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AGRICULTURAL RESTRUCTURING
IN
SOUTHERN AFRICA

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MACROECONOMIC LINKAGES AMONG IMPORT DEMAND, FOOD DEMAND AND FOREIGN DEBT FOR SELECTED SOUTHERN AFRICAN ECONOMIES: AN EXPLORATORY ANALYSIS

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INTRODUCTION

There are two approaches to dealing with the food security issues in low- and middle-income countries (LMICs): "food self-sufficiency" and "food self-reliance". Food self-sufficiency is a strategy that relies entirely on domestic production to provide an adequate food supply for a nation's inhabitants. Food self-reliance is based on international trade and relies on food imports (or financial reserves) to provide the food needs of a nation's inhabitants beyond domestic production. To attain food security through trade a country must be able to import food at short notice. The ability to import depends on the country's reserve of foreign exchange and the access to food aid. Valdés and Siamwalla (1981) found that, for LMICs that are price takers in the world market, food security can be achieved at a lower cost through varying the levels of imports while operating a relatively small buffer stock of food than by programs of food self-sufficiency.

The debt problem of Sub-Saharan Africa has severely limited the ability of the region to finance critical imports such as food to maintain food security. During the 1970s and the first half of the 1980s, the external debt portfolio of many LMICs grew at an astronomical pace. Total external debt of Sub-Saharan Africa increased from \$5.8 billion in 1970 to \$109.4 billion in 1986 and debt repayment obligations rose from \$472 million in 1970 to \$5 882 million in 1986 (Table 1). However, since 1982 external sources of funding have diminished considerably, making it difficult to sustain the previous level of consumption, investment, and imports. Net transfers to Sub-Saharan Africa decreased from its highest level in 1980 of \$5.6 billion to -\$1.8 billion in 1986 (Table 1). During the same period, total imports decreased from \$61.7 billion in 1980 to \$42.2 billion in 1986 (Table 2). In Sub-Saharan Africa, the situation was exacerbated by unfavorable agricultural policies and severe weather conditions that had deleterious effects on yields of food and export crops. Accordingly, many African countries found it desirable to increase food imports at the same time that their financial debt was making this more difficult than in the past.

According to Greene (1989), the region's external debt has its origin in government actions, in particular external borrowing for development projects. The countries of Sub-Saharan Africa borrowed money, mostly from official sources, to implement projects that were designed to improve domestic industry and infrastructure rather than to boost export production directly. It was expected that, as these economies developed, increases in export production and favorable trends in export prices would provide the foreign exchange needed to service these loans. The two oil price increases of 1973-74 and 1979-80 and the subsequent depression in non-oil commodity markets during the 1980s undermined these expectations. Real GNP and the value of exports decreased from \$198.5 billion in 1980 to \$109.3 billion in 1986 and from \$57.4 billion in 1980 to \$33.2 billion in 1986, respectively (Table 2).

Table 1
Sub-Saharan Africa: External public and private debt

	1970	1975	1980	1985	1986
	(U.S.\$ million)				
Total external debt	5 789	15 391	55 982	93 216	109 399
Total debt service	472	1 307	4 073	8 054	5 882
Interest payments	169	428	1 920	3 101	2 239
Disbursements	1 075	3 659	9 673	6 476	7 642
Net transfers ^a	603	2 352	5 600	-1 578	-1 760
Debt ratio ^b	0,14	0,16	0,28	0,53	0,75
Debt service ratio ^c	0,05	0,05	0,07	0,21	0,18

^a Net transfers = disbursements - total debt service.

^b Debt ratio = total external debt/GNP.

^c Debt service ratio = total debt service/exports.

Source: World Bank. *World Debt Tables*, 1989-1990.

Table 2
Sub-Saharan Africa: Major economic aggregates

	1970	1975	1980	1985	1986
	(U.S.\$ million)				
Gross national product	41 199	95 283	198 468	176 689	145 454
Real GNP ^a	87 471	145 916	198 468	135 394	109 282
Total exports	8 783	23 968	57 445	38 609	33 181
Total imports	9 865	28 856	61 725	43 641	42 187
International reserves	2 028	7 894	15 013	6 410	6 923
Current account balance	-741	-3 748	-3 109	-1 661	-4 868

^a Calculated using the U.S. consumer price index from the IMF, *International Financial Statistics*, 1989.

Source: World Bank. *World Debt Tables*, 1989-90.

The value of exports decreased because of anti-inflationary policies in industrialized countries during the first half of the 1980s. This occurred after the second oil price increase and led to a sharp decline in prices of non-oil primary commodities, the major export commodities of Sub-Saharan African countries. The value of exports decreased below the 1980 levels despite a 16% rise in the export volume from 1980 to 1986. Since revenues

from commodity export taxation did not rise as fast as the government expenditures in development projects, foreign borrowing was used to meet these costs and to maintain expenditure levels.

Government policies that led to the overvaluation of currencies in essence taxed agricultural exports. Further, governments intervened in the marketing of crops by offering and enforcing low output prices to producers to meet administrative costs and to raise revenues. These policies inhibited exports and encouraged the formation of parallel exchange markets. Currency overvaluation, government subsidies for imported food, fertilizer, and petroleum products, and the imposition of high tariff rates or import quotas on the imports of finished goods encouraged imports and promoted the growth of inefficient, import-intensive manufacturing enterprises. In addition, the failure to adjust domestic interest rates in line with rising inflation promoted capital flight, discouraged domestic savings and encouraged private borrowings which contributed further to monetary expansion and inflation.

In the 1980s, the region found itself increasingly unable to meet debt obligations, while maintaining existing trends in the growth of imported goods. The situation began to deteriorate in the mid-1980s, and by 1986 the position of most of the region's countries became precarious with most facing increasing financial difficulties.

The purpose of this paper is to analyze empirically the effects of foreign debt on the demand for total imports in selected Southern African countries. That is, whether the "debt crisis" in Southern Africa has had a negative impact on the ability of these countries to import, particularly the ability to import food and attain food security.

COUNTRIES SELECTED FOR STUDY

Three countries have been selected for analysis: Botswana, Malawi and Zambia. Botswana is considered a middle-income country (MIC) while both Malawi and Zambia are low-income countries (LICs). Botswana and Zambia are mineral-led economies. The former depends on diamonds and to a lesser extent on copper and nickel; in 1966 for Botswana, diamonds accounted for 0% of GDP, but by 1986 46% of GDP was contributed by this sector. Agriculture's contribution to GDP over this same period declined from 39% to 4%. For Zambia, the sectorial share of agriculture has remained fairly constant, around 15%; however, copper is the dominant source of foreign exchange. Malawi is heavily dependent on agriculture which accounts for over 40% of GDP and 90% of its export; it has no mining sector.

Botswana

Of the three countries, Botswana may be characterized as the most outward-oriented in its economic policies. Protectionist policies are virtually non-existent and in cases where domestic industries are protected, they are required to make a commitment to maintain both pre-trade quality and price. Subsidies are used sparingly to achieve economic diversification away from the mining sector, towards agriculture and manufacturing activities. The government practices fiscal conservatism, and government expenditures are contained within government revenues. By 1973, Botswana was able to balance its recurrent budget from domestic revenue sources and in subsequent years was running a surplus (Harvey & Lewis, 1990). The balance of payments turned from a deficit in the mid-1960s to a surplus by the mid-1980s. This was due to the growth in exports which increased from a 25% share of

GDP (in the late 1960s) to 58% (by the mid-1980s). Botswana also achieved a phenomenal growth in capital inflow. In 1965, it essentially had one donor; by 1984, the country attracted aid from every major donor and had among the highest per capita level of official development assistance.

Two major factors affected the economic environment which allowed Botswana's economy to improve: increases in diamond prices, and its ability to negotiate access into the highly priced meat market of the European Community (EC) for its beef exports. Adverse external shocks were in the form of a fall in export diamond sales in 1981-82, low base metal prices for copper and nickel, an extended drought, and an outbreak of foot and mouth disease.

Botswana's financial stress was lower than the average for Sub-Saharan African countries. This can be seen from comparing Table 1 with Table 3, in particular, by comparing average debt service ratio for Sub-Saharan countries with that of Botswana. In each of the reported years, Botswana's debt service ratio is well below the average for Sub-Saharan Africa.

Table 3
Botswana: External public and private debt

	1970	1975	1980	1985	1986
	(U.S.\$ million)				
Total external debt	17,40	147,30	155,60	343,30	390,40
Total debt service	0,60	7,10	12,60	46,30	45,20
Interest payments	0,40	3,40	6,60	20,40	27,00
Disbursements	5,70	24,70	24,40	68,30	28,80
Net transfers ^a	5,10	17,60	11,80	22,00	-16,40
Debt ratio ^b	0,21	0,58	0,18	0,50	0,40
Debt service ratio ^c	0,01	0,03	0,02	0,05	0,04

^a Net transfers = disbursements - total debt service.

^b Debt ratio = total external debt/GNP.

^c Debt service ratio = total debt service/exports.

Source: World Bank. *World Debt Tables*, 1989-1990.

Zambia

Zambia's economic policies have been basically import-substitution policies with wide-spread tariffs and protectionism, increasing government intervention in goods markets, and an exchange rate regime that was overvalued. In agriculture, commodity prices were controlled by marketing boards; low producer prices served as a disincentive for increased output. This pricing policy was implemented to tax agriculture for government revenues and to favor urban consumers in the grain markets. Growth in gross domestic product (GDP) declined from 2.4% during 1965-73 to -0.1% in the 1980-87 period (UNDP/World Bank). Agricultural production grew at an average of 2% in the initial period, declined to an average

Macroeconomic linkages among import demand, food demand and foreign debt

of 1.6% in 1973-80 and then increased to 3.2% in the 1980s. Exports of goods, however, stagnated and accounted for about 10% of GDP.

External shocks exacerbated the negative effects of the inward-oriented policies. General downward pressures in commodity prices in the last two decades resulted in a drastic deterioration of the terms of trade. Zambia sustained a cumulative loss of 18% of GDP for the period 1971-1983 (Gulhati & Yalamanchili, 1988). At the same time government budget deficits were running over 10% of GDP and balance of payments deficits exceeded 15% of GDP. The external debt grew to \$5.6 billion in 1986 from just over \$0.6 billion in 1970. Debt service as a percentage of exports grew from 6% in 1970 to 19% in 1986 (Table 4). It became increasingly difficult to finance imports and service foreign debt. New capital inflows were obtained at high commercial rates.

Since 1983 structural adjustment programs have been in place to reform the economy. These include price controls, reduction of food subsidies, increases in producer prices of agricultural commodities, liberalization of agricultural marketing, and the introduction of a foreign exchange auction.

Further insight into Zambia's relative financial stress position can be gleaned from comparing Table 4 with Tables 1 and 3, in particular, for the debt service ratio. In all the reported years, except 1985, Zambia's debt service ratio is above the average for Sub-Saharan Africa; in all the years it is above that of Botswana. In 1986, Zambia's debt ratio was almost 10 times that of Botswana, and its debt service ratio was almost five times that of Botswana.

Malawi

Malawi's economy is agriculture-based with a mix of private and state enterprises. The country has adopted an estate strategy of production for the major export crops of tobacco, tea and sugar and has a goal of achieving food "self-sufficiency". While agricultural production fared well in the 1970s, growth in agricultural exports in the 1980s was slower than previously. GDP grew at an average annual rate of over 5% in the 1970s, but declined in the 1980s to an average growth rate of 2.6% (UNDP/World Bank, 1989).

In general, industrial policy is not restrictive and the exchange rate regime flexible; however, agriculture is controlled, with a marketing board (ADMARC) administering prices and marketing. In the 1980s, Malawi experienced various shocks in its economy: a fall in the price of tobacco, the major source of export earnings; a drought which required food imports to cover domestic shortfalls; high cost of transporting export crops through war zones in Mozambique; and an influx of refugees from the Mozambican war. As a result of a combination of these factors, the terms of trade declined from an index of 100 in 1980 to 28 in 1987. The loss sustained as a result of the deterioration in the terms of trade over the period from 1970 is about 5% of GDP (Gulhati and Yalamanchili, 1988).

Malawi's financial position as indicated by its debt service ratio and its debt ratio is above that of the average for Sub-Saharan Africa (see Table 5.) For the years reported, its debt service ratio is above that of Botswana but below that of Zambia (except for the reported year of 1975). Malawi's debt ratio position has been below that of Zambia except for the reported year of 1970 and above that of Botswana for all years reported.

Since 1981, three structural adjustment loans totalling \$224 million have been funded by the World Bank and other donors (Lele, 1989). The reform mechanisms adopted are designed to improve the balance of payments situation, reduce the budget deficit and allow

a freer reign for market forces in the allocation of resources and the determination of the structure of production.

Table 4
Zambia: External public and private debt

	1970	1975	1980	1985	1986
	(U.S.\$ million)				
Total external debt	653,00	1 351,00	3 253,00	4 641,00	5 625,00
Total debt service	64,00	96,00	289,00	95,00	140,00
Interest payments	29,00	47,00	107,00	43,00	64,00
Disbursements	351,00	432,00	631,00	301,00	303,00
Net transfers ^a	287,00	336,00	342,00	206,00	163,00
Debt ratio ^b	0,37	0,59	0,90	1,95	3,99
Debt service ratio ^c	0,06	0,11	0,18	0,11	0,19

^a Net transfers = disbursements - total debt service.

^b Debt ratio = total external debt/GNP.

^c Debt service ratio = total debt service/exports.

Source: World Bank. *World Debt Tables*, 1989-1990.

Table 5
Malawi: External public and private debt

	1970	1975	1980	1985	1986
	(U.S.\$ million)				
Total external debt	122,00	260,00	821,00	1 022,00	1 132,00
Total debt service	6,00	17,00	68,00	82,00	111,00
Interest payments	4,00	8,00	35,00	30,00	36,00
Disbursements	40,00	61,00	158,00	69,00	120,00
Net transfers ^a	34,00	44,00	90,00	-13,00	9,00
Debt ratio ^b	0,43	0,42	0,71	0,91	0,96
Debt service ratio ^c	0,07	0,08	0,22	0,29	0,41

^a Net transfers = disbursements - total debt service.

^b Debt ratio = total external debt/GNP.

^c Debt service ratio = total debt service/exports.

Source: World Bank. *World Debt Tables*, 1989-1990.

METHODOLOGY

First, a variable for financial stress is constructed with confirmatory factor analysis to measure the effects of foreign debt upon import demand (Bollen, 1989). Next, a two-stage import-allocation model is developed to estimate the demand for total imports and then, conditional on the expenditure level of total imports, the demand for food, non-food primary products including fuel, and manufactured imports. By exploiting the linkages between the first and second stages, unconditional demand elasticities with their respective standard errors are also estimable for the three import categories.

Constructing a Financial Stress Index

In general, a country's financial stress can be defined as the inability to meet financial or debt obligations as they become due. These obligations can be met through current foreign exchange reserves or new borrowing. Hence, changes in the world macroeconomic environment in the 1980s and government policies in LMICs contributed to the financial stress of these countries through different avenues. Financial stress has different components or manifestations, such as short-term liquidity, long-term solvency, and profitability. Liquidity typically involves the ability of a country to generate the necessary foreign exchange to meet its principal and interest payments on its debt when they become due. Solvency is a long-term concept which shows the country's ability to meet its overall debt with its available production capacity. Profitability implies the return on investment in an economy relative to the cost of capital. In other words, it has to do with the question of whether investment in an economy yields sufficient revenues to meet interest payments. Usually financial difficulties in only one dimension are not automatically translated into financial stress. For example, in the case of solvency, a rapidly growing economy with a high level of profitability may require a higher debt. Hence, appropriate measures of financial stress must consider all three dimensions of the financial position of a country.

Although financial stress (FS) from foreign debt is an unobservable variable, there are observable indicators of FS. Accordingly, we construct our FS index by confirmatory factor analysis which isolates the common variation in its observable indicators (Bollen, 1989). This common variation is then used as the latent variable of financial stress. The multiple indicator model is then specified as where X_t is a vector of observable indication of FS, δ is a vector of factor loadings, ϵ_t is a vector of error terms, and t represents the time period.

In this study, the vector X consists of RNAC (real net autonomous cost inflows or net new disbursements less interest payments deflated by the import price index), DRS (debt service ratio or the percentage change in principal plus interest payments minus the percentage change in gross national product over the previous year), DR (debt ratio or the percentage change in total external debt minus the percentage change on gross national product), and P (profitability or the growth in real gross national product less the world interest rate). RNAC and DRS are measures of liquidity, DR is a measure of solvency, and P a measure of profitability.

The first equation is estimated using maximum likelihood. Specifically, let Σ be the estimated correlation matrix from the sample, F be the variance of the latent variable, and θ be a diagonal matrix of idiosyncratic variation. Maximum likelihood estimation then involves choosing δ , F , and θ such that where T is the number of observations, X is the normalized matrix of indicators and $\text{tr}(\bullet)$ denotes trace.

Using the estimated factor loadings, an index of financial stress is constructed. Each

of the factor loadings relates a normalized random variable to a normalized random unobservable variable. Thus, the financial stress is constructed as where the bars denote averages and σ_i denotes the standard deviation of series i . Because of its construction, if FS is greater than 1.96 or less than -1.96, the country is experiencing significant financial stress or prosperity, respectively. When entered into the import model, FS was normalized so that the year of highest financial prosperity was equal to zero and then divided by 100.

Aggregate import demand

Once financial stress is modelled, the total import demand is specified using a modified Khan's model (Khan, 1974) which formulates total import demand of a country as a function of total import price relative to a domestic price index and domestic income. As the price of imports becomes relatively higher, the quantity of imports should decline. In addition, as income in a country increases the quantity of imports demanded should rise. In log-linear terms M is the quantity of imports demanded, PM is the unit value of imports, PD is the domestic price level, Y is the real gross national product (GNP), and ϵ is a random error term. Since the equation is specified in logarithms, α_1 and α_2 are the relative price and income elasticities, respectively. To complete his model, Khan constrains $M^d = M^s$ and adds an import price equation where PW is the world price level, W is real world income, and μ is a random error term.

The present study extends Khan's model in two essential ways. Firstly, we hypothesize that the income effect on total import demand is affected by financial stress. Specifically, if two countries have the same income level and face similar prices, the country with higher financial stress will demand less imports than the other country. Econometrically, this means α_2 is a function of financial stress (FS) where FS is the financial stress index. This gives $\log M = \alpha_0 + \alpha_1 \log(PM/PD) + \delta_0 \log Y + \delta_1 FS * \log Y + \epsilon$. Secondly, we expand Khan's model to include an import demand system for three categories of imported goods which is conditional on total import expenditure. These categories are food, non-food primary commodities including fuel, and manufactures.

Conditional import demand system

Once the country has allocated total income (Y) to domestic goods and imported goods, it allocates total import expenditure (M) to the different imported groups. In this study we have three aggregate imported goods: food, non-food primary commodities including fuel, and manufactures. Financial stress is assumed to affect the demand for these goods through its interaction with import expenditure; the parameter on import expenditure is a function of FS. This gives a three-equation conditional demand system of the following where P_i ($i = 1,2,3$) is the price of good i and ξ_i is the random error of i . The complete model thus consists of a five-equation system plus the identity $M^d = M^s$.

EMPIRICAL ANALYSIS

The data of the three countries (Botswana, Malawi, and Zambia) cover the 1970-1986 period. Data for the debt-related variables (total external debt, principal and interest payments, and disbursements) are obtained from **World Bank Debt Tables**. The **World Tables** published by the World Bank provides data on GNP and gross domestic product deflators. World prices and world income are taken from the **International Financial Statistics** published by the International Monetary Fund. Data for total imports and for the

different commodity groups and their respective price indices were obtained directly from the World Bank.¹ The financial stress index is constructed using confirmatory factor analysis (Bollen, 1989), and the full demand system is estimated with three-stage least squares.

Total import demand

The parameter estimates with asymptotic standard errors for the total import demand equations are reported in Table 6. In all three countries, the parameter, δ_1 , on the interaction term between income and financial stress is negative; δ_1 is significant ($\alpha = 0.05$) for Malawi and Zambia, and the negative effect of FS is greatest for Zambia. As stated above, Botswana's debt burden is below the average for Sub-Saharan Africa and is not a binding constraint. Zambia's debt position is well above average for Sub-Saharan Africa and the worst among the three selected countries.

The income effect on total import demand is in the same direction (positive) for all three countries. For Botswana and Malawi, the size of the estimated parameter, δ_0 , on income is of the same approximate magnitude (0.72 for Malawi; 0.77 for Botswana), and their asymptotic standard errors are less than half the size of the parameter estimates. For Zambia, this parameter estimate is smaller (0.23) and insignificant ($\alpha = 0.05$). The parameter estimate, α_1 , on relative price is negative and significant ($\alpha = 0.05$) for Botswana; the estimates for Malawi and Zambia are statistically the same as zero.

Table 6

Total import model parameter estimates for three southern African countries, 1970-1986

Countries	Parameter estimates							
	Demand equation				Supply equation			
	Const.	PM/PD ^a	Y ^b	Y*FS ^c	Const.	M ^d	PW ^e	W ^f
Botswana	1,44 (0,58) ^g	-0,80 (0,16)	0,77 (0,09)	-0,23 (0,41)	4,19 (7,30)	0,05 (0,12)	0,74 (0,13)	-0,22 (0,57)
Malawi	1,12 (1,17)	0,05 (0,08)	0,72 (0,17)	-0,62 (0,26)	32,45 (13,01)	0,32 (0,29)	1,25 (0,28)	-2,41 (0,90)
Zambia	5,77 (3,59)	0,03 (0,50)	0,23 (0,44)	-1,32 (0,44)	26,14 (10,56)	0,23 (0,28)	1,29 (0,16)	-1,96 (0,63)

a PM/PD = Import price/domestic price (index 1980=100).

b Y = Income (million \$).

c FS = Financial stress index.

d M = Total import value (million \$).

e PW = World price (million \$).

f W = World income (million \$).

g Standard errors are in parentheses.

Total import demand elasticities are calculated with asymptotic standard errors based on the parameter estimates and sample means (Table 7). The elasticities of total import demand with respect to financial stress (δ_{mfs}) are negative for all three countries; they are

¹ We would like to thank Mr. Jonggoo Park for his generous assistance in making this data available to us.

statistically different from zero ($\alpha = 0.05$) for Malawi (-0.11) and Zambia (-0.66). Income elasticities of total imports are inelastic for all three countries; they are significant ($\alpha = 0.05$) for Botswana and Malawi and range between 0.7 and 0.8. Total import own-price elasticities (η_{mpm}) are only significantly different from zero ($\alpha = 0.05$) for Botswana; it is inelastic and equal to -0.8.

Table 7
Total import elasticities for three southern African countries
calculated at the sample means, 1970-1986

Countries	Elasticity estimates		
	η_{mpm}^a	ϵ_{my}^b	δ_{mfs}^c
Botswana	-0,80 (0,16) ^d	0,77 (0,09)	-0,08 (0,14)
Malawi	0,05 (0,08)	0,72 (0,17)	-0,11 (0,04)
Zambia	0,03 (0,50)	0,23 (0,44)	-0,66 (0,22)

^a η_{mpm} = Total imports own-price elasticity.

^b ϵ_{my} = Income elasticity of total imports.

^c δ_{mfs} = Elasticity of total imports with respect to financial stress in 1985.

^d Standard errors are in parentheses.

Demand for three groups of imported goods

The group-demand equations are conditional on total import expenditure. The three groups of imported goods are food, primary products including fuel, and manufactures. As reported above, FS has a negative effect on total import demand for all three countries although not significantly for Botswana. How this decline in total imports is allocated to the three groups of goods depends on several factors including expenditure elasticities and price elasticities of demand of these goods as well as overt sectoral policies taken by the government in response to financial constraints due to financial stress.

Generally, we expect food imports to be less elastic than manufactures for both price and expenditure changes. Thus, we expect food imports to decline less proportionately than manufactures imports. In some cases, food imports may actually rise (see below). Demand for primary products, which includes fuel, could react either positively or negatively, depending on the actual composition of this group and the ability of the economy to substitute away from relatively high-priced inputs.

Parameter estimates of the group-demand equations are not reported in this paper but may be obtained from the authors. However, elasticity estimates of demand with respect to income, import expenditure, prices, and financial stress are reported and discussed below for each of the three import groups.

FOOD IMPORT DEMAND

Demand elasticity estimates with asymptotic standard errors for food imports are

reported in Table 8. In all three countries, the own-price elasticities of demand for imported food are negative and inelastic; those of Botswana and Malawi are over twice as large as their asymptotic standard errors. These results indicate that the demand for imported food conditional on total import expenditure in these countries decreases as the relative price of imported food increases although by a smaller percentage change than that of price. Elasticities of demand for imported food with respect to total import expenditures (γ_{mfm}) are positive and significantly different from zero ($\alpha = 0.05$) for Botswana (1.15) and Zambia (0.91). In the case of Malawi this elasticity is insignificant ($\alpha = 0.05$). Income elasticities of demand for food (ϵ_{mfy}) are also calculated; only the positive elasticity of Botswana is statistically significant ($\alpha = 0.05$).

Table 8
Food import elasticities for three southern African countries at the sample means, 1970-1986

Countries	Elasticity estimates			
	η_{mfpf}^a	γ_{mfm}^b	δ_{mffs}^c	ϵ_{mfy}^d
Botswana	-0,75 (0,16) ^e	1,15 (0,09)	-0,12 (0,14)	0,88 (0,10)
Malawi	-0,37 (0,14)	-0,21 (0,21)	0,19 (0,06)	-0,15 (0,15)
Zambia	-0,53 (0,29)	0,91 (0,26)	-0,48 (0,29)	0,21 (0,41)

^a η_{mfpf} = Food imports own-price elasticity.

^b γ_{mfm} = Elasticity of food imports with respect to total import expenditure.

^c δ_{mffs} = Elasticity of food imports with respect to financial stress in 1985.

^d ϵ_{mfy} = Income elasticity of food imports.

^e Standard errors are in parentheses.

The elasticities of demand for food imports with respect to financial stress (δ_{mffs}) are unconditional elasticities and depend on both income and total import expenditure. Botswana, the country with the least severe financial stress from foreign debt among the three, has a negative but insignificant elasticity of demand for imported food with respect to FS. This is not surprising in light of the finding concerning the effect of FS on total import demand in Botswana. Zambia, the country with the most severe financial stress, has a negative and significant elasticity ($\alpha = 0.10$) with respect to FS. For Malawi, this elasticity is positive and significant ($\alpha = 0.05$).

The differences in signs between these two elasticities for Malawi and Zambia are probably due to the different economic structures of the two countries, their food security policies, the level of their financial stress, and the way in which their governments react to the budget constraint imposed by financial stress. Zambia's desire to obtain food self-sufficiency and their financial situation forced them to reduce all imports including food. As such, the Zambian government responded by increasing incentives to food producers thereby increasing per capita domestic food production and thus reducing food imports. Malawi

followed a more open approach and reacted differently. Being less concerned with achieving food security through food self-sufficiency, Malawi’s government sought to decrease fiscal spending by decreasing subsidies to agriculture for input purchases, particularly for fertilizers. Accordingly, domestic food production declined and food imports rose. This effect was exacerbated by drought-like conditions during much of the 1980s.

MANUFACTURES IMPORTS

Demand elasticity estimates for manufactures imports and their asymptotic standard errors are reported in Table 9. All of the conditional elasticities of demand for manufactures with respect to total import expenditure (γ_{mnm}) are positive and significant ($\alpha = 0.05$); that of Botswana is near unitary, that of Malawi is elastic, and that of Zambia is inelastic. The income elasticities of demand for manufactures imports (ϵ_{mny}) are all less than one and positive, and those for Botswana and Malawi are over twice as large as their asymptotic standard errors. The own-price elasticity estimates of import demand for manufactures imports (η_{mmpma}) for Botswana is negative, inelastic and statistically significant ($\alpha = 0.05$); those of Malawi and Zambia are insignificant.

All elasticities of demand for manufactures imports with respect to financial stress (δ_{mmfs}) are negative. These elasticities are larger than their asymptotic standard errors for Malawi and Zambia and equal to -0.20 and -0.64, respectively. Malawi has responded to financial stress by increasing food imports at the expense of manufactures imports. Zambia’s response as we would expect is larger than that of Malawi’s.

Table 9
Manufactures import elasticities for three southern African countries at the sample means, 1970-1986

Countries	Elasticity estimates			
	η_{mmpma}^a	γ_{mnm}^b	δ_{mmfs}^c	ϵ_{mny}^d
Botswana	-0,04 (0,01) ^e	0,96 (0,03)	-0,06 (0,12)	0,74 (0,09)
Malawi	0,01 (0,01)	1,11 (0,05)	-0,20 (0,05)	0,80 (0,20)
Zambia	0,01 (0,04)	1,12 (0,07)	-0,64 (0,25)	0,26 (0,50)

^a η_{mmpma} = Manufactures imports own-price elasticity.

^b γ_{mnm} = Elasticity of manufactures imports with respect to total import expenditure.

^c δ_{mmfs} = Elasticity of manufactures imports with respect to financial stress in 1985.

^d ϵ_{mny} = Income elasticity of manufactures imports.

^e Standard errors are in parentheses.

PRIMARY GOODS IMPORTS

Demand elasticity estimates for primary commodity imports are reported in Table 10. All the conditional elasticities of demand for primary commodity imports with respect to total import expenditures (γ_{mpm}) are significant ($\alpha = 0.05$), but are positive and elastic for

Botswana and Malawi, but negative and inelastic for Zambia. Income elasticity estimates for primary commodities (ϵ_{mpy}) are positive, twice as large as their asymptotic errors, and equal to 1.12 and 0.85 for Botswana and Malawi, respectively. In the case of Zambia this elasticity is not statistically different from zero ($\alpha = 0.05$). Conditional own-price elasticity estimates for primary commodity imports (η_{mpps}) are over twice as large as their asymptotic standard errors for Botswana and Zambia. The one for Botswana is positive and elastic, while the one for Zambia is negative and inelastic.

Table 10
Primary commodities import elasticities for three southern African countries at the sample means, 1970-1986

Countries	Elasticity estimates			
	η_{mpps}^a	γ_{mpm}^b	δ_{mpfs}^c	ϵ_{mpy}^d
Botswana	-0,19 (0,05) ^e	1,45 (0,08)	-0,08 (0,26)	1,12 (0,16)
Malawi	-0,00 (0,01)	1,06 (0,32)	0,27 (0,08)	0,85 (0,26)
Zambia	0,05 (0,03)	-0,66 (0,20)	-0,22 (0,21)	-0,15 (0,29)

^a η_{mpps} = Primary commodities imports own-price elasticity.

^b γ_{mpm} = Elasticity of primary commodities imports with respect to total import expenditure.

^c δ_{mpfs} = Elasticity of primary commodities imports with respect to financial stress in 1985.

^d ϵ_{mpy} = Income elasticity of primary commodities imports.

^e Standard errors are in parentheses.

Unconditional elasticities of demand for primary commodities with respect to financial stress (δ_{mpfs}) are negative but insignificant for Botswana and Zambia; that of Malawi is positive and significant. Again, the pattern for Malawi seems to be severe declines in manufactures imports as a response to financial stress, perhaps deliberately on the part of the government in order to insure sufficient food and raw material supplies.

CONCLUSION

This paper examines the effect of financial stress as well as income and prices on the demand for total imports, food imports, primary goods imports including fuel, and manufactures imports for three Southern African countries, Botswana, Malawi, and Zambia. Financial stress from foreign debt has a negative impact on total imports. For Botswana, a middle-income country, the effect, though negative, is not binding. The effect of financial stress from foreign debt on Zambia's demand for total imports is the largest; this is not surprising as Zambia's financial stress is greater than that of the other two countries.

The effect of financial stress on the demand for three broad categories of goods (i.e., imports of food, primary goods and manufactured goods) is different for each category and for each of the three countries. The effect of financial stress on Botswana is not significant although the signs of these elasticities are all negative. The financial stress elasticities of

Zambia are also all negative and are significantly different from zero, except in the case of primary goods imports. Malawi has a significant and negative elasticity with regard to manufactures imports, but a positive elasticity for food imports and primary goods imports. The differences in how a country allocates its decrease in total imports to the various imported goods depend on the structure of the economy and government policies, particularly its policies in the area of food security and industrial policies.

Overall, the results indicate that financial stress at least has the potential to constrain a country's ability to insure food security. Even when a country such as Malawi increased its food imports in the face of increasing financial stress from foreign debt, it did so at the cost of significantly declining manufactures imports.

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