Investment, the Real Exchange Rate, and Dutch Disease: A Two-Period General Equilibrium Model of Cameroon

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This paper examines the structural adjustment problem of a developing country with a finite foreign-exchange surplus and develops a method of evaluating choices among the possible sectoral and macroeconomic policies for such a country. Traditional treatment of this adjustment, commonly known as "Dutch disease," considers the composition of output between traded and nontraded goods but does not include the trade-off between consumption and investment. This study adds the investment dimension by incorporating two-period optimization in a multisectoral computable general equilibrium (CGE) model for Cameroon. Unlike other CGE models, the composition of aggregate demand responds to factor prices driving investment decisions. The structure of output and trade similarly respond to macroeconomic forces, not just to relative prices.

The model is used to test the impact of foreign-capital inflow, tariff policy, and policy toward public firms. Simulation results point out the key role of import substitutes, manufactures in this case. The pattern of the investment response indicates that this sector is likely to contract in the short run and expand in the near future. However, public firms, also producing import substitutes, are unlikely to succeed in an investment boom, even with credit distribution biased in their favor. Tariff protection for manufactures raises the price of investment goods and heightens credit demands, but does encourage the domestic sector. On the macroeconomic side, we note a significantly greater impact of the interest rate on investment than on savings. These results conform with empirical observation.

1. INTRODUCTION

During the last 15 years, a number of developing economies have been buffeted by large inflows of foreign exchange—some through windfall export earnings, others through foreign loans. These temporary surpluses can force at least two adjustments in the economy: in the mix between traded and nontraded goods, and in the balance
between savings and consumption. As both affect the level and structure of real investment, these developments will be costly to reverse when conditions change—when the export boom collapses or the country must repay the foreign loans.

This paper characterizes the structural adjustment problem of a developing country with fluctuating foreign-exchange earnings and evaluates possible sectoral and macroeconomic policy responses. In the rest of this introduction, we motivate and present a specific model that captures the necessary features. The description is heuristic; a complete set of equations is in the appendix. The institutional framework and data for the model are adapted from a particular oil surplus country, Cameroon. Section 2 describes and interprets simulations with the model. Section 3 draws together the policy implications and lessons for other exchange-surplus countries.

Saving-investment decisions are important because they respond to short-term shocks, but have long-term repercussions. Yet the standard literature on foreign-exchange windfalls neglects this issue and focuses on the adjustment in the tradable-nontradable mix. Known as the "Dutch disease," this adjustment occurs when new demand for traded goods is met by imports at constant world prices, but excess demand for nontraded goods causes their prices to rise relative to those of traded goods. This real exchange-rate appreciation and the movement of resources into nontraded goods production leads to declining competitiveness and contraction in the traded sectors.

The "disease" arises because the standing capital stock is not perfectly mobile. Expenditures during the boom can leave a rigid economic structure that will be inappropriate to a new exchange-short situation. Nevertheless, the basic theoretical statement of Dutch disease adjustment (Corden 1982) does not include investment. As we show, including investment behavior could alter the outcome of this syndrome.

In this paper, we present a framework that captures the consumption-savings and tradables-nontradables adjustment simultaneously. The underlying approach is a computable general equilibrium (CGE) model of the economy.

Typically, CGE models find single-period solutions and are used

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1The term "Dutch disease" derives from the decline in competitiveness of the Netherlands' traditional exports after the discovery of the Groningen gas fields in the early 1970s.

2Corden noted that movement of resources into the booming sector also contributes to Dutch disease. In the present case, we assume the booming export sector is an enclave with negligible impact on domestic employment.
for comparative statics analysis (see, for example, Dervis et al. 1982). They can be run over time by updating exogenous variables and solving for a series of single-period outcomes. Investment funds are usually allocated to sectors based on static shares of total savings where these savings are a residual of consumption or a linear function of income. Variations of this framework allow some response of investment allocation to the current sectoral rates of return to capital. But there are no multiperiod decisions, and no account is taken of expected future profitability of current investment.

Future profitability is accounted for in dynamic central planning models, but these do not include private optimizing behavior. They have no financial market and assume an exogenous interest rate. They endow investors with complete foresight of all future prices and solve for a long-run steady state. Investment decisions express the approach to this steady state. In contrast, a two-period model brings saving and investment decisions into the realm of near-term expectations, but is more dependent on terminal conditions. An example is the model by Feltenstein (1985), where the second-period solution depends on fixed terminal values for the interest rate, capital price, and bond holdings.

The model presented in this paper is simpler than a two-period model, but requires fewer terminal conditions. The simplification is possible in part because next period's output is projected based on first-period developments, rather than solved for in a complete set of markets. Once the production estimate is made, cost-minimizing future employment of capital and labor can be determined for any set of factor prices. So it is only necessary to complete the future factor markets in order for producers to pick optimal investment levels. To this end, an explicit financial market provides the opportunity cost of future capital, and an exogenous labor growth rate completes the labor market to produce the future wage.

One characteristic of this approach is a lesser concern with perfect foresight. It is not necessary for either investors or savers to know all prices for every period in the future. Because the solution for future factor prices implies a future value-added price, we assume that consumers can use this "consistent" future price to distribute their consumption between the present and the future. The only terminal condition in the model is that producers must place a value on the

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3One exception is a model of the Philippines by Delfin Go (1988), but it shares the other characteristics mentioned.
capital stock left standing at the end of period two. This can be determined for each sector from the base-year interest rate and investment data.

The rest of the model—specifically, the trade specification, the within-period demand system, and intermediate demand—stems from earlier work on Cameroon by Benjamin et al. (1989). That study used a typical single-period CGE model with rigid saving and investment allocations, like those described above. The differences in the current model can be summarized as follows: endogenous, dynamically optimal saving and investment behavior are intermediated by a financial market segmented into formal and informal sectors. The sectoral data have been regrouped to define four private and two public sectors where the public sectors have distinct behavior in both labor and credit markets. In most cases, public firms can always borrow at subsidized formal interest rates, but they can only hire a limited number of workers, and they must wait one period before they can lower their wage. Government fiscal balances have an impact on the supply of loanable funds and real interest rates in the formal and informal credit markets. In the model, interest rates are signals for the intertemporal allocation of production and consumption. The impact of these differences on model results will be noted in the next section.

The model is “closed” by setting the nominal exchange rate and the level of foreign-capital inflow exogenously. This accommodates the West African franc zone institution of a fixed exchange rate and allows foreign-capital flows to be varied exogenously as either a shock or a policy choice. With an exogenous exchange rate and current account, the adjustment mechanism becomes changes in the price level of domestically produced goods. As these domestic prices vary against the nominal exchange rate, and thus against foreign prices, so varies the real exchange rate. In this way, the nominal exchange rate or the foreign price level is the numeraire of the model.

Having described the model, we can sketch the macroeconomic adjustment mechanisms equilibrating the two-period saving and investment decisions. Consider a one-sector version of the model, and begin with an expansion of foreign-capital inflows. When new foreign capital supplies new savings, borrowing costs fall. The lower interest rate, and thereby the lower return required for the marginal project, encourages firms to invest more, to allocate more of current output for use in producing future output. In aggregate, first-period output is fixed (due to fixed factor supplies), so the new demand for investment goods drives up domestic prices relative to the exchange rate. The share of imports in total consump-
tion rises in response to the higher relative price of domestic goods compared to imports. The trade surplus shrinks, balancing the new foreign-capital inflow.

The decline in the interest rate has a negative effect on household saving. But, as we will see in the empirical section, this effect is usually superseded by two other factors. First is the income effect. The growth of investment demand raises wages and incomes while consumer prices are held down by the larger component of relatively cheap imports. This increase in real income has a positive effect on saving. Second, the choice between consumption and saving is influenced by relative present and future prices. Since first-period domestic goods are becoming more expensive, and growing investment levels are expected to yield greater productive capacity and cheaper goods for the future, households are induced to save more from current income and transfer consumption to the future. This increase in savings helps to keep the interest rate low, and it helps to finance the investment boom.

Of course many more interactions take place in the multisectoral model. With any given aggregate trend in production, investment, imports, and exports, some sectors may contract while others expand. Relative prices become important signals in the model and important clues as to the nature of adjustments in model experiments. Descriptions of experimental results will note in particular the intersectoral trends in investment.

2. SIMULATIONS

This section describes the data for the model and the results of model experiments involving changes in foreign-capital inflows. There are six sectors. The private sectors include one exportable, one import-replacing good, and two near nontraded goods. Imports and exports of food are so low that the sector behaves like a nontradable. Services include a significant nontraded investment good—construction—as well as some traded components like financial services. Cash crops comprise the main exporting sector, and manufactured goods experience high levels of trade.

The two public sectors are public industry, largely protected from imports by quotas, and public services, which includes public administration. Both sectors export small amounts, mostly international transportation and tourism in the latter case. A summary of the base structure of output and final demand for all sectors in 1982–1983 is given in Table 1.
Table 1: Production and Final Demand for 1982–1983

<table>
<thead>
<tr>
<th>Sector</th>
<th>1 Food crops</th>
<th>2 Cash crops</th>
<th>3 Private industry</th>
<th>4 Private services</th>
<th>5 Public industry</th>
<th>6 Public services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>12.6</td>
<td>6.9</td>
<td>28.8</td>
<td>33.5</td>
<td>7.3</td>
<td>10.9</td>
</tr>
<tr>
<td>Consumption</td>
<td>29.6</td>
<td>0.4</td>
<td>28.9</td>
<td>32.7</td>
<td>5.5</td>
<td>2.8</td>
</tr>
<tr>
<td>Investment</td>
<td>9.3</td>
<td>13.5</td>
<td>18.8</td>
<td>38.1</td>
<td>7.6</td>
<td>12.7</td>
</tr>
<tr>
<td>Government</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Imports</td>
<td>1.8</td>
<td>1.7</td>
<td>66.5</td>
<td>30.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exports</td>
<td>0.7</td>
<td>21.0</td>
<td>59.4</td>
<td>13.8</td>
<td>1.1</td>
<td>4.0</td>
</tr>
<tr>
<td>Employment</td>
<td>60.8</td>
<td>15.6</td>
<td>5.1</td>
<td>13.2</td>
<td>0.6</td>
<td>4.0</td>
</tr>
<tr>
<td>Value added</td>
<td>18.7</td>
<td>5.9</td>
<td>25.9</td>
<td>35.8</td>
<td>3.3</td>
<td>10.4</td>
</tr>
</tbody>
</table>

Distribution in percent

<table>
<thead>
<tr>
<th>Shares of sectoral output</th>
<th>Consumption</th>
<th>.63</th>
<th>Investment</th>
<th>.19</th>
<th>Government</th>
<th>.14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imports</td>
<td>0.03</td>
<td>.05</td>
<td>0.45</td>
<td>0.18</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Exports</td>
<td>0.01</td>
<td>.55</td>
<td>0.37</td>
<td>0.07</td>
<td>0.03</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Shares of value added

2A. Oil Sector Earnings

Given limited domestic participation in oil production, fluctuations in oil earnings from changes in world prices are modeled by variation in the foreign exchange resources of the government (see Benjamin and Devarajan 1985).

The first experiment explores the case where the economy receives a large injection of foreign exchange. In this case the government repatriates in $500 million (or 177 billion CFA francs). This is a large amount, about four times the historical levels, and was chosen only to sharpen the results. The injection is equal to 7 percent of GDP and 26 percent of imports. The results are similar for lesser amounts. Table 2 summarizes the main intersectoral adjustments in percentage changes from the base solution.

Since the nominal exchange rate is the numeraire of the model, real exchange-rate appreciation can be seen in the rise of domestic prices in relation to the fixed exchange rate. The price increases are part of an overall macroeconomic expansion. The unsterilized foreign-capital inflow finances a credit expansion, and this increase in the money supply brings down the interest rate, encouraging new investment. The capital inflow also finances a large current account deficit that brings
Table 2: Increase in Foreign Earnings ($500 m) (in percentage changes from base values)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Food crops</th>
<th>Cash crops</th>
<th>Private industry</th>
<th>Private services</th>
<th>Public industry</th>
<th>Public services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic prices</td>
<td>8.1</td>
<td>3.8</td>
<td>5.3</td>
<td>9.0</td>
<td>4.7</td>
<td>5.6</td>
</tr>
<tr>
<td>Output</td>
<td>1.3</td>
<td>-8.0</td>
<td>-7.4</td>
<td>6.1</td>
<td>-0.3</td>
<td>-0.2</td>
</tr>
<tr>
<td>Exports</td>
<td>-10.4</td>
<td>-9.8</td>
<td>-11.8</td>
<td>-6.1</td>
<td>-8.3</td>
<td>-9.8</td>
</tr>
<tr>
<td>Imports</td>
<td>23.3</td>
<td>-2.9</td>
<td>17.0</td>
<td>19.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investment by destination</td>
<td>28.0</td>
<td>-10.4</td>
<td>5.2</td>
<td>104.8</td>
<td>-40.5</td>
<td>-20.8</td>
</tr>
<tr>
<td>Wages period one</td>
<td>7.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wages period two</td>
<td></td>
<td>-10.2</td>
<td></td>
<td></td>
<td></td>
<td>-12.6</td>
</tr>
<tr>
<td>Informal interest rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In real resources; these help supply the new investment demand. The declining interest rate causes producers to switch from labor to capital until the full employment constraint on the labor market brings down the second-period wage.

In this experiment, government consumption is fixed in nominal terms, so the new public transfers become available as loanable funds from the bank. This transmits the maximum impact of the new foreign exchange onto investment. Growth in the capital stock, along with exogenous growth in the labor force, increases production capacity and pushes out supply schedules for the second period. Expanding supply brings the price of future capital and labor below their base values.

Turning to the first period, prices of the least-traded goods, food and services, rise the most. The "transfer problem" predicts that new demand from the influx of foreign exchange will cause the price of nontraded goods to rise relative to traded goods, since excess demand for the latter can be met by imports at constant world prices. This result is replicated across the four import-substituting sectors.

In a different model of Cameroon (Benjamin et al. 1989), with fixed saving rates and fixed investment shares, an experiment of the same size produced a much higher real exchange-rate appreciation. The present model allows some of the adjustment to the foreign-exchange shock to be transferred to the future. For example, consumers can anticipate that \( P_2/P_1 \) will fall compared with the base value. This causes them to delay some of their new consumption to the second period,
Table 3: Aggregate Results from Foreign Earnings Experiment (in billions of CFAF)

<table>
<thead>
<tr>
<th></th>
<th>Base</th>
<th>Foreign earnings increase</th>
<th>Percentage change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real investment</td>
<td>473</td>
<td>645</td>
<td>36.4</td>
</tr>
<tr>
<td>Real consumption</td>
<td>1558</td>
<td>1606</td>
<td>3.1</td>
</tr>
<tr>
<td>Real household saving</td>
<td>115</td>
<td>130</td>
<td>13.0</td>
</tr>
<tr>
<td>Household disposable</td>
<td>1673</td>
<td>1833</td>
<td>9.6</td>
</tr>
<tr>
<td>Total absorption</td>
<td>2371</td>
<td>2591</td>
<td>9.3</td>
</tr>
</tbody>
</table>

boosting current saving despite the declining interest rate. Table 3 shows the aggregate results from these two-period decisions.

Investment is much more responsive to the interest rate than is saving. Thus an interest-rate policy would have predictable effects on investment, but could not be expected to have a strong impact on saving independent of general equilibrium effects on income and prices. This results from the specification that households save for future consumption and that the level of future consumption is influenced less by changes in the interest rate than by changes in income.

Table 3 shows that investment grows overall, but this growth is hardly uniform across sectors, as can be seen in Table 2. The pattern of investment among the private sectors reflects that of output. But the effect of output trends can be overridden by changes in factor prices. Since the prices of future capital and labor are both falling, producers have an incentive to expand factor employment. Because future wages fall relatively less than rentals, producers are encouraged to raise capital-labor ratios. The strength of the pull from factor prices depends on the base structure of each sector. The greater the share of capital in base production, the greater is the response to changes in factor prices. Thus the private-industry sector, with a high capital-labor ratio, expands investment even though it suffers a loss in current (and thus in projected) output similar to cash crops where investment was reduced.

While different sectors vary in their response to changes in factor prices, the relative factor prices themselves also vary across sectors. For a given shock, all sectors observe the same percentage change in wages, but a new equilibrium interest rate has a different effect on rentals in each sector. These differences are due to two factors: first, the sectoral shares of informal out of total borrowing, and second, the different values placed on capital stock standing in each sector at the
end of period two. The significant departures from this pattern are the public firms that do all their borrowing at fixed interest rates. Since public firms face a declining wage against a constant interest rate, they have an incentive to switch from capital to labor. The impact of the falling wage-rental ratio is stronger in public industry, which is the relatively more capital-intensive of the two public sectors.

This first experiment with increased foreign earnings gives a portrait of Dutch disease in an economy that plans for the near future but does not forecast its total current account surplus nor its permanent income over the next 10 to 15 years and thus is not fully intertemporally optimizing. While consumers and producers are smoothing expenditures over time, the government’s choice to patriate a given amount of exchange earnings in a given year is arbitrary and not the result of any optimizing behavior. But for any level of new foreign-exchange expenditures, it would be useful to know how other policy choices might affect the economy’s adjustment. We turn now to the impact of policy changes on the Dutch disease.

2B. Policy

The next experiment examines the use of the import tariff to protect competing import substitutes. When traded sectors suffer from real exchange-rate appreciation due to new inflows of foreign loans or export windfalls, raising import tariffs is far from first best policy. If a country’s lifetime increase in foreign earnings is being optimally distributed over time, the real exchange-rate appreciation need not be reversed (van Wijnbergen 1985). Once we assume the country cannot perfectly predict all future current account balances, the argument for policy to smooth short-run shocks to production resurfaces. Other arguments against tariffs arise from the superiority of other policies. Again, the prevalence of tariffs testifies to the difficulty of these alternatives. The strongest argument that arises here is the harm to exports, as Table 4 shows. These results come from repeating the base foreign earnings experiment with a 50 percent increase in the tariff on manufactures, sector three.

The results indicate a simple import substitution story: import protection causes real appreciation and harms exports. Yet, the growth of investment in industry is impressive given that its output still contracts, though less than before. The new protection for private manufactures significantly reduces the decline in domestic output observed in the previous case. This sector’s strong reliance on capital and its strong response to lower future factor prices give a big boost to its own
Table 4: Increase in Foreign Earnings ($500 m). High Tariff on Manufactures (in percentage changes from base)

<table>
<thead>
<tr>
<th>Sector</th>
<th>1 Food crops</th>
<th>2 Cash crops</th>
<th>3 Private industry</th>
<th>4 Private services</th>
<th>5 Public industry</th>
<th>6 Public services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic prices</td>
<td>12.2</td>
<td>8.0</td>
<td>12.5</td>
<td>13.0</td>
<td>11.0</td>
<td>8.8</td>
</tr>
<tr>
<td>Output</td>
<td>1.8</td>
<td>-11.1</td>
<td>-3.2</td>
<td>5.8</td>
<td>0.01</td>
<td>-0.3</td>
</tr>
<tr>
<td>Exports</td>
<td>-15.1</td>
<td>-16.4</td>
<td>-18.4</td>
<td>-10.0</td>
<td>-17.7</td>
<td>-14.7</td>
</tr>
<tr>
<td>Imports</td>
<td>36.1</td>
<td>1.2</td>
<td>4.3</td>
<td>25.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investment by</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>destination</td>
<td>31.0</td>
<td>-21.7</td>
<td>48.3</td>
<td>99.3</td>
<td>-35.8</td>
<td>-20.6</td>
</tr>
<tr>
<td>Wages period one</td>
<td>10.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wages period two</td>
<td></td>
<td>-9.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Informal interest</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-12.0</td>
</tr>
</tbody>
</table>

investment. But the higher real appreciation hurts all exports and is particularly harmful to the cash-crop sector. The tariff policy does, however, increase total investment and successfully promote private industry.

In these experiments with increases in foreign earnings, the public sectors have faced falling wage-rental ratios that have caused their investment to decline. The fixed interest rate they pay for credit represents the government’s policy of promoting these sectors. We can test the effectiveness of this policy by eliminating those features in the model that make the public sectors act differently from the others. This means removing fixed interest credit and raising the share of all sectors’ variable rate credit to 100%. This also means removing the requirement that public sectors maintain their labor force despite adverse wage trends. However, as the results in Table 5 show, these changes in the model cannot overcome basic features of the public sectors, including their low profitability in the base year.

The most obvious difference caused by eliminating special public firm behavior is the rise in price of future capital and labor. This occurs despite the same increase in financial resources and labor supply that bring down future factor prices in the other experiments. By allowing the public firms to compete for credit in a market where new supplies would push interest rates down, enough new demand for credit is unleashed to force the interest rate up. In the end, it is the same, most profitable sectors that come away with the credit and the investments; they just have to pay more to win the competition.
Table 5: Increase in Foreign Earnings ($500 m): No Subsidized Credit for Public Firms (in percentage changes)

<table>
<thead>
<tr>
<th>Sector</th>
<th>1 Food crops</th>
<th>2 Cash crops</th>
<th>3 Private industry</th>
<th>4 Private services</th>
<th>5 Public industry</th>
<th>6 Public services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic prices</td>
<td>10.5</td>
<td>3.9</td>
<td>5.8</td>
<td>8.9</td>
<td>2.2</td>
<td>4.8</td>
</tr>
<tr>
<td>Output</td>
<td>2.2</td>
<td>-8.7</td>
<td>-8.6</td>
<td>3.1</td>
<td>-0.5</td>
<td>-0.3</td>
</tr>
<tr>
<td>Labor</td>
<td>3.9</td>
<td>-13.4</td>
<td>-9.1</td>
<td>4.0</td>
<td>-15.9</td>
<td>-5.3</td>
</tr>
<tr>
<td>Investment by destination</td>
<td>144.6</td>
<td>-42.1</td>
<td>23.5</td>
<td>82.0</td>
<td>-62.2</td>
<td>-36.1</td>
</tr>
<tr>
<td>Wages period one</td>
<td>8.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wages period two</td>
<td>27.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Informal interest rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9.2</td>
<td></td>
</tr>
</tbody>
</table>

Two distinctive changes occur with the rising factor prices. First, the labor-intensive food-crops sector invests much more heavily as future wages increase. Second, the decline of investment in cash crops is accented by higher wages and interest. In the original experiment, the influence of falling output in cash crops could not be overcome by falling factor prices. Now output still falls, and it combines with rising factor prices to make investment conditions in cash crops even worse.

3. CONCLUSIONS

This paper has argued for and tested endogenous, forward-looking investment and saving behavior in a CGE model. The dynamic extensions provide useful results and support a broad range of applications.

3A. Structural Results

Earlier comparative static results (see Benjamin et al.) first noted the surprising expansion of a highly traded manufacturing sector, despite real appreciation, as domestic demand boomed. The two-period results indicate that this is a process likely to take time, with manufactures contracting in the short run and expanding in the next few years through new investments. This pattern has been observed in several developing oil exporters.

Model results also suggest the following warning signals for a sectoral strategy: (1) The nontraded and service sectors, which do well in the short run, should continue to grow. (2) The export cash crops that suffer in the current period will lose further capacity in the future.
(3) The government will probably have to increase subsidies to public firms in order to preserve whatever externalities, if any, they provide by way of employment and technological development.

A higher tariff on a sector supplying investment goods sends producers to the credit market seeking more funds to cover higher investment-goods prices. The consequent increase in interest rates affects all sectors' investment. But the protected sector's growth in investment can overcome these influences and be the driving force in the aggregate trend.

Model results also help to separate out certain causes for a commonly observed phenomenon: vastly different rates of return to capital across sectors. The source of this phenomenon lies in a mix of economic and institutional factors. The model used here provides some measure of the influence of rules governing the credit market, particularly the policy toward public firms. Any given change in the interest rate can have mixed effects on borrowing rates across sectors. And for a given change in borrowing rates, different sectors will respond differently, depending on their structure of production.

3B. Macroeconomic Results

Investment and savings in aggregate are important macroeconomic variables. One significant model outcome is the greater response of investment to the interest rate as compared to the response of savings. The result is predictable from the model equations, but these equations derive from maximization of standard profit and utility functions. Static models that make saving a simple function of the interest rate are likely to overestimate the degree of responsiveness. The empirical evidence does not sustain a strong relation between real interest rates and real savings in developing countries. Models that incorporate this skepticism should be useful in guiding policy that affects interest rates and the financial market.

Another use for the aggregate-model results is as an empirical test of the impact of adjustment policies on domestic absorption. In static CGE models, the composition of domestic final demand is determined mostly by fixed shares of income or as residuals. In the current model, government consumption is fixed, but the trade-off between private consumption and investment derives from dynamic optimization. In this way, a shock works not only by changing income, but also by

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4See Gillis et al. (1989, pp. 340-345).
affecting the relative factor prices—wages and interest rates—that drive investment decisions.

In sum, the model in this study adds to static CGE results the endogenous development of the structure of the capital stock. As noted at the beginning, wherever future levels of the current account are unpredictable, whenever capital cannot be costlessly transferred between sectors, policymakers must be concerned with the structure of investment. The analysis is richer when it also includes the economic and institutional effects of the financial market. This model produces reasonable and useful results for Cameroon, and could be fruitfully applied to other countries. Until perceptions of the future become clearer, in economic theory and in fact, we need to continue efforts to model the near-term actions of agents with imperfect foresight and the impact these have on important economic policy issues.

APPENDIX: MODEL EQUATIONS

Household Savings and Consumption

\[ M_h = n \ Yd \ (1+t)^{-\phi} \] \hspace{1cm} (1)

\[ Hsav = Yd - P_t C_t \] \hspace{1cm} (2)

\[ \frac{C_t}{C_2} = \left( \frac{\beta}{1-\beta} \right)^\theta \left( \frac{P_2}{P_1} \right)^\theta \] \hspace{1cm} (3)

\[ Yd = \frac{P_2 C_2 + t M_h}{1+t} + P_t C_t \] \hspace{1cm} (4)

\[ c_{it} = \frac{\tau_t C_t}{P_t} \] \hspace{1cm} (5)

\[ Yd = \sum_i P N_{it} \text{CES} (K_{it}, L_{it}) \] \hspace{1cm} (6)

\( M_h \) = household money demand

\( t \) = the informal interest rate

\( Yd \) = disposable household income

\( n, \phi \) = constants

\( Hsav \) = household saving

\( C_t \) = total consumption in period \( t \) where \( t = 1,2 \)

\( P_t \) = consumer price index in period \( t \)

\( \theta \) = the elasticity of substitution

\( \beta \) = a constant

\( \tau_t \) = the share spent on good \( i \)
$PN_i$ = the net or value-added price sector $i$

$L_{it}$ = employment in period $t$ sector $i$

$K_{it}$ = capital stock in period $t$ sector $i$

**Investment and Borrowing**

$$K_{it}^* = \left( \frac{\alpha_i}{1 - \alpha_i} \right)^z \left( \frac{\omega_i}{R(t)} \right)^{\lambda_i} L_{it}$$

(7)

$$I_t^* = K_{it}^* - K_{it} + \text{depreciation + inventory change}$$

(8)

$$ID_i = \sum_j h_{ij} I_i$$

(9)

$$Z_i^* = I_t^* (t) \sum_j P h_{ij} + BD_i - \text{retained earnings} - \text{formal loans}$$

(10)

$$R_i(t) = \lambda_i f (1 - \lambda_i)tb - KV_i$$

(11)

$$\sum I_i = \overline{IS}_i$$

(12)

$K_{it}^*$ = desired capital stock for period-two sector $i$

$\alpha_i$ = wage distribution factor sector $i$

$\omega_i$ = equilibrium wage for period two

$R_i(t)$ = rental on capital sector $i$

$\lambda_i$ = constants

$I_i^*$ = desired investment sector $i$

$Z_i^*$ = desired informal borrowing sector $i$

$h_{ij}$ = the $(ij)$ element of the capital coefficients matrix

$P_i$ = purchase (composite) price of good $i$

$BD_i$ = bank deposits sector $i$

$\lambda_i$ = share of informal interest rate in total borrowing cost sector $i$

$tb$ = formal interest rate

$KV_i$ = value placed on stock of capital at the end of period two

**Government**

$$GR = \sum \text{td} \cdot XD_i + \sum \text{tm} \cdot EM_i + \text{oil tax} + \text{income tax} + \text{loans}$$

(13)

$$GTF = GR - \overline{GC} - \overline{G}i - GDB$$

(14)

$GR$ = government revenue

$\text{td}_i$ = indirect tax rate sector $i$

$\text{tm}_i$ = import tariff rate sector $i$

$EM_i$ = imports sector $i$

$GTF$ = net government transfers abroad to own account
$GC$ = government consumption  \\
$GI$ = government investment  \\
$GDB$ = government deposits in domestic banks

**Banks**

\[
\text{bank foreign assets} = \text{deposits} - \text{loans to domestic} \quad (15)
\]

**Balance of payments**

\[
\Delta \text{total foreign assets} = \sum_i PWE_i - PW_iEM_i + \text{foreign loans} - GTF \quad (16)
\]

$PWE_i$ = world price of exports  \\
$PW_i$ = world price of imports  \\
$E_i$ = exports of good $i$  \\
$ER$ = exchange rate CFA/dollar

**Trade**

\[
\frac{EM_i}{D_i} = CES \left( \frac{PD_i}{PM_i} \right) \quad (17)
\]

\[
PM_i = PW_i (1 + tc_i)ER \quad (18)
\]

\[
EX_i = E_i \left[ \Pi_iER(1 + tc_i) \right]^{\gamma_i} \quad (19)
\]

\[
\frac{EX_i}{XXD_i} = CET \left( \frac{PD_i}{PD_i} \right) \quad (20)
\]

$D_i$ = domestic production for domestic consumption sector $i$  \\
$PD_i$ = price of domestic output sector $i$  \\
$PM_i$ = price of imports sector $i$  \\
$\Pi_i$ = a weighted average of world prices for good $i$  \\
$te_i$ = export tariff sector $i$ (set to zero)  \\
$PE_i$ = domestic price for Cameroon exports of good $i$  \\
$XXD_i$ = the domestic production of good $i$ consumed domestically

**Equilibrium of Output and Final Demand**

\[
XD_i = CES [L_u, K_u] \quad (21)
\]

\[
PN_i = PD_i - \sum_j P_ja_{nj} - td_iPD_i \quad (22)
\]

\[
U_i = \sum_j a_{nj}XD_j \quad (23)
\]

\[
GC = \bar{GC} = \frac{G_o}{P_o} \quad (24)
\]

\[
XD_i = d_i(U_i + c_i + ID_i + G_i) + EX_i \quad (25)
\]
\[ a_{it} = \text{the input-output coefficient} \]
\[ U_i = \text{intermediate demand for good } i \]
\[ d_i = \text{the portion of demand met by domestic production} \]

REFERENCES


