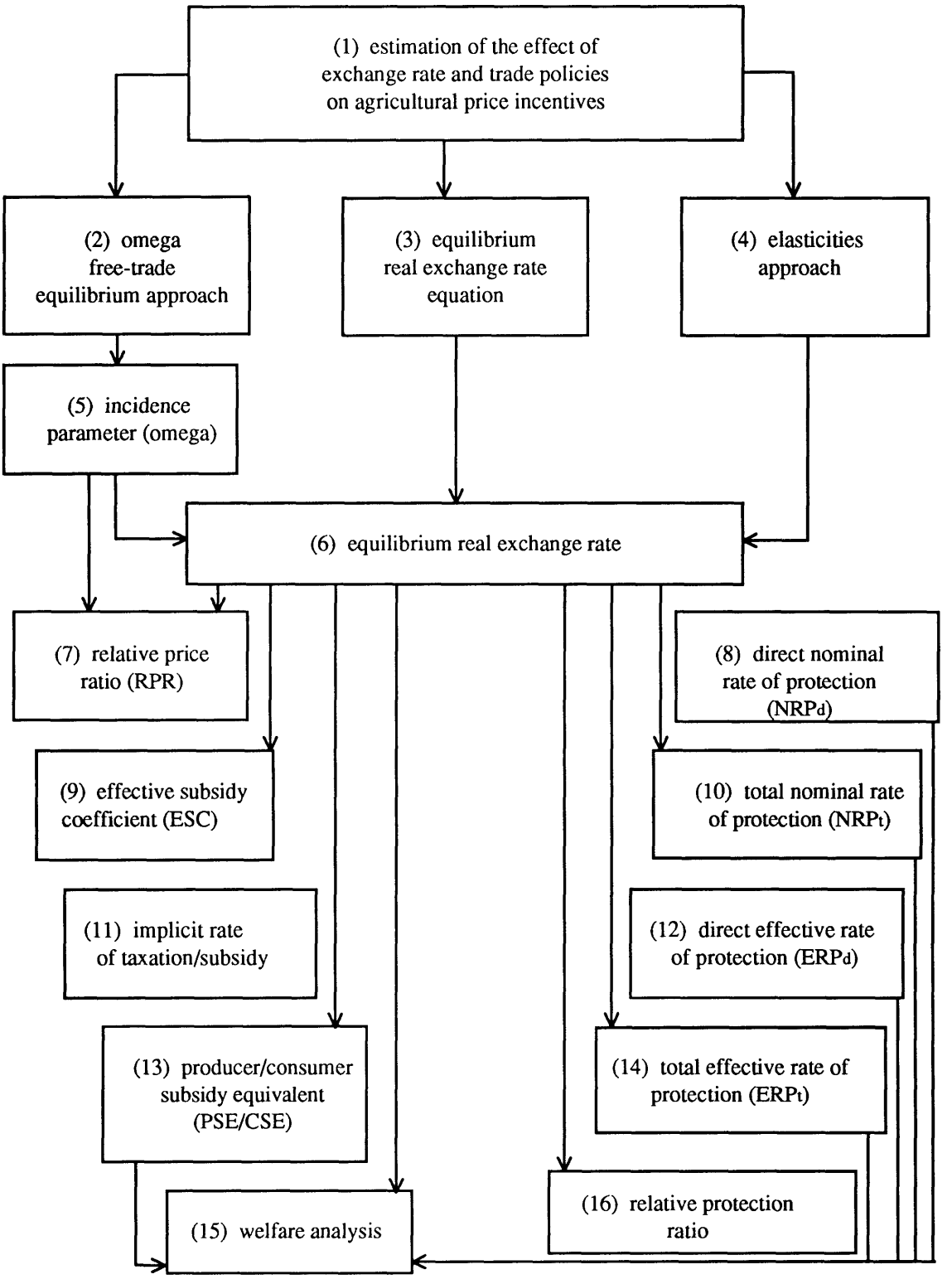
[1] Exportables are defined as those domestically produced goods which are or could be exported, any remaining being consumed at home. Similarly, importables are goods which are or could be imported (Swidrowski 1975).

**Figure 3.1: Options for choice of method**




Note: Rectangles 7 to 16 represent the different measures of policy intervention

McDougall (1970) extended Mundell's two-commodity analysis to a three-sector framework, whereby, because of transport costs, there exists a third class of commodities, the non-tradeables[2], that do not enter international trade. The presence of home goods, therefore, introduces a third nominal price and a second relative price. McDougall argued that the price of these non-traded[3] goods would move in a different manner to the price of tradeables[4]. The resulting supply and demand effects which would accompany a change in the home goods price level would affect the general outcome of export and import taxes and productivity changes.

Dornbusch (1974) and Sjaastad (1980) extended McDougall's three-commodity model, and specifically discussed the effects of taxes and tariffs in a small open economy. This sectoral approach is called the 'true' protection analysis and focuses on the incidence of protection.

The models developed by Dornbusch and Sjaastad are based on similar assumptions. The home country consumes and produces exportables, importables and home goods; the country is small so that the relative price of traded goods in the world market is taken as given; income is equal to expenditure; initial distortions are absent; the relative prices of tradeables in terms of home goods is flexible so as to allow the home goods market to clear; and trade is balanced.

Sjaastad explained that a policy that protects one sector of the economy essentially imposes a tax on other sectors of the economy, but the degree to which that protection results in a damage to other activities depends upon the substitution relationships in production and demand.

Dornbusch and Sjaastad considered the case where home goods substitute for traded goods in a free-trade equilibrium situation. Imposition of a tariff would raise the relative price of importables in terms of the home goods, granting protection to the import-competing activities at the expense of all other sectors, whereas the equilibrium relative price of exportables would decline in terms of home goods, taxing the export sector. The result would be an excess demand for home goods and a matching trade

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[2] Non-tradeables are those goods produced and consumed in the country and are not physically traded internationally (Swidrowski 1975). Sjaastad (1980) defined home goods as those whose relative internal prices cannot be deduced directly from the external relative prices plus the tariff-subsidy schedule.

[3] Non-traded goods/home goods/non-tradeables/domestic goods have been used inter-changeably.

[4] Includes both importables and exportables.

surplus. To attain equilibrium, the price of home goods would have to increase relative to the prices of tradeables, or the prices of tradeables would have to fall by the same proportion as the price of home goods.

Sjaastad stated that the key question then is to determine the extent to which protection of the import-competing activities is shifted onto the export sector, which is measured by the incidence of protection, $\omega$. Sjaastad defined $\omega$ as the negative of the percentage change in the real exchange rate for exportables ($P_x/P_h$) for a given percentage change in the ratio of the domestic price of importables relative to exportables ($P_m/P_x$), which can be represented as follows:

$$\omega = -\left( \frac{\Delta(P_x / P_h) \; / \; (P_x / P_h)}{\Delta(P_m / P_x) \; / \; (P_m / P_x)} \right) \qquad (3.1)$$

where:

$P_h$ = domestic price index of home goods;
$P_x$ = domestic price index of exportables;
$P_m$ = domestic price index of importables; and
$\omega$ = incidence parameter.

Using this definition, Sjaastad explained that $\omega$ could be estimated from the equation:

$$\text{Ln}\,(P_h / P_x) = \text{constant} + \omega\,\text{Ln}\,(P_m / P_x) + \text{error term} \qquad (3.2)$$

where Ln is the natural logarithm operator.

Sjaastad showed that the value of $\omega$ lies between zero and minus one. If the shifting of import duties onto the export sector is slight, ($\omega \rightarrow 0$), which occurs when the home goods and exportables are close substitutes in demand or production, the burden is borne by the home goods sectors. But if the shifting of import duties onto the export sector is large, ($\omega \rightarrow 1$), which occurs when the home goods and importables are good substitutes in demand or production, the burden of the import duty is mainly borne by the export sector.

One of the main conclusions that emerged from Dornbusch's and Sjaastad's work was that, given the uniform import tariff and export subsidy equivalents, the incidence of the trade distortions depends only upon substitution effects. These effects could be summarised into a single parameter, $\omega$, which determines the extent to which import duties are shifted onto the export sector and, hence, become the equivalent of export

taxes. Thus, $\omega$ depends only on the substitution possibilities in production and demand and so is not influenced by the structure of the duties and subsidies on imports and exports. Another conclusion was that, while commercial authorities can fix the individual tariffs and subsidies, they have little control over the incidence, on importers and exporters, of the actual tariff and subsidy structures. In addition, the overvaluation of the domestic currency induced by protection is identical with the effect of that protection on the nominal price of the home goods.

The following section encompasses empirical studies using the omega free-trade equilibrium approach to estimate both the incidence parameter and the equilibrium real exchange rate.

### 3.2.2 Empirical studies on the incidence of protection and estimation of the equilibrium real exchange rate

The omega free-trade equilibrium approach to estimating the equilibrium real exchange rate that would prevail in an open economy with free trade is based on the estimation of the incidence parameter. Referring to Figure 3.1, this option for analysis follows through rectangles 2, 5 and 6. It involves estimating the incidence parameter which is then used in the calculation of the equilibrium real exchange rate. Having determined the equilibrium real exchange rate, the indirect effects of economy-wide trade and macroeconomic policies can then be calculated. By adding the indirect effects to the direct effects, the total effects can then be found.

The equilibrium real exchange rate is the exchange rate that would exist in a open economy with free-trade and no government intervention. It is the rate which would keep the current account at a sustainable level, taking into account normal capital flows, if all quantitative and tariff protection against imports and interventions affecting exports were removed (Edwards 1988).

García (1981) did a study on the effects of exchange rate and commercial policy on agricultural incentives in Colombia for the period 1970 to 1979, using monthly data. García followed the model developed by Dornbusch (1974) and Sjaastad (1980), but modified it to allow for two exportable sectors; coffee and non-coffee exports. The results indicated that there was a high degree of incidence of commercial policy on the exports of Colombia as shown by an average value for $\omega$ of –0.96, implying that about 96 per cent of the burden of protection granted to other sectors of the economy fell on the exportable sector.

Oyejide (1986), Tshibaka (1986) and Bautista (1987) undertook studies on the effects of exchange rate and trade policies on agricultural incentives in Nigeria, Zaire and the Philippines, respectively. They used the models illustrated by Dornbusch (1974) and Sjaastad (1980), that is, equation 3.2, to show how trade and exchange rate policies have economy-wide repercussions on the structure of relative prices. All three studies used annual time series data. Ordinary least squares (OLS) and autocorrelation-corrected estimates were computed.

Oyejide (1986) investigated the degree of protection granted to agriculture in Nigeria compared to other sectors. He studied the aggregate effects on agriculture, oil and mining, services and manufacturing, and some individual crops, namely cocoa, groundnuts, and palm kernel. For the period 1960 to 1982 in Nigeria, the incidence of protection, $\omega$, was found to lie between –0.55 to –0.90, meaning that imposition of import tariffs resulted in 55-90 per cent implicit taxation on exportables including agricultural exports.

In the study on Zaire, the incidence parameter, $\omega$, was found to be –0.52, which implied that at least half the burden of protecting importables fell on the exports for the period 1971-82 (Tshibaka 1986).

Bautista (1987) estimated a similar equation to the one developed by Dornbusch and Sjaastad, but included productive capacity and balance-of-trade as other explanatory variables. The productive capacity variable (determined by the existing level of technology and resources) was used to represent real GNP. Bautista re-estimated the equation without the productive capacity variable, and then without both the productive capacity and balance-of-trade variables. The value of $\omega$ was found to range between –0.85 and –0.87, showing that about 86 per cent of the burden of protecting the import-competing sector fell on the exportables. All the coefficients were found to be significant at the one per cent level, and the coefficient of determination, $\overline{R}^2$, was greater than 90 per cent in all three estimated equations. However, the equation with all the explanatory variables gave the best fit (highest $\overline{R}^2$), suggesting that it is superior to the models without the extra explanatory variables, including Oyejide's and Tshibaka's.

The method of analysis used by García, Oyejide, Tshibaka and Bautista is represented by rectangles 2, 5 and 7 in Figure 3.1. However, Dorosh and Valdés (1990) went through a slightly different option of analysis represented by rectangles 2, 5 and 6, and later also 8 and 10, reviewed below.

Dorosh and Valdés (1990) did a study similar to the previous ones, but for Pakistan, using quarterly data from 1961-87. They determined the effect of real exchange rate policy changes on the agricultural sector using two approaches, namely, the free-trade equilibrium approach, and the elasticities approach. Under the omega free-trade equilibrium approach, Dorosh and Valdés (1990) estimated the equation:

$$\text{Ln RER}_x = \text{constant} + \omega \text{ Ln trpol}_t + \beta_2 \text{ Ln tt}_t + \beta_3 \text{ Rremit}_t + \beta_4 \text{ Raid}_t + \beta_5 \text{ Rgovt}_t + \text{error term} \quad (3.3)$$

where:

| | |
|---|---|
| Ln $RER_x$ | = natural logarithm of the real effective exchange for exports, Ln ( E $\left(P_T^w / P_h\right)(1-t_x)$ )[5]; |
| $\omega$ | = the incidence parameter; |
| Ln trpol | = natural logarithm of 'trade policy', Ln $((1+t_m)/(1-t_x))$; |
| Ln tt | = natural logarithm of external terms of trade, Ln $\left(P_x^w / P_m^w\right)$[6]; |
| Rremit | = (private transfers in dollars divided by $P_T^w$ ) / real GDP index; |
| Raid | = (sum of aid loans and grants to Pakistan measured in dollars divided by $P_T^w$ ) / real GDP index, lagged two quarters; and |
| Rgovt | = (government expenditures) / real GDP index. |

The real effective exchange rate for exports ($RER_x$) was used as the dependent variable because export subsidies and taxes had been significant in Pakistan. OLS and autocorrelation-corrected estimates were calculated and the equation re-estimated using two-stage least squares (2SLS) with instrumental variables to correct for possible endogeneity problems.

Dorosh and Valdés found $\omega$ ranging between –0.410 and –0.677 meaning that, in Pakistan, about 50 per cent of the protection accorded to the import-competing sector through the imposition of tariffs resulted in taxation of the exportables sector of the economy.

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[5] $P_T^w$ = trade-weighted world price index of tradeable goods; $t_x$ and $t_m$ are the implicit export tax rate and implicit import tariff rate, respectively.

[6] $P_x^w$ and $P_m^w$ are the world price indexes of exportables and importables, respectively.

Dorosh and Valdés did more extensive analysis than that in the previous studies reviewed. The estimated value of $\omega$ was used to calculate the equilibrium real exchange rate index, using the formula:

$$\text{equilibrium } RER_x = RER_x \cdot [(1+T)^{-\omega}] \qquad (3.4)$$

where $(1+T) = (1+t_m)/(1-t_x)$, and is known as the equivalent tariff or 'trade policy'.

The estimated equilibrium real exchange rate could then be used in the determination of the indirect effects of trade and exchange rate policies. These indirect effects are included as part of the total nominal rates of protection (rectangle 10 in Figure 3.1).

Hurtado, Valdés and Muchnik (1990), in a study on Chile, estimated an equation, using seasonally adjusted quarterly data, with an average value of the real exchange rate as the dependent variable. Their independent variables were somewhat different from those used by Dorosh and Valdés. The explanatory variables included absorption as a percentage of GDP[7]; external terms of trade, domestic terms of trade, ratio of the value of domestic industrial exports to domestic industrial production, deflated index of wages paid by the public sector, and the real exchange rate lagged one period. Hurtado et al. found that $\omega$ was –0.28, implying that only about 28 per cent of the burden of protection of imports fell on the exportables for the period 1960 to 1982.

Kim (1994) sought to obtain an economy-wide measure of the incidence of protection, $\omega$, in Korea. The free-trade equilibrium equation Kim estimated included additional explanatory variables in the basic model (equation 3.2) by Dornbusch and Sjaastad. These extra explanatory variables included external terms of trade, current account surplus, and growth of the economy with the log of GDP used as its proxy. Kim used both seasonally adjusted and seasonally unadjusted quarterly data. Estimation procedures were similar to those used by Dorosh and Valdés, including OLS, an autocorrelation-corrected model, and 2SLS estimation with instrumental variables. The long-run estimates for $\omega$ were –0.446 and –0.434 for seasonally adjusted and unadjusted data, respectively, giving an average of –0.44, meaning that about 44 per cent of the import tariffs in Korea were shifted onto the exportable sector of the economy. Referring to Figure 3.1, Kim's analysis only covered rectangles 2 and 5.

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[7] Absorption = C+I+G, and GDP = C+I+G+(X-M); where C = consumption, I = investment, G = government expenditure, X = value of exports and M = value of imports.

## 3.3 The real exchange rate equation method

An alternative approach to determining the equilibrium real exchange rate is obtained by using the real exchange rate equation method, following options in rectangles 3 and 6 in Figure 3.1.

Edwards (1988) developed a model to investigate how changes in the fundamental determinants of the equilibrium real exchange rate affect its path through time. The model was developed in a three-commodity framework of a small open economy. Edwards assumed that all the three goods (exportables, importables and non-tradeables) are consumed and are produced competitively, households utility is maximised, and international markets where individuals or firms can borrow and lend at the given world interest rate are present. He also assumed that the only constraint is that the present value of the current account balances has to be zero.

From this model, Edwards (1988) deduced that the most important determinants of the equilibrium real exchange rate are: external terms of trade, level and composition of government consumption of non-tradeables, controls on capital inflow, and exchange rate and trade controls (ie import tariffs and export taxes). Other possible determinants of the equilibrium real exchange rate that Edwards did not derive explicitly from his model are technological progress, and capital accumulation (investment ratio of GDP). Edwards (1989) used this real exchange rate model equation to determine the equilibrium real exchange rate for 12 developing countries using pooled data.

In a more detailed account of the model in Edwards (1989), it was noted that, before estimating an equation to make the model operational, one of the major issues that needs to be resolved is data availability. Often, data limitations mean that some variables either have to be omitted or, alternatively, proxies for them have to be found. Edwards (1989) suggested proxies for some of the variables, for example, a suitable proxy for capital control is the ratio of the net capital inflows to GDP, while proxies for exchange and trade controls are the implicit import tariffs and implicit export taxes.

## 3.4 The elasticities approach

A third approach to determining the equilibrium real exchange rate is the elasticities approach and, in Figure 3.1, follows the options through rectangles 4 and 6.

Krueger, Schiff and Valdés (1988) undertook a project on the political economy of agricultural pricing policies for eighteen developing countries. A comprehensive

report of this study is in Krueger, Schiff and Valdés (1991). Estimates of the equilibrium real exchange rate were determined using the elasticities approach. The estimated equilibrium real exchange rate was then used in calculating indirect and total nominal rates of protection. In Figure 3.1, the option of analysis used by Krueger et al. is rectangles 4, 6 and 10.

This involved estimating the equivalent tariff of import protection and the foreign exchange demand and supply elasticities; and then undertaking a comparison with the actual real exchange rate to estimate the amount of change needed in the real exchange rate to yield a sustainable current account level. The equilibrium real exchange rate was determined from the equation:

$$RER^{*} = E \cdot \frac{Q_0 + \left(t_m/(1+t_m)\right)\cdot \eta_D\, Q_D - \left(t_x/(1-t_x)\right)\cdot \varepsilon_S\, Q_S}{\left(\varepsilon_S\, Q_S + \eta_D\, Q_D\right)} + 1 \qquad (3.5)$$

where:

$RER^{*}$ = equilibrium real exchange rate;
$E$ = official nominal exchange rate;
$Q_0$ = unsustainable deficit in the current account = $Q_D$-$Q_S$;
$\eta_D$ = elasticity of demand for foreign exchange (that is, the elasticity for demand for imports);
$\varepsilon_S$ = elasticity of supply of foreign exchange (that is, the elasticity of supply of exports);
$Q_D$ = demand for foreign exchange (the level of imports); and
$Q_S$ = supply of foreign exchange (the level of exports).

A limitation of this method is that it requires estimates of both implicit tax ($t_x$) and tariffs ($t_m$) as well as the supply and demand elasticities of foreign exchange.

Using the elasticities approach, Dorosh and Valdés followed the method executed by Krueger et al. (1988). Dorosh and Valdés found that the equilibrium real exchange rate series, estimated using the free-trade equilibrium approach, followed a similar pattern over the years to those obtained using the elasticities approach. However, both approaches to calculating the equilibrium real exchange rate are essentially comparative static approaches, based on the implicit assumption that the observed historical exchange rates, trade levels, and other macroeconomic variables are in equilibrium.

## 3.5 Digression: estimation of the implicit export tax and the implicit import tariff rates

Dorosh and Valdés (1990) presented two ways of calculating the implicit export tax and the implicit import tariff. In the absence of import and export quotas, good measures of the average implicit import tariff ($t_m$) or export tax ($t_x$) rates are calculated using actual revenues and trade values. However, when binding quantitative restrictions are taken into account, the implicit import tariff or export tax is calculated from the ratio of domestic to world prices of the import and export goods, thus giving a more accurate measure of the direct effect of trade policies. The implicit taxes or tariffs on each category of exports or imports are aggregated using value shares as weights in order to calculate the average implicit tax or tariff. A time series for $t_x$ and $t_m$ is then constructed from base-year estimates of average implicit export tax or import tariff, and from price indices of export and import goods. Thus, the latter method was used by Dorosh and Valdés to calculate the implicit tax and tariff rates for Pakistan because quantitative restrictions on imports had a significant effect on domestic prices of imports.

Kim (1994) calculated the implicit export tax and implicit import tariffs rates as the differences between the domestic and external prices of tradeables converted to percentages. He considered any price wedge between the domestic and external prices attributable to export promotion and import protection, and so his measures included any direct and informal incentives (or barriers) the Korean government used. Bautista (1987) also used this same method to calculate the implicit export tax and implicit import tariffs rates for the Philippines. The limitation with this measure is that it suggests that transport, marketing and other such costs, included in the price wedge, are all part of the implicit tariffs and taxes.

In order to estimate the equilibrium real exchange rate, the choice of method of analysis, up to now, has included the omega free-trade equilibrium approach, the real exchange rate equation method, and the elasticities approach. Referring to Figure 3.1, the equilibrium real exchange rate (rectangle 6) acts as an intermediary trade policy variable measure. It is used in the calculation of several of the policy intervention measures found in the studies reviewed. The following sections cover the various policy intervention measures that were used in the studies reviewed.

## 3.6 Measures of policy intervention

Trade, exchange rate, fiscal, and monetary policies have a significant impact on agriculture in developing countries, and their effects often overshadow those of sector-

specific policies. According to the World Bank (1986), these policies are leading determinants of the growth and composition of agricultural output, and the volume and composition of trade in agricultural products. They are often the principal sources of bias against agriculture.

In spite of the above, all governments intervene in agricultural markets in order to raise tax revenues, support producers' income, reduce consumers' food costs, attain self-sufficiency in food production, or counter interventions of other governments. There are numerous policy instruments for government intervention, such as direct trade interventions (taxes, tariffs, and quotas), controlled exchange rates, and market price supports. Economists have devised several measures of comparative or competitive advantage, gains from freer trade, and losses from market distortions. Among these measures, four widely used ones, from the least to the most comprehensive, are: nominal protection coefficient (and rates); effective protection coefficient (and rates); producer and consumer subsidy equivalent; and classical welfare analysis (Tweeten 1992). Referring to Figure 3.1, these measures are represented by rectangles 8 and 10, 12 and 14, 13, and 15 respectively.

### 3.6.1 The nominal protection coefficient

Nominal protection coefficient (NPC) is the ratio of the domestic price of a commodity to its border price (measured at the farmgate). Conceptually, the NPC is an indicator of domestic policy distortions. The NPC is expressed as:

$$NPC = \left(P_i / P_i^{"}\right) \qquad (3.6)$$

where:

$i$ = the commodity in question;
$P_i$ = domestic price at the farmgate; and
$P_i^{"}$ = border price[8] for an exportable good.

[8] The border price is defined as the international price converted into a country's currency, usually at the official exchange rate. The border price relevant for imports is the c.i.f minimum delivery price at the nearest port plus additional transport costs to the market. In the case of an export, the border is the f.o.b maximum price available at the nearest port less transport and other marketing costs of getting the commodity to the port from the producers' market (Tweeten 1992).

The direct nominal rate of protection ($NRP_d$) is the percentage by which the domestic price exceeds, or is lower than, the border price. It can be expressed as NPC-1, which is the same as:

$$NRP_d(i) = \frac{P_i - P_i''}{P_i''} \qquad (3.7)$$

When the NPC is less than one, the NRP is negative, and this means that farmers receive a lower domestic price than the ruling price on the world market, resulting in implicit taxation of their produce, and a disincentive to production.

NPCs and NRPs are limited in that they do not quantify the impact of all government policy on the relative income of the agricultural sector, and they omit taxes or subsidies that do not affect the farmgate price of the product. Despite these shortcomings, they are likely to show the correct direction of agricultural distortions (Lindert 1991). Two micro-level measures that avoid this defect are the effective rates of protection (ERP), widely used in the 1960s and 1970s, and the producer subsidy equivalent (PSE) developed in the late 1980s (Tweeten 1992).

### 3.6.2 Effective protection coefficient

Agricultural production involves the use of inputs of materials and services which may also be protected or taxed. As a result of divergences between domestic and international prices, value-added, rather than the product price, is used to determine the effective protection coefficient (EPC). Thus, the EPC quantifies the effects of protection on inputs as well as outputs by measuring the domestic value-added as a proportion of foreign or world value-added (Corden 1971; Balassa 1971; Scandizzo and Bruce 1980; Hassan, Greenaway and Reed 1992; Tweeten 1992). The domestic value-added on the product, and on its inputs, results from the imposition of tariffs and other protective measures. It is defined as the ratio of value-added calculated using the domestic market prices, to the value-added using the border prices. When converted into percentages, the EPC becomes the effective rate of protection (ERP).

Assuming three traded inputs (i = 1,2,3) and three non-traded inputs (i = 4,5,6), the Corden and Balassa formulae for the EPC can be expressed as in equations 3.8 and 3.9. Corden (1971) expressed the EPC as follows:

$$EPC_j = \frac{P_j^d - \sum_{i=1}^{3} a_{ij} P_i^d}{rP_j^b - r\sum_{i=1}^{3} a_{ij} P_i^b} \quad (3.8)$$

Balassa (1971) expressed the EPC as follows:

$$EPC_j = \frac{P_j^d - \sum_{i=1}^{6} a_{ij} P_i^d}{rP_j^b - r\sum_{i=1}^{3} a_{ij} P_i^b - \sum_{i=4}^{6} a_{ij} P_i^d} \quad (3.9)$$

where:

$a_{ij}$ = quantity of the $i^{th}$ input used to produce one unit of the $j^{th}$ output;
$P^d_{j(i)}$ = domestic price of the $i^{th}$ input or the $j^{th}$ output in domestic currency;
$P^b_{j(i)}$ = border price of the $i^{th}$ input or the $j^{th}$ output in foreign currency;
r = exchange rate; and
i = 1,2,3 traded inputs, and 4,5,6 non-traded inputs.

The Corden method does not take into account the indirect traded inputs, which may lead to measurement errors (Corden 1971). However, in the Balassa method, it is assumed that non-traded inputs are infinitely elastic in supply so that they are treated like traded inputs. Although this may not be a reasonable assumption, it is often resorted to because of the difficulty of separating traded from non-traded inputs. Since the Corden method does not consider the effects of non-traded inputs, the measures of the EPCs from the Corden method are usually lower than those from the Balassa method (Corden 1971).

An EPC greater than (less than) one means that protective measures raise (lower) the value-added in the activity under consideration. A negative EPC signifies an absolute loss of foreign exchange to the economy. Hassan et al. (1992) noted that, unlike the NPC, an EPC less than or greater than one is not an actual incentive or disincentive, but only a potential one.

A limitation with the NPC and EPC is that no distinction is made between the price facing the producers and consumers. Even though the EPC is a better measure than the NPC of the incidence of protection on the domestic producer of a commodity, it does not take into consideration any exchange rate over-valuation. The EPC is also highly sensitive to error or arbitrary assumptions used in the classification of inputs

into tradeables and non-tradeables. In addition, enterprise budgets used to calculate the EPC are inexact, especially in developing countries (Tweeten 1992). Tweeten argued that, given their limitations, NPCs and EPCs are often more reliable indicators of ranking's among commodities than of absolute levels of protection.

**Comment on the use of border prices**

Border prices are used as the point of reference for ERPs, NPCs and NRPs in measuring the impact of national pricing policies. Although the international market prices provide a useful standard against which economic performance can be measured, there are some limitations with such an approach. Scandizzo and Bruce (1980) observed that sometimes world (border) prices are above the long-run average price for some commodities; this leads to over-estimates of the gains and losses for commodities with negative protection rates and under-estimates of the gains and loses for commodities with positive protection rates. In addition, Hassan et al. (1992) noted that identifying world prices is difficult since there is no unique international market, but many different systems of prices depending on the data, the level, and the location of the transactions considered, especially for agricultural products which are characterised by seasonality. Furthermore, for some products with low demand elasticities, prices may be poor indicators of profitability since they neglect the fall in the profits of existing producers that would follow an expansion of production. Despite these limitations, border price values are the most appropriate opportunity costs for most commodities. When the small country assumption holds, border prices are assumed to be exogenous world prices, and so represent the true opportunity cost of the traded commodities.

### 3.6.3 Producer and consumer subsidy equivalents

Neither the NPC nor the EPC is adequate for including the wide range of policies that governments may use to influence agriculture. The producer subsidy equivalent (PSE) and the consumer subsidy equivalent (CSE) are flexible measures of all domestic policy transfers to producers and consumers. The PSE, unlike the EPC, can readily accommodate cross-effects, such as the influence of policy interventions in corn production on the PSE of beef. It can be refined into a fairly comprehensive measure of the effects of all policies on the rate of producer surplus. PSE is often expressed as a percentage of the gross value of farm production; CSE as a percentage of food cost (Tweeten 1992).

No further comments will be made about the PSE and CSE because the aim here is to review studies that have measured the effect of only the trade and exchange rate policies on agricultural price incentives on specific commodities, whereas the PSE and CSE are aggregate measures of all policy intervention effects. In addition, calculation of the PSE and CSE is very elaborate. Moreover, these measures are very comprehensive requiring a great deal of data and time to compute.

### 3.6.4 Classical welfare analysis

A final measure of costs of market intervention and benefits from trade liberalisation is classical welfare analysis. The advantage of classical welfare analysis over the other three measures is that the economic costs of lost national or international income from trade distortions and government interventions are included. In addition, all three coefficients presented earlier are used to determine the effects on nominal incomes within the farm enterprise. They ignore any effects of government polices on the cost of living and, thus, the real value of those nominal incomes (Lindert 1991). Classical welfare analysis shows the level and distribution of program benefits and costs among producers, consumers, taxpayers, and the society as a whole, and also attempts to correct some of the shortcomings of the less comprehensive methods by including supply and demand responses. The NPC, EPC and PSE/CSE estimates are important inputs into classical welfare analysis (Tweeten 1992).

For similar reasons to those given for the PSE and CSE, classical welfare analysis will not be dealt with any further.

## 3.7 Empirical studies on policy intervention effects

Scandizzo and Bruce (1980) reviewed and evaluated a number of partial adjustment studies in six countries (Argentina, Egypt, Kenya, Pakistan, Thailand and Yugoslavia). Four coefficients were used to measure the incentive/disincentive effects of administered prices, taxes and subsidies to producers. These were the NPC, EPC, PSE and the effective subsidy coefficient (ESC). As noted in sections 3.6.1 and 3.6.2, the NPC and EPC can be converted into NRPs and ERPs by using percentages. The NRP, ERP, PSE and ESC can then be represented by rectangles 8, 9, 12 and 13 in Figure 3.1. Scandizzo and Bruce explained that the ESC is the EPC adjusted by the sum of the difference between, profits, taxes, interest and the price of non-traded goods actually paid, and what is considered to be 'normal charges', that is, the value of direct and implied subsidies.

The results of the country case studies showed that, while there had been some variation over time, the NPCs, the EPCs and the ESCs were typically less than one, and the PSEs were typically negative, indicating disincentives to the production of the crops included in the study and to agriculture in general. The results also indicated that, for agricultural products, where the value of the purchased inputs are typically a small proportion of the value of the output, there were insignificant differences between the NPCs, EPCs and ESCs. According to Scandizzo and Bruce, this was an important finding because EPCs and ESCs are much more difficult to calculate than NPCs. Thus, for agricultural products in developing countries where the input costs are a relatively small proportion of output values, incentive/disincentive effects can be measured by nominal protection coefficients alone.

García (1981) examined the effects of policies on particular commodities in Colombia using direct nominal rates of protection ($NRP_d$). The study showed that many food products (sorghum, soybeans, wheat, milk, corn, rice and others) received high rates of protection in the 1950s and 1960s; however, these rates fell in the 1970s and sometimes turned into a tax. Exports (coffee, cotton, beef and flowers) were generally taxed throughout with high rates of taxation in the 1950s and 1960s, and decreasing rates in the 1970s.

In a study in Kenya by Schluter (1984), only disaggregated nominal protection coefficients (NPC) were used (equation 3.6) as the measures of the effects of exchange rate and trade policies on agricultural incentives. Eight possible exports of Kenya were examined. The findings showed that, generally, sheep and goats meat, maize, sugar, and pulses had significant negative nominal protection coefficients, meaning that these commodities were taxed. For coffee, tea, and horticultural crops, there was no protection, because prices were adjusted regularly to ensure that the export parity prices were equal to the border prices at the prevailing exchange rate.

Where data are limited, as was the case for Zaire, Tshibaka (1986) explained that two ratios, the direct nominal rates of protection ($NRP_d$) and the implicit rate of taxation, can be computed from price data as measures of protection. These were the two ratios used in his study, following options in rectangles 2, 5, 6, 8, and 11 in Figure 3.1. The $NRP_d$ was defined as in equation 3.7. Tshibaka noted that the implicit rate of taxation or subsidy is an indicator of the wedge between the average price received by local producers and the relevant world price (c.i.f for imported commodities and f.o.b for exported ones) taking into account the exchange rate adjustment based on purchasing power parity. The implicit rate of taxation or subsidy of an individual product would be given by:

$$\text{Implicit rate of taxation/subsidy} = \frac{\Delta P}{\left(P^{*} E_0 \, FPI / CPI\right)} \qquad (3.10)$$

where:

$\Delta P$ = producer price wedge in domestic currency;
$P^{*}$ = world price in foreign currency;
$E_0$ = official exchange rate;
CPI = domestic consumer price index; and
FPI = trade-weighted consumer price index of (Zaire's) major trading partners.

Tshibaka pointed out that, as in the case for NRPs, the implicit rates of taxation or subsidy have some limitations. They do not account for the indirect effect of commercial policy on the real exchange rate or of changes in terms of trade. The quality of the commodities whose prices are being compared is also disregarded. The concepts can only be applied to tradeables, therefore, the whole sector of the economy producing non-tradeables is not considered. The implicit rates of taxation/subsidy measure the effects of price intervention only for prices of tradeable output but ignore the input side. As a result, they are not adequate measures of the effects of price intervention that occur in both output and input markets.

Despite these limitations, the estimates of implicit rates of protection of the Zairean farm sector were computed, and found that most of the crops were taxed. Overall, exports (coffee, palm kernel and cotton) were discriminated against more then food crops (maize, rice and groundnuts).

Oyejide (1986) used both $NRP_d$ and ERP to estimate the effects of price intervention on agricultural incentives in Nigeria. On the whole, there has been increasing protection of the agricultural sector from external competition, even though this has only been shown by the decreasing rates of implicit taxation. Export crops only started receiving positive production incentives through protection in the early 1980s. On the other hand, import-competing crops appear to have been receiving substantial protection against imports.

Bautista (1987) used the relative price ratios (RPR) which indicate the direction and magnitude of the price effects on importables and exportables relative to home goods. In Figure 3.1, RPR is shown in rectangle 7. The RPR is given by:

$$\text{Ln}\, RPR_{mh} = (1-\omega)\left(\text{Ln}\, T_m - \text{Ln}\, T_x\right) \qquad (3.11)$$

$$\text{Ln RPR}_{xh} = -\omega\,(\text{Ln } T_m - \text{Ln } T_x) \qquad (3.12)$$

where:

$RPR_{mh} = (P_m/P_h) / (P_m^*/P_h^*)$ ; and
$RPR_{xh} = (P_x/P_h) / (P_x^*/P_h^*)$ .

$P_h$ , $P_m$ , and $P_x$ are defined as previously. The * means prices are measured under an unbiased trade regime, that is, when the implicit tax and tariff are zero ($T_x = T_m = 0$). $T_x = (1-t_x)$, $T_m = (1+t_m)$, and $\omega$ is the incidence parameter which Bautista had estimated using the free-trade equilibrium approach (see section 3.2.2). A limitation of this method used by Bautista is that it only compares the protection accorded to one sector relative to another sector, but does not measure the actual protection granted to individual crops.

The effect of trade policy on production incentives in the Philippines was consistently positive for importables (RPR>1), and consistently negative for exportables (RPR<1). The findings indicated that, during the period 1950-80, there were substantial disincentives for the production of traditional agricultural commodities and, to a lesser extent, of non-traditional export products. Domestic production of the import-competing goods was favoured over home goods until the early 1970s, when the bias shifted toward home goods production.

In the study on eighteen developing countries by Krueger et al. (1988), direct, indirect and total nominal rates of protection were used to measure the policy intervention effects. The method of analysis followed options in rectangles 4, 6, 8 and 10 in Figure 3.1. The findings suggested that most countries adopted direct policies which resulted in the equivalent of export taxes, that is, negative direct nominal protection of the agricultural products. Exceptions were, Ghana, where the highly overvalued exchange rate resulted in such strong disincentives that some compensatory action was politically essential, Portugal, Zambia, Chile and Turkey.

The impact of the indirect effects on producer incentives was even stronger than the direct ones for most countries for the periods 1975-79 and 1980-84. On average, the indirect effects on incentives to agricultural producers were two and a half times as large as the direct effects, thus exacerbating the negative direct protection or effective taxation (Krueger et al.).

Dorosh and Valdés (1990) used both the nominal and effective rates of protection to show the effect of trade and exchange rate policies on agricultural incentives in

Pakistan. Referring to Figure 3.1, Dorosh and Valdés followed options represented by rectangles 2, 5, 6, 8, 10, 12 and 14. Direct, indirect, and total nominal rates of protection were calculated for each commodity. The direct effects were measured using the $NRP_d$ as defined in equation 3.7. In order to calculate the indirect ($NRP_{id}$) and total ($NRP_t$) effects, the equilibrium real exchange rate that had been estimated using the omega free-trade equilibrium approach (see section 3.2.2), was employed. The $NRP_{id}$ were estimated using the formula below:

$$NRP_{id}(i) = \frac{\left(P_i''/P_{na}\right) - \left(P_i^*/P_{na}^*\right)}{\left(P_i^*/P_{na}^*\right)} \qquad (3.13)$$

where:

$P_i''$ = border price of commodity valued at the official exchange rate;
$P_i^*$ = border price of commodity valued at the equilibrium real exchange rate;
$P_{na}$ = domestic price index of non-agriculture; and
$P_{na}^*$ = domestic price index of non-agriculture with free-trade calculated at the equilibrium real exchange rate.

In the $NRP_{id}$ , the prices of non-agricultural goods and services are assumed to remain unchanged, but long-term investment in agriculture is a function of the relative price of agricultural to non-agricultural goods. Therefore, the ratio of output of a commodity to the price of non-agricultural goods is the appropriate measure of incentives. Since the trade and exchange rate policies affect prices of both non-agriculture and agricultural goods, the total effect of the policy on agricultural relative prices is given by the total nominal rate of protection (Dorosh and Valdés 1990). The total effects were then estimated using the equation:

$$NRP_t(i) = \frac{\left(P_i/P_{na}\right) - \left(P_i^*/P_{na}^*\right)}{\left(P_i^*/P_{na}^*\right)} \qquad (3.14)$$

Dorosh and Valdés found that, during the 1960s, the overvaluation of the rupee, which lowered the border prices of all traded goods, outweighed the protection provided by direct trade policies (calculated using the official exchange rate) for wheat, ordinary rice and cotton, but increased the taxation of basmati rice. From 1972 to 1987, direct taxation of agricultural exportables (averaging −15 per cent) was reinforced by indirect taxation (about −38 per cent). In contrast, the average for the direct and total protection of import-competing products was positive, although the indirect effects reduced this protection from 48 per cent to 7 per cent in the same period.

Dorosh and Valdés (1990) used the Balassa formula (equation 3.9) to calculate the effective protection rates. The direct effects of value-added per unit of output of a commodity were measured by the effective rate of protection ($ERP_d$), and are expressed as follows:

$$ERP_d = \frac{\left(VA_i - VA_i^{"}\right)}{VA_i^{"}} \qquad (3.15)$$

where:

$VA_i$ = value-added in the agricultural sector; and

$VA_i^{"}$ = value-added in the agricultural sector measured using border prices valued at the official exchange rate.

and the total (direct and indirect) effect ($ERP_t$) were given by:

$$ERP_t = \frac{\left(VA_i/VA_{na}\right) - \left(VA_i^{*}/VA_{na}^{*}\right)}{\left(VA_i^{*}/VA_{na}^{*}\right)} \qquad (3.16)$$

where:

$VA_i^{*}$ = value-added in the agricultural sector measured using border prices valued at the equilibrium exchange rate.

$VA_{na}$ = value-added in the non-agricultural sector; and

$VA_{na}^{*}$ = value-added in the non-agricultural sector measured using border prices valued at the equilibrium exchange rate.

Dorosh and Valdés found that the effective rates of protection results confirmed the nominal rate of protection results; over the past three decades, Pakistan's trade polices have consistently favoured the import-competing sector at the expense of the export sector.

Hurtado et al. (1990) used the same measures as Dorosh and Valdés (options in rectangles 2, 5, 6, 8, 10, 12 and 14 in Figure 3.1) to calculate the effects of policy interventions on agricultural incentives in Chile. Generally, the $NRP_d$ analysis indicated that wheat was slightly protected in most years ($NRP_d$ about 10 to 20 per cent), but was taxed in some years. Powdered milk was heavily protected throughout ($NRP_d > 1$ in most years), whereas fluid milk was protected ($NRP_d > 1$) only up to 1964, after which it received varying degrees of protection, usually above 15 per cent. Beef was taxed until 1974 ($NRP_d$ negative), when it became a non-tradeable. Fruits

were protected up to 1975, and 'undistorted' for the rest of the period ($NRP_d = 0$). The direct effective rates of protection ($ERP_d$) were negative in most years for milk and beef. Wheat received effective protection in some years. Fruits were protected up to 1974, after which they were taxed. When the $NRP_d$ and $ERP_d$ were adjusted using the equilibrium real exchange rate, the $NRP_t$ and $ERP_t$ gave different results. Wheat was generally taxed in most years, milk was protected for most years, and fruit was taxed up to 1966, then received protection up to 1980, when it was again taxed. The indirect effects of exchange and trade policies reversed the findings in some years.

Using both the Corden and the Balassa formulae, Hassan et al. (1992) estimated the effective protection coefficients (EPCs), with quarterly data from 1980 to 1987, for 18 commodities produced in the Egyptian agricultural sector. The principal conclusion was that the official domestic prices of all export crops had been less than those on world markets, as was shown by the EPCs of less than one, whether using the official or free-market exchange rate. The implication of these findings is that export crops were taxed. A limitation with the method used by Hassan et al. is that only direct effects of the trade policies on agricultural incentives were calculated, leaving out the indirect effects due to changes in the exchange rates. This method of analysis is represented by rectangles 8 and 10 in Figure 3.1.

Making use of previous studies, Hassan et al. compared the NPCs and EPCs in different countries. They found that most developing countries tended to tax their agricultural producers with price policies that gave them less than the world price for their product (NPC < 1). In the late 1970s, for instance, Bangladesh gave its wheat and rice farmers only two-thirds of the world price for their grain (NPC = 0.63 and 0.69 respectively), and Egypt gave its farmers only about half the world price (NPC = 0.57 and EPC = 0.57). Yet, in the developed countries, farmers were consistently protected (NPC = 1.15 for UK wheat and 2.81 for Japan wheat). Hassan et al. also observed that, within any country, or among countries with similar income levels, exporting farmers were taxed more heavily than import-competing farmers.

## 3.8 Choice of estimation procedures

### Reasons for not employing these approaches in the study on Ugandan exports

#### (a) Estimation of the equilibrium real exchange rate

When evaluating policy using Edwards' method, it is necessary to use or construct a broad multilateral index of the real exchange rate for the country (Edwards 1989). Failure to do so could result in misleading and incorrect inferences regarding the

evolution of a country's degree of competitiveness. In Uganda, the export taxes have played a major role in trade policy throughout the study period (1970-92). The use of a real exchange rate for exports is then a more appropriate measure in the calculation of the equilibrium real exchange rate, than a broad multilateral index. The estimation procedures used by Dorosh and Valdés (1990) allow for this flexibility, whereas the Edwards' method does not. Moreover, Edwards' model required quarterly data over a long period of time. Such data is unavailable for Uganda. Therefore, the estimation procedures used by Dorosh and Valdés were chosen for this study, instead of those used by Edwards.

Furthermore, as noted by Edwards (1989), an important issue in any estimation of a real exchange rate equation, is the availability of data. Therefore, the Dorosh and Valdés equation was chosen over the ones used by Kim (1994) and Hurtado et al. (1990) because there were complete series of data on the explanatory variables in the Dorosh and Valdés model. In addition, the models by Oyejide (1986), Tshibaka (1986) and Bautista (1987) were not used because of the unavailability of data on the domestic price indexes of importables and exportables. Overall, the Dorosh and Valdés model appears to be quite superior to the latter three models.

The elasticities approach was not considered as an analytical option for this study due to lack of data on the elasticities of foreign exchange supply and demand for Uganda.

**(b) Measuring the effects of policy intervention**

Compared to nominal rates of protection (NRP), effective rates of protection (ERP) are better measures of policy interventions; however, they were not used in this study for Uganda because of the lack of data on inputs costs. The use of only NRPs was not considered a serious problem since, according to the findings of Scandizzo and Bruce (1980), the values of the NRP and ERP are not significantly different for a country where tradeable inputs are a small percentage of the total input costs, as is the case for most developing countries.

Implicit rates of protection were not used because the indirect exchange rate effects are not accounted for. The relative price ratio and relative protection ratio only measure the policy intervention effects on one sector relative to another, but do not measure the effects on individual crops; that is, they are aggregate measures. The producer subsidy equivalent (PSE), consumer subsidy equivalent (CSE), and welfare analysis are also aggregate measures, and, in any case, could not be used given the time frame for the write-up of this study.

## 3.9 Conclusion

Having reviewed the various studies undertaken on the effects of exchange rate and trade policies on agricultural price incentives, the omega free-trade equilibrium approach, specifically following Dorosh and Valdés (1990), was selected as the most appropriate method to calculate the incidence parameter, $\omega$. The direct nominal rates of protection ($NRP_d$) and total nominal rates of protection ($NRP_t$), which include the indirect effects, were then selected as the measures of the effect of government intervention on agricultural price incentives in Uganda. These procedures are detailed in Chapter 4.

# 4. Model specification

## 4.1 Introduction

The purpose of this chapter is to present the analytical model and estimation procedures that are used in the study. In the first four sections of this chapter, the determination of the free-trade equilibrium real exchange rate is explained. The estimation procedures of the nominal rates of protection (NRP) are then discussed. These NRP will be used to explain the extent to which trade and exchange rate changes have affected the prices of coffee, cotton, and tea, and will thereby help to fulfil the objective of the study. Finally, the sources of the data, and the relevant adjustments made, are explained.

## 4.2 The real exchange rate as an intermediary trade policy variable

In this section, the definition of the real exchange rate and its measurement are addressed In addition, the model used to calculate an estimate of the equilibrium real exchange rate that would prevail in a free market economy is presented. This is done using the omega free-trade equilibrium approach following Dornbusch (1974), Sjaastad (1980), Hurtado et al. (1990), and Dorosh and Valdés (1990).

### 4.2.1 The nominal effective exchange rates

Uganda had a fixed exchange rate between 1970 and 1980, after which the exchange rate was floated in 1981. However, the government continued to intervene in the foreign exchange market (see section 2.5) and to use trade policy changes to bring about a sustainable current account position. As discussed in Chapter 2, trade policy instruments in Uganda mainly consisted of import tariffs and export taxes.

In a free-trade environment, the actual cost of foreign exchange (that is, the exchange rate to exporters and importers) is measured by the nominal exchange rate (E). Due to the presence of tariffs and taxes in Uganda, the effective exchange rate to importers was raised, and to exporters was lowered. The nominal exchange rate, therefore, did not reflect the actual cost of foreign exchange to importers and exporters. Thus, the nominal effective exchange rate for exports ($EER_x$) and imports ($EER_m$) are defined as follows:

$$EER_x = E (1 - t_x) \qquad (4.1)$$

$$EER_m = E (1 + t_m) \quad (4.2)$$

where:

E = average official nominal exchange rate applicable to both exports and imports (Uganda shillings (Ushs) per unit of United States dollar (US$);

$t_x$ = implicit export tax rate; and

$t_m$ = implicit import tariff rate.

In the absence of import and export quotas, good measures of the average implicit import tariff ($t_m$), or implicit export tax ($t_x$), rates are calculated using actual revenues and trade values (Dorosh and Valdés 1990). Assuming uniform taxes on exports and tariffs on imports, the implicit export tax and import tariff for Uganda are given by:

$$t_x = RX / ( X * E) \quad (4.3)$$

$$t_m = RM / (M * E) \quad (4.4)$$

where:

X = total value of Ugandan exports in million US$;

M = total value of Ugandan imports in million US$;

RX = revenue to the Uganda government from export taxes (million Ushs);

RM = revenue to the Uganda government from import tariffs (million Ushs); and

E = nominal exchange rate (Ushs/US$).

According to Dorosh and Valdés, when binding quantitative restrictions are taken into account, the implicit import tariff or export tax is calculated from the ratio of domestic to world prices of the import and export goods, giving a more accurate measure of the direct effect of trade policies (see section 3.5).

The only quota in place in the case of Ugandan exports was the International Coffee Agreement (ICA) quota. Uganda was not always able to meet its quota, but for the years that she did, and had a surplus, Uganda was able to export the surplus to other countries under bilateral trade arrangements (Van Buren 1995). In this study, therefore, it will be assumed that there were no effective barriers to trade in the form of export quotas. There were indirect import restrictions in the form of rationing of foreign exchange to pay for the imports. Also, during the early 1970s, there were some import quotas in place. However, due to the unavailability of disaggregated data

on import prices and quantities, the significance of these barriers could not be judged. The restrictions on imports and exports for environmental, diplomatic, health, or other grounds, as explained in Chapter 2, do not signify a shortage in supply of foreign exchange, and were thus not considered a form of restriction or barrier to trade. It was assumed that the presence of such restrictions in a country is the norm. Therefore, the implicit export tax and import tariff rates ($t_x$ and $t_m$) for Uganda were computed from equations 4.3 and 4.4.

The nominal effective exchange rates for exports and imports do not account for changes in world prices and in domestic prices of non-traded goods. However, neither world prices of tradeables nor domestic prices of non-tradeables can be assumed constant over the study period, and, therefore, the real exchange rate is used. The real exchange rate is calculated as the increase in the nominal exchange rate multiplied by the relative inflation between (two) countries. The real exchange rate, therefore, reflects changes in the domestic price of traded goods relative to that of home goods. In the following section, the definition of the real exchange rate is discussed and the actual form of the real exchange rate used in this study is presented.

### 4.2.2 The real effective exchange rate: the dependent variable

The real exchange rate indicates the real worth of foreign exchange in terms of the domestic currency. There are several definitions of the real exchange rate. The traditional measure of the real exchange rate is the ratio of the price of tradeables to that of non-tradeables. If domestic taxes and tariffs on exports and imports are ignored for the time being, the real exchange rate is given by:

$$RER = \frac{E\ P_T^w}{P_h} \qquad (4.5)$$

where:

RER = real exchange rate index;

$P_T^w$ = world price index of traded goods; and

$P_h$ = domestic price index of home goods.

This measure has some limitations, such as the difficulty of classifying industries into tradeable and non-tradeable sectors. This difficulty may be overcome by the use of the purchasing power parity (PPP) real exchange rate. The PPP real exchange rate is constructed from foreign and domestic consumer price indexes. The consumer price

index ($CPI_{Ug}$) is used as a proxy for the price of home goods ($P_h$), because home goods weigh heavily on the consumer price index.

In order to gauge the influence of the real exchange rate on aggregate exports and imports, it is desirable to know how the value of the Uganda shilling changes with respect to an aggregate of currencies, and also with respect to a whole basket of goods traded with other countries. When these factors are taken into account, the PPP real exchange rate is then expressed as follows:

$$RER \approx \frac{E \cdot CPI_T^w}{CPI_{Ug}} \tag{4.6}$$

where:

$CPI_{Ug}$ = consumer price index for Uganda; and

$CPI_T^w$ = the trade-weighted average consumer price index of the major trading partners of Uganda.

The advantage of the PPP real exchange rate is that it takes into account the behaviour of the relevant consumer price indexes, and exchange rates in bilateral trading countries. However, this overall trade-weighted real exchange rate index encompasses agriculture, as well as other sectors of the economy. Even within agriculture, the exchange rate for coffee, cotton, or tea will be different since they are weighted by the sales to those countries that import the particular crop from Uganda. For simplicity, and due to the limited time available for this study, these effects were not considered.

The real exchange rate based on the trade-weighted CPI in the numerator (equation 4.6) is inefficient because of the fact that non-tradeables weigh heavily on the CPI and yet a proxy for the price of tradeables is needed. Consequently, the trade-weighted wholesale price indexes for the major trading partners of Uganda provides a better numerator. The real exchange rate is then given by:

$$RER \approx \frac{E \cdot WPI_T^w}{CPI_{Ug}} \tag{4.7}$$

where:

$WPI_T^w$ = trade-weighted wholesale price index of the major trading partners of Uganda;

The gross domestic product deflator (PGDP) is sometimes used in the denominator; when used, the expression of the real exchange rate changes to:

$$RER \approx \frac{E \cdot WPI_T^w}{PGDP_{Ug}} \qquad (4.8)$$

where:

$PGDP_{Ug}$ = deflator of the gross domestic product of Uganda.

In this study, the definition of the real exchange rate given by equation 4.8 is used. Even though the CPI is heavily weighted by non-tradeables, it does have a tradeable element, and it is also likely to be biased by the effect of direct and indirect transfers, marketing costs, and price controls, such as tariffs on imported consumer goods. Therefore, the producer price index (PPI) would be the most appropriate denominator in the measure of the real exchange rate for this study, since it is based on domestic production and producer prices. This is so because, in Uganda, food crop production accounts for 71 per cent of the agricultural GDP (of which only one-third is marketed) and export crop production comprises only 5 per cent of agricultural GDP (World Bank 1993b). However, due to the absence of data on the PPI, the PGDP at factor cost was considered to be the second best proxy for the index of domestic price of home goods, because the PGDP measures price movements in production and is also weighted by non-tradeables.

The year 1989 was chosen as the base-year for the study because it was a relatively stable year in Uganda's history: there were no natural catastrophes or droughts; it was not an election year; nor did it immediately follow the institution of a major government program or economic policy change.

The nominal and real exchange rates are measured using the rate of the Uganda shilling (Ushs) to the United States dollar (US$). The US$ is used since Ugandan exports are conventionally valued in Ushs and US$, and also because the USA is one of Uganda's largest trading partners, accounting for 25 per cent of Uganda's trade in exports.

Since the real exchange rate defined above does not take into account the effect of trade policy, the real effective exchange rates for exports ($RER_x$) and imports ($RER_m$) are more appropriate measures of the true exchange rate that is applicable to the exporters and importers. When the domestic taxes and tariffs on exports and imports are taken into account, the $RER_x$ and $RER_m$ are expressed as follows:

$$RER_x = RER\ (1 - t_x) \qquad (4.9)$$

$$RER_m = RER\ (1 + t_m) \qquad (4.10)$$

It is these real effective exchange rates, which the government can directly affect, that are relevant in the assessment of the relative profitability of tradeable goods. Because export taxes have been significant in Uganda, the real effective exchange rate for exports ($RER_x$) was considered as the most appropriate measure of the real exchange rate for Uganda. Substituting equation 4.8 into 4.9 gives:

$$RER_x = E\left(\frac{WPI_T^w}{PGDP_{Ug}}\right)(1 - t_x) \qquad (4.11)$$

Equation 4.11 is the measure of the real exchange rate that was used in this study as the dependent variable.

As seen in Chapter 2, an overvalued exchange rate resulting from a protective trade regime (import substituting) acts as an implicit tax on tradeable goods, depressing their prices in terms of domestic currency relative to home goods. This change in the prices distorts the incentive structure to producers, penalising agricultural exports by encouraging resource movement from the production of exports to that of domestically consumed goods. The degree of substitution in production that takes place between the home goods and tradeables is measured by an incidence parameter, $\omega$ (see section 3.2) which can be determined using the omega free-trade equilibrium approach. The real exchange rate, therefore, plays an intermediary role in transmitting the effects of trade and macroeconomic policies on to agricultural prices. In the next section, the model estimated in the study is presented. The possible factors that may have affected the real effective exchange rate for exports in Uganda are then discussed.

## 4.3 The model

In formulating the omega free-trade equilibrium real exchange rate model for Uganda, it has been assumed that: Uganda consumes and produces both exportables and importables as well as a non-traded goods; Uganda is a small country, so the relative price of tradeable goods in the world market is taken as given; the relative prices of tradeables in terms of home goods is flexible so as to allow the non-traded goods market to clear; and trade is balanced.

As mentioned in section 3.3, Edwards (1989) noted that the real exchange rate is determined by several factors. He suggested that, where data are unavailable, proxies may be used or the variable omitted. The real exchange rate equation set up for this study is similar to that of Dorosh and Valdés, but is modified to include a dummy for

war. The real effective exchange rate for exports for Uganda can be expressed as follows:

$$RER_x = f(trpol, tt, aid, govt, D) \quad (4.12)$$

where:

$RER_x$ = real effective exchange rate for exports;

trpol = domestic trade policy;

tt = external terms of trade;

aid = capital inflows into Uganda;

govt = Uganda government recurrent expenditures; and

D = dummy for war.

The regression equation fitted to historical data to obtain an estimate of the numerical value of the trade policy coefficient, $\omega$, for Uganda was:

$$\text{Ln } RER_{x\,(t)} = \beta_0 + \omega \text{ Ln } trpol_t + \beta_2 \text{Ln } tt_t + \beta_3 Raid_t + \beta_4 Rgovt_t + \beta_5 D_t + \varepsilon_t \quad (4.13)$$

where:

Ln $RER_x$ = natural logarithm of the real effective exchange rate for exports, $\text{Ln}\left[ E\left( \frac{WPI_T^w}{PGDP_{Ug}} \right)(1 - t_x) \right]$;

$\omega$ = the incidence parameter ($0 \leq \omega \leq 1$);

Ln trpol = natural logarithm of the trade policy term, Ln $((1+t_m) / (1-t_x))$;

Ln tt = natural logarithm of external terms of trade, $\text{Ln}\left(P_x^w / P_m^w\right)$;

Raid = (capital inflows into Uganda in US$ divided by $WPI_T^w$) / real GDP index;

Rgovt = (government expenditures) / real GDP index;

D = dummy for war;

$\varepsilon$ = random error; and

t = year (23 observations, annual data).

During the estimation of the $RER_x$ equation, variables that are in index form were converted to natural logarithms. However, the actual values of capital inflow and government expenditure, deflated by the GDP deflator, are used because the capital inflow variable had negative values in some years.

## 4.4 The independent variables

Before discussing the a priori expectations concerning the explanatory variables, it is useful to specify what is meant by an appreciation and a depreciation of the real exchange rate in this study. Referring to equation 4.11, a depreciation of the $RER_x$ is indicated by an increase in the number of Ushs exchanging for one US$, that is, an increase in the numerical value of the $RER_x$. An appreciation, on the other hand, is indicated by a decrease in the number of Ushs exchanging for one US$, that is, a decrease in the numerical value of the $RER_x$.

### 4.4.1 Trade policy and the incidence parameter

The real exchange rate is the rate that would be determined by an equilibrium in the foreign exchange market in an open economy. In reality, government trade policies influence supply and demand for both tradeables and non-tradeables through changes in the prices of tradeable and home goods, and changes in the implicit import tariffs and export taxes. Consequently, there is a deviation between the real exchange rate prevailing in the country, and the equilibrium real exchange rate that would exist in an environment of free-trade and no interventions in the foreign exchange market.

The distortionary effect of trade policy in Uganda can be exemplified by import tariffs that protect domestic industries and lower industrial imports relative to the level in an unprotected market. Restricting imports causes the domestic price of importables ($P_m$) to rise relative to home goods ($P_h$) or exportables ($P_x$), leading to an increase in the quantity of home goods demanded. In order to restore the equilibrium in the home goods market, the price of home goods has to rise relative to the price of exportables and the new after-tariff price of importables and, consequently, $RER_x$ appreciates (the numerical value of ($P_x/P_h$) decreases). This tends to overvalue the real exchange rate.

As noted in Chapter 3, the extent to which an increase in the domestic price of imports causes an increase in demand for home goods, and so an increase in their price, is measured by the incidence parameter, $\omega$. Also from Chapter 3, $\omega$ is defined as the negative of the percentage change in the real exchange rate for exportables ($P_x/P_h$), for a one percentage change in the ratio of the domestic price of importables relative to exportables ($P_m/P_x$). Stated in equation format:

$$\omega = -\left( \frac{\Delta(P_x / P_h) \,/\, (P_x / P_h)}{\Delta(P_m / P_x) \,/\, (P_m / P_x)} \right) \qquad (4.14)$$

Ideally, one would use the ratio of the domestic price of exportables to the domestic price of home goods, $(P_x/P_h)$, as the real exchange rate for exports (Dorosh and Valdés). Because of estimation problems, and following Dorosh and Valdés, $P_T^w \cdot E\left(1 - t_x\right)$ is used as a proxy for the $P_x$ variable. However, as shown in equation 4.11, $WPI_T^w$ was used as a proxy for $P_x$. This was done because it was difficult to get data on the $P_x$ and $P_T^w$ variables. In addition, the PGDP was used as a proxy for $P_h$, for reasons discussed in section 4.2.

As discussed in Chapter 3, domestic commercial policy or trade policy is measured by the domestic terms of trade $(P_m/P_x)$. According to Dorosh and Valdés, and Hurtado et al. (1990), the trade policy variable can also be measured using the ratio of the implicit import tariff to the implicit export tax, $(1+t_m)/(1-t_x)$.

In this study, therefore, the $(P_x/P_h)$ is defined by the $RER_x$, and the trade policy variable by $(1+t_m)/(1-t_x)$. As Dorosh and Valdés show, $\omega$ is equivalent to the proportionate change in the $RER_x$ for a one percent change in the trade policy term, $(1+t_m)/(1-t_x)$.

### 4.4.2 External terms of trade

Another factor that affects the real exchange rate relates to the external terms of trade given by:

$$\left(P_x^w / P_m^w\right) \qquad (4.15)$$

The external terms of trade is the ratio of the world price of export goods $(P_x^w)$ to the world price of import goods $(P_m^w)$. The external terms of trade affects the relative prices of tradeables to non-tradeables in two ways: directly on the domestic price; or indirectly through the effect on income.

A worsening external terms of trade, because of an increase in the world price of importables relative to exportables, decreases the purchasing power of Uganda's exports, and so reduces real domestic income. The actual effect on the demand for tradeables and home goods depends on the respective income elasticities. A decrease in real domestic income leads to a decrease in the quantity demanded of home goods, which causes the price of home goods to fall relative to that of tradeables, thus causing the real exchange rate to depreciate. The a priori expectation is that worsening external terms of trade will require a depreciation of the real effective exchange rate

for exports to restore balance. The a priori expectation of the sign of the coefficient in this case is negative.

The second effect is directly on domestic prices. A decrease in the external terms of trade, due, for example, to a more than proportionate increase in the world price of importables relative to exportables, results in an increase in the price of imports into Uganda, causing domestic price of imports, in Ushs, to increase as well. Given that some of these imports are inputs into agricultural production, the domestic cost of agricultural production increases and, consequently, the price of home goods also increases. In addition, the cost of producing exports will increase, and, since the effective price to the exporters is the world price, the exporters will have to absorb the increased costs of production. Alternatively, an increase in the price of imports would result in a reduction in the quantity demanded for imports, and an increase in the quantity demanded of home goods. Consequently, the price of home goods increases relative to the price of tradeables. In order to restore external balance, the real effective exchange rate for exports has to appreciate. The a priori expectation of the sign of the coefficient in this case is positive.

The a priori expectation about the sign of the coefficient for the external terms of trade variable is, therefore, indeterminate.

### 4.4.3 Capital inflows

Capital inflows into a country include foreign grants and long-term loans, as well as any other private and official transfers that may be remitted to the home country by citizens abroad.

Foreign grants and long-term loans accrue mainly to the government. The magnitude of the effect of such receipts on the real exchange rate varies according to the amount of spending on home goods and on tradeables. The greater the amount of capital inflow into the country spent on home goods, the more the domestic prices tend to rise relative to the price of tradeables, causing a decrease in the numerical value of the $RER_x$, and so an appreciation of the $RER_x$. The a priori expectation of the sign of the coefficient in this case is negative.

Since worker remittances and any other private transfers are partly spent on home goods, they represent inflows into the country, and are thus an important part of foreign exchange earnings. A rise in their level leads to an appreciation of the $RER_x$ since the domestic price of home goods is raised relative to the price of importables.

The a priori expectation, therefore, is that the sign of the coefficient for capital inflow is negative.

### 4.4.4 Government expenditure

The level of government recurrent expenditure may also affect the real exchange rate by altering the overall pattern of spending in the economy. For the case of Uganda, government expenditure is on both tradeable goods, such as security (armaments), and non-tradeable goods, such as investment in infrastructure, salaries, education, and health (MFEP 1994a). The weighting of expenditure on tradeables and non-tradeables varies from year to year. For example, in 1988/89, 1990/91 and 1993/94, salaries accounted for 35.7, 16.8 and 31.9 per cent of total government recurrent expenditure, while security accounted for 33.0, 37.5 and 23.4 per cent, respectively (MFEP 1994a). Therefore, the effect of government expenditure on the real exchange rate is twofold. If the expenditure falls mostly on tradeable goods, the consequent increase in the quantity demanded of tradeables relative to non-tradeables will result in a depreciation of the real exchange rate. The a priori expectation, then, is that the sign of the coefficient will be positive. However, if the government expenditure on non-tradeables carries a greater weight, the a priori expectation is that the real exchange rate will appreciate. Therefore, the sign of the coefficient for government expenditure is indeterminate, and quite likely insignificant, as the positive effects may be offset by the negative effects.

### 4.4.5 War

The situation in Uganda, as seen in Chapters 1 and 2, has been characterised by periodic wars and civil strife during the 23 year period of this analysis. This important factor cannot be excluded in analysing the determinants of the $RER_x$ for Uganda. A dummy variable (equal to 1 for war and 0 otherwise) was included to try to capture the effect of wars. Between 1977 and 1979, the whole country was affected by the war to overthrow the Idi Amin regime. Between June 1985, when the Obote-II regime was overthrown and an the interim military government was ruling, and January 1986, when Museveni took over, was another period in which the country was wrecked by war and pillage. Political unrest and insecurity meant that agricultural activities were reduced to food crop production; moreover, even this food crop production was on a smaller scale than usual, resulting in the escalation of domestic prices. The a priori expectation is that the sign of the coefficient for the dummy for war is, therefore, negative.

## 4.5 Testing for the likely endogeneity of the trade policy variable

The above discussion assumes that trade policy and other variables can be treated as exogenous to the model. However, trade policy may be determined simultaneously with the $RER_x$. If trade policy is actually endogenous, the OLS estimation would yield inconsistent and biased estimates. The equation would then have to be re-estimated using two-stage least squares (2SLS) in order to obtain consistent and unbiased estimates (Griffiths et al. 1993; Hamilton 1994). A Hausman-type test was therefore first performed to establish whether the trade policy variable (Ln trpol) was purely exogenous to the system equation 4.13 and, thus, whether it was necessary to execute 2SLS.

In order to perform the test, a prediction for the trade policy variable ($\text{Ln } \hat{\text{trpol}}$) was obtained from the reduced form of the system equation 4.13. Using the Department of Econometrics (1995) as a guide, the reduced form equation can be expressed as follows:

$$\begin{aligned} \text{Ln trpol}_t = {} & \alpha_0 + \alpha_2 \text{Ln tt}_t + \alpha_3 \text{Raid}_t + \alpha_4 \text{Rgovt}_t \\ & + \alpha_5 D_t + \alpha_6 IV_t + \nu_t \end{aligned} \qquad (4.16)$$

where IV represents the instrumental variable to be used to estimate the reduced form equation.

A valid instrumental variable is one which is strongly correlated with the suspect endogenous variable(s) but uncorrelated with the regression disturbance (Hamilton 1994). Hamilton (pg. 253) states that 'finding valid instruments is often extremely difficult and requires careful thought and a bit of luck'. In addition, for any given situation, a number of instruments can be chosen, and each set of instruments leads to an alternative consistent estimator. Consequently, one cannot say that an instrumental variable estimate is efficient. However, the greater the correlation between the endogenous variable and the instrument, the more efficient will be the instrumental variable estimator (Griffiths et al. 1993; Hamilton 1994).

In spite of these limitations, suitable instruments for trade policy in Uganda were sought, and the best one found was the international price index of coffee. The international price index of coffee was included as an instrumental variable because, as the world price of coffee was falling, the Uganda government instituted both trade and exchange rate policies, as discussed in Chapter 2, in order to maintain the competitiveness of Uganda's coffee exports on the world market. It was expected, therefore, that the world price of coffee would be correlated with the trade policy variable. Furthermore, Kim (1994) noted that international price indexes are not

subject to movements in quality and product composition. They, therefore, predict price changes more precisely, and make good instrumental variables.

After obtaining the prediction for the trade policy variable from equation 4.16, an augmented model was then set up as follows:

$$\text{Ln RER}_{x(t)} = \gamma_0 + \gamma_1 \text{Ln trpol}_t + \gamma_2 \text{Ln tt}_t + \gamma_3 \text{Raid}_t + \gamma_4 \text{Rgovt}_t + \gamma_5 D_t + \gamma_6 \left(\text{Ln trpol}_t - \text{Ln } \hat{\text{trpol}}_t\right) + \mu_t \quad (4.17)$$

where Ln $\hat{\text{trpol}}$ is the predicted value of Ln trpol from the estimation of the equation 4.16. The hypotheses tested from equation 4.17 were:

$H_0 : \gamma_6 = 0$ (trade policy is exogenous)

$H_1 : \gamma_6 \neq 0$ (trade policy is endogenous)

The rule of thumb is that the trade policy variable is exogenous if the OLS estimator, $\hat{\gamma}_6$, is not significantly different from zero; in other words, the null hypothesis is not rejected (Pagan 1984; Department of Econometrics 1995).

## 4.6 The equilibrium real exchange rate index

Once the incidence parameter, $\omega$, has been estimated, it can be used to compute the free-trade equilibrium real exchange rate index ($RER_x^E$), since the $RER_x^E$ measures the combined effects of trade and exchange rate policy changes. Following Dorosh and Valdés, and Hurtado et al., the $RER_x^E$ is given by:

$$RER^E_{x(t)} = RER_{x(t)} \cdot ((1+T)^{-\omega_{(t)}}) \quad (4.18)$$

where:

$RER_x^E$ = free-trade equilibrium real exchange rate index; and

$(1+T) = (1+t_m)/(1-t_x)$, which may be regarded as the equivalent tariff or the trade policy variable.

## 4.7 Nominal rates of protection

Having determined the value of $\omega$ and hence the $RER_x^E$, the nominal protection coefficient (NPC) and nominal rates of protection (NRP) can then be calculated. The direct effects of agricultural trade and price policies in Uganda were calculated using historical nominal exchange rates in determining the border prices. The indirect effects

of overall trade policy and changes in the $RER_x$ were then included in the measures of the total effects on prices by using the $RER_x^E$.

Border prices were used as the point of reference to measure policy distortions caused by the trade and exchange rate policies. Even though there are limitations to using the border price as a standard against which economic performance is measured (see section 3.6.2), it was assumed that the border prices of coffee, cotton and tea were the most appropriate standards.

The direct effects of trade and agricultural pricing policies were measured using the NPC and NRP. The nominal protection coefficient (NPC) is given by:

$$NPC = \left(P_i / P_i''\right) \tag{4.19}$$

where:

i = the commodity in question (coffee = 1, cotton = 2, tea = 3);

$P_i$ = domestic price index of good i measured at the farmgate; and

$P_i''$ = border price index of the (exportable) good valued at the official exchange rate.

A NPC greater than one means that the commodity is protected by the Uganda government trade and exchange rate policies, and a value less than one means the policies actually tax the producers. In addition, the higher the NPC, the greater is the protection to the domestic industry and the greater is the market distortion.

The direct effects were measured by nominal rates of protection ($NRP_d$), which compare the actual domestic prices received by the producers with the actual border prices prevailing at the time. The $NRP_d$ is given by:

$$NRP_d\,(i) = \frac{P_i - P_i''}{P_i''} \tag{4.20}$$

When the $NRP_d$ for coffee, cotton or tea is negative, the domestic price is lower than the world price (border price), implying that the commodity is being taxed, and thus there are disincentives in its production.

The direct effects of trade and agricultural pricing policies assume no changes in overall trade policy or exchange rates. However, the indirect effects of the trade and economy-wide macroeconomic policies affect border prices, and the opportunity costs of production and consumption. To capture these indirect effects of trade and macroeconomic policies on non-agriculture, the indirect nominal rates of protection

($NRP_{id}$) were used. Following Dorosh and Valdés, and Hurtado et al., the indirect nominal rates of protection are given by:

$$NRP_{id}(i) = \frac{\left(P_i^{"}/P_{na}\right)-\left(P_i^{*}/P_{na}^{*}\right)}{\left(P_i^{*}/P_{na}^{*}\right)} \qquad (4.21)$$

where:

$P_i^*$ = border price index of commodity i valued at the equilibrium real exchange rate;

$P_{na}$ = domestic price index of non-agriculture; and

$P_{na}^*$ = domestic price index of non-agriculture with free-trade and valued at the equilibrium real exchange rate.

Equation 4.21 can be simplified to give:

$$NRP_{id}(i) = \frac{\left(P_i^{"}/P_{na}\right)}{\left(P_i^{*}/P_{na}^{*}\right)} - 1 \qquad (4.22)$$

Given that:

$$P_i^{*} = P_i^{"}\left(RER_x^{E}/RER_x\right), \qquad (4.22a)$$

substituting for $P_i^*$ in equation 4.22 by 4.22a yields:

$$NRP_{id}(i) = \frac{\left(P_i^{"}/P_{na}\right)}{\left(RER_x^{E}/RER_x\right)\left(P_i^{"}/P_{na}^{*}\right)} - 1 \qquad (4.23)$$

where $\left(RER_x^{E}/RER_x\right)$ measures the exchange rate adjustment.

When equation 4.23 is simplified, we obtain:

$$NRP_{id}(i) = \left(\frac{RER_x}{RER_x^{E}}\right)\left(\frac{P_{na}^{*}}{P_{na}}\right) - 1 \qquad (4.24)$$

When the relative prices of non-agricultural to agricultural goods and services are considered, the ratio of output of a commodity to the price of non-agricultural goods is the appropriate measure of incentives (Dorosh and Valdés; Hurtado et al.). The total effect of the policy on agricultural relative prices is thus given by the total nominal rate of protection ($NRP_t$), as follows:

$$NRP_t(i) = \frac{(P_i/P_{na}) - (P_i^*/P_{na}^*)}{(P_i^*/P_{na}^*)} \quad (4.25)$$

$$NRP_t(i) = \frac{(P_i/P_{na})}{(P_i^*/P_{na}^*)} - 1 \quad (4.26)$$

where the notation is the same as mentioned earlier.

Using similar steps to those for the $NRP_{id}$ , the $NRP_t$ can be represented by:

$$NRP_t(i) = \left(\frac{P_i}{P_i^*}\right)\left(\frac{RER_x}{RER_x^E}\right)\left(\frac{P_{na}^*}{P_{na}}\right) - 1 \quad (4.27)$$

Equation 4.27 gives the combined effects of sectoral and economy-wide price incentives on agricultural prices, and was the measure used by Dorosh and Valdés, and Hurtado et al. It is interpreted as the nominal rate of protection adjusted to account for the effects of sectoral and economy-wide policies.

Having specified the model to determine the incidence parameter, and all the estimation procedures necessary to compute the $NRP_d$ , $NRP_{id}$ , and $NRP_t$ for each export crop, namely, coffee, cotton and tea, the analysis, and all the relevant calculations were done, and the results are presented in Chapter 5.

## 4.8 Data sources, availability and utilisation

This section provides a general overview on the data used in the study. The sources and relevant explanations related to the data series are documented. Time-series data over the period 1970 to 1992 were collected and compiled from secondary sources.

### 4.8.1 Sources of the data

Complete data series of domestic production, prices (farmgate), and volumes and values of exports of the three crops, were obtained from the data set complied by the staff of the Department of Agricultural Economics, Makerere University, Kampala. The data series on the trade-weighted wholesale price index ($WPI_T^w$), consumer price index ($CPI_{Ug}$), and exchange rates (both nominal and real) were obtained from the same source. The original sources of these data were: the Statistics Department, Ministry of Agriculture, Animal Industry and Fisheries (MAAIF); the Planning Division, Ministry of Finance and Economic Planning (MFEP); various publications of

Background to the Budget; the Coffee Marketing Board (CMB); the Lint Marketing Board (LMB); and the Uganda Tea Authority (UTA).

World prices for each commodity ($P_i^w$), world price indexes for exports ($P_x^w$) and imports ($P_m^w$), external terms of trade, total value of exports (f.o.b) and imports (c.i.f), the GDP price deflator, and the price index for non-agricultural commodities ($P_{na}$) were all obtained from various series of the World Tables Data Files of the World Bank. Data for capital inflows into the country were obtained from the Background to the Budget 1994/95, and the World Tables Data Files of the World Bank.

The International Financial Statistics (IFS) Yearbooks, and Background to the Budget 1994/95, were the sources of the gross domestic product (GDP) and government expenditure figures. Export tax and import tariff revenue data were obtained from Background to the Budget, Government Financial Statistics Yearbooks, and Financial Statement and Revenue Estimates published by the Bank of Uganda.

### 4.8.2 Compilation and adjustments

Some of the data that appear in the study are not in the form in which they were obtained from the sources; adjustments have been made, where necessary, to convert the values to uniform measures. For example, production and export volume figures were converted to thousand metric tonnes and world prices of the commodities were converted to a uniform measure of US$ per metric tonne. In addition, splicing or chaining of two incomplete series of price indexes, and changes in the base-year of some series of price indexes, was done using the procedures explained in The Economist (1992). The complete data series used in the study are presented in Appendix 2. In view of the currency reform that was exercised in 1987, all figures prior to that period were expressed in terms of 'new' Uganda shillings.

The results of the study depend on the quality and reliability of available data. The parallel market in Uganda during the mid and late 1970s was quite large. It is possible, therefore, that official data on the quantities produced and exported during that period, are under-estimated. Given that data on the parallel sector of the economy were unavailable, and given the history of Uganda, the integrity of the available data series used were assumed to be the best representative for the country.