A Description of Adjustment to External Shocks: Country Groups
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The views presented here are those of the author, and they should not be interpreted as reflecting those of the World Bank
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Comments Welcome

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Abstract

This paper develops a modelling framework to examine adjustment to external shocks -- terms of trade movements, recession in the industrial countries and increases in interest rates -- in five groups of developing countries. The framework is used to review the main features of their adjustment up to 1981. This provides a convenient backdrop against which individual country adjustment may be viewed.
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A Description of Adjustment to External Shocks: Country Groups

1. Introduction

The 1970s will be remembered as a decade that witnessed serious convulsions in the world economy.

- Petroleum prices quadrupled in 1973-74, fell by a sixth between 1974 and 1978, and then increased by 80 percent in real terms during 1979-80.

- The industrial market economies went into a recession in 1974-75 and thereafter recovered strongly before plunging into another recession in 1979-80 from which a slow recovery is under way. Stagflation was born in the OECD countries with successive peaks of economic activity occurring at ever higher levels of unemployment.

- The end of the decade saw an "interest-rate shock" following the use of restrictive monetary policies to combat inflation in the leading industrial countries. To this, must be added the fact that: in the early 1980s, the real prices of major primary products exported by developing countries--adjusted for rising prices of imported manufactures--fell to their lowest levels since World War II.

Some perspective on the magnitude of these convulsions may be obtained from the following statistics. World trade in fuels increased from $29 billion in 1970 to $535 billion in 1980. Paying for the 1970s' fuel-price increases was equivalent to finding the money to buy all the exports of another United States or Federal Republic of Germany. The current-account deficits of the oil-importing developing countries as a proportion of GNP
doubled from around 2.5 percent in 1973 to 5 percent in 1980. Debt-servicing payments of all developing countries, deflated by their export unit values, rose nearly threefold between 1972 and 1979; interest rates, deflated by export prices, rose from -10 percent in 1979 to 20 percent in 1981.

This paper reports on work which forms part of a three-stage program of research on developing country adjustment to external shocks in the 1970s and early 1980s. The first stage articulates a framework to impose analytical order on country descriptions of shock and adjustment; to construct comparators that can place individual country performance in perspective; and to locate empirical regularities among growth performance, external shocks, modes of adjustment and, when data permit, policy variables. The second stage explores links between a variety of policy instruments and modes of adjustment defined by the comparative analysis with a view to eliciting policy lessons. The third stage, which is normative, examines the optimality of different policy responses to external shocks. 1/

Plan of the Paper

Section 2 of the paper develops the analytical framework of the first stage with a number of country examples. The analytical framework is used in Section 3 to classify thirty four developing countries into five groups according to certain features of their adjustment which are then reviewed. This provides a convenient backdrop against which individual country adjustment may be viewed, a task to which a companion paper (Mitra (1984)) is devoted. Section 4 concludes. Annex I contains a formal statement of the

methodology, while Annex II states data sources. Annex III illustrates the application of the methodology to a particular country. Annex IV lists the classification of thirty four countries into five broad groups.

2. The Methodology

This section outlines the methodology underlying the comparative analysis. \(^1\) An open economy macroeconomic model is estimated for each country over the 1963-81 period, with an assumed structural break after 1973. The output of the model over the 1974-81 period is then compared with the output over the same period had the 1963-73 parameters prevailed and under certain assumptions about the course of variables exogenous to the model. The hypothetical development will be referred to as the counterfactual. The changes in the principal macroeconomic aggregates between the two scenarios is then decomposed into price and quantity changes.

External Shocks

External shocks comprise (1) international price effects, (2) recession-induced effects, and (3) net interest rate effects.

(1) **International price effects** measure the balance of payments impact of changes in an economy's terms of trade relative to the counterfactual, and are the sum of (a) the export price effect and (b) the import price effect.

(a) The **export price effect** measures the net impact of a fall in the purchasing power of exports over manufactures exported by the OECD countries relative to the counterfactual.

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\(^1\) A more formal account of the model and decomposition method appears in Annex I. The procedure is illustrated with reference to a particular country in Annex III.
(b) The import price effect measures the net impact of a rise in the purchasing cost of imports in terms of manufactures exported by the OECD countries relative to the counterfactual.

Both export and import price effects may each be subdivided into two components. First, the relative increase (decrease) in import (export) prices exerts an unfavourable impact on the balance of payments - the direct effect. Second, it impoverishes the economy, and, with unchanged policies, restrains imports, thereby exerting a favourable impact on the balance of payments - the indirect effect. It can be shown both here and in what follows that, provided the economy's savings propensity is positive, the direct effect dominates the indirect effect, so that a relative increase (decrease) in import (export) prices always exerts a damaging effect on the balance of payments.

When measured against a 1971-73 base as a percentage of GNP, international price effects averaged on an annual basis over the 1974-81 period ranged from an extremely unfavorable 7.5% in Chile and 5.9% in Uruguay through a somewhat less unfavorable 3.5% in Malawi, 2.9% in the Philippines and 2.8% in Pakistan to a moderately favorable 3.5% in Malaysia and 3.7% in Tunisia to an extremely favorable 9.8% in Nigeria and 14.2% in Indonesia. While import price effects were unfavorable in all cases, it is the magnitude of export price effects which were extremely unfavorable in Chile and Uruguay on the one hand and very favorable in Nigeria and Indonesia on the other.

(2) Recession-induced effects on the balance of payments are two fold:
(a) The export volume effect (which is a direct effect) is the shortfall in a country's exports as a result of a slowdown in the rate of growth of GNP in principal trading partner countries. From this must be subtracted
(b) the **import saving effect** (or indirect effect), i.e. the restraint in the growth of imports, with unchanged policies, due to the slowdown in income growth induced by the export volume shortfall.

Recession induced effects were generally positive, ranging as a percentage of GNP from 0.1% in Spain and Uruguay through 1.4% in Korea and 1.9% in Taiwan, China to 3.7% in Indonesia.

(3) **Net interest rate effects** are two fold:

(a) The **payments effect** measures the impact on the balance of payments of an increase in real interest rates (in terms of manufactures exported by OECD countries), payable on a country's debt relative to the counterfactual. From this must be subtracted

(b) the **receipts effect**, i.e. the impact on the balance of payments of an increase in real interest rates (in terms of manufactures exported by OECD countries), earned by a country's interest-bearing assets, relative to the counterfactual.

Net interest rate effect, when measured vis-a-vis real interest rates prevailing in 1971-73, ranged as a percentage of GNP from -0.6% in Mali and -0.2% in Kenya to 2% in Korea and 2.5% in Bolivia. Payments effects were particularly important in Bolivia, Korea and Singapore; the payments effect on short-term debt was important in Singapore and, to a lesser extent, in Portugal.

**Modes of Adjustment**

Countries unfavorably affected by external shocks had four basic ways (and combinations thereof) of responding to external shocks: (1) trade adjustment, (2) domestic resource mobilization, (3) investment slowdown, and (4) additional external financing. To avoid unnecessary repetition it is
understood that, as with shocks, all modes of adjustment are measured as deviations from the counterfactual. The country examples provided below are drawn from those which suffered rather than benefitted from external shocks over the 1974-81 period.

(1) **Trade adjustment** is the sum of (a) export expansion and (b) import substitution.

(a) **Export expansion** is the increase in the responsiveness of exports to changes in GNP growth in principal trading partners. It has a twofold effect:

(i) The **direct effect** measures the favorable impact on the balance of payments of boosting exports.

From this must be subtracted

(ii) the **indirect effect**, i.e. the boost in import growth due to the expansion in income growth induced by the direct effect.

Of the thirty four countries to which the analysis underlying this paper has been applied, those in which export expansion played a prominent role include Singapore, the Republic of Korea, the Philippines, Chile and Thailand, as well as Taiwan (China).

(b) **Import substitution** is the reduction in the responsiveness of the country's import demand to income.

(i) The **direct effect** measures the balance of payments impact of restraining imports.

From this must be subtracted

(ii) the **indirect effect**, i.e., the boost in import growth due to the expansion in income growth induced by the direct effect.

Examples of adjustment through significant import substitution are Brazil, Yugoslavia, and Malawi.
Both export expansion and import substitution improve the trade balance and boost GNP growth.

(2) **Domestic Resource Mobilization** measures the import restraining effect of a slowdown in income growth induced by improved savings performance as defined below. It may be broken down into its private and public components.

(a) **Private Resource Mobilization** is the reduction in the responsiveness of private consumption to income. This was important in Honduras, Morocco, Singapore, Yugoslavia, Jamaica and the Republic of Korea.

(b) **Public Resource Mobilization** has two parts.

(i) **Public Consumption Restraint**, or the reduction in the responsiveness of public consumption to income, and

(ii) **Tax Intensification**, or the increase in the responsiveness of indirect taxes-less-subsidies to income. This term therefore ignores any changes in the direct tax effort, an omission which may be justified on grounds of their relative unimportance in developing countries.

El Salvador, Singapore and Honduras favored this mode of adjustment.

(3) **Investment Slowdown** measures the import restraining effect of a slowdown in income growth brought about through a reduction in the ratio of investment to income relative to the period 1971-73.  

1/ This was a dominant mode of adjustment in Jamaica, Singapore, Mali and Kenya.

(4) **Net Additional External Financing** measures changes in gross additional external financing (defined as capital flows, reserves, and transfers and services net of interest payments, deflated by a price index of manufactures

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1/ This could be broken down, data permitting, into its private and public investment components.
exported by OECD countries) less changes in net interest payments arising due to changes in real net debt relative to the counterfactual. 1/ This played an important role in a large number of countries, for example, Mexico, El Salvador, Honduras, Morocco, Mali, Portugal, Spain, Guatemala, Turkey, Pakistan, the Philippines, Uruguay and Kenya.

III. PATTERNS OF ADJUSTMENT

An analysis of the experience of thirty four developing countries over the period 1974-81 reveals that twenty five of them suffered adverse external shocks. Responses to those shocks varied considerably across countries, a feature which is worth bearing in mind in what follows. To impose a measure of analytical order on the richness and diversity of country experience, however, it is convenient to divide countries into five groups according to the sign of external shocks and the degree of reliance on different modes of adjustment. 2/ Group 1 countries -- Chile, Costa Rica, Philippines, Singapore, South Korea and Taiwan -- adjusted principally through export expansion and public resource mobilization; Group 2 countries -- Argentina, Brazil, Guatemala, Honduras, India, Kenya, Malawi, Mali, Thailand, Turkey and Uruguay -- relied on either export expansion or public resource mobilization, while Group 3 countries -- Jamaica, Portugal and Yugoslavia -- were characterized by import substitution and negative public resource mobilization. Group 4 countries -- El Salvador, Mexico, Morocco, Pakistan and Spain -- resorted to financing without domestic adjustment. Finally, Group

1/ See equation (A. 26) in Annex I for an algebraic statement.

2/ The countries belonging to each group are listed for easy reference in Annex IV.
5 countries -- Benin, Bolivia, Colombia, Indonesia, the Ivory Coast, Malaysia, Niger, Nigeria and Tunisia -- experienced favorable external shocks. The (unweighted) average shock-adjustment figures over the 1974-81 period are shown for the five groups in Table 1.

1. Export Expansion and Public Resource Mobilization: The average shock was highest for this group at 3.98% of GNP. International price effects accounted for roughly 60% of total shocks, with the recession induced and net interest rate effects contributing equally to the remainder. All countries of the group resorted heavily to export expansion, which exceeded external shocks by over one-third and to public resource mobilization, of which the principal component was tax intensification. Together, export expansion and public resource mobilization accounted for 154% of external shocks. Import substitution was significantly negative in every country except Costa Rica, especially during the later years of the period. While Chile, Philippines and Taiwan, China relied on substantial additional external financing and stepped up their ratio of investment to GNP, South Korea sustained an investment boom with comparatively limited recourse to additional external resources. By contrast, Singapore adopted a somewhat contractionary package, with a cut in the share of investment and real repayment of borrowed funds, the latter being true in Costa Rica as well. The ratio of external financing to external shocks was higher in 1974-81 as compared to 1974-78, but was nevertheless quite modest in relation to the other country groups.

2. Export Expansion or Public Resource Mobilization: International price effects accounted for roughly 80% of external shocks. This group occupies a position intermediate between Groups I and III in terms of adjustment characteristics. Three patterns of adjustment may broadly be distinguished.
## Table 1: Balance-of-Payments Effects of External Shocks and Modes of Adjustment, 1974-78 and 1974-81 Averages
(Percentage of Local Currency GNP)

<table>
<thead>
<tr>
<th>I. External Shocks</th>
<th>Group I 74-78</th>
<th>Group II 74-78</th>
<th>Group III 74-78</th>
<th>Group IV 74-78</th>
<th>Group V 74-78</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Export Price Effect</td>
<td>-1.97</td>
<td>-2.87</td>
<td>-0.63</td>
<td>-0.45</td>
<td>-3.86</td>
</tr>
<tr>
<td>(ii) Indirect Effect</td>
<td>-2.38</td>
<td>-3.05</td>
<td>-0.37</td>
<td>-0.37</td>
<td>-0.99</td>
</tr>
<tr>
<td>Difference (-(i)-(ii))</td>
<td>0.41</td>
<td>0.18</td>
<td>-0.27</td>
<td>-0.08</td>
<td>-0.99</td>
</tr>
<tr>
<td>(i) Import Price Effect</td>
<td>6.08</td>
<td>8.06</td>
<td>3.16</td>
<td>3.71</td>
<td>4.55</td>
</tr>
<tr>
<td>(ii) Indirect Effect</td>
<td>4.81</td>
<td>5.80</td>
<td>1.44</td>
<td>1.72</td>
<td>3.20</td>
</tr>
<tr>
<td>Difference (-(i)-(ii))</td>
<td>1.27</td>
<td>2.25</td>
<td>1.72</td>
<td>2.00</td>
<td>1.34</td>
</tr>
<tr>
<td>II. Recession-Induced Effect</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Export Volume Effect</td>
<td>1.97</td>
<td>2.04</td>
<td>0.60</td>
<td>0.69</td>
<td>1.18</td>
</tr>
<tr>
<td>(b) Import Saving Effect</td>
<td>1.27</td>
<td>1.28</td>
<td>0.30</td>
<td>0.39</td>
<td>0.84</td>
</tr>
<tr>
<td>Difference (-(a) - (b))</td>
<td>0.70</td>
<td>0.76</td>
<td>0.30</td>
<td>0.30</td>
<td>0.34</td>
</tr>
<tr>
<td>III. Net Interest Rate Effect</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Payments Effect</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) Medium and Long Term</td>
<td>0.11</td>
<td>0.68</td>
<td>-0.09</td>
<td>0.18</td>
<td>0.05</td>
</tr>
<tr>
<td>(ii) Short-Term</td>
<td>-0.01</td>
<td>0.87</td>
<td>-0.01</td>
<td>0.16</td>
<td>0.04</td>
</tr>
<tr>
<td>Sum (-(i) + (ii))</td>
<td>0.10</td>
<td>1.54</td>
<td>-0.10</td>
<td>0.34</td>
<td>0.04</td>
</tr>
<tr>
<td>(b) Receipts Effect</td>
<td>0.01</td>
<td>0.76</td>
<td>-0.01</td>
<td>0.09</td>
<td>0.91</td>
</tr>
<tr>
<td>Difference (-(a) - (b))</td>
<td>0.02</td>
<td>0.80</td>
<td>0.00</td>
<td>0.25</td>
<td>0.00</td>
</tr>
<tr>
<td>IV. Total Shock</td>
<td>2.48</td>
<td>3.98</td>
<td>1.66</td>
<td>2.47</td>
<td>0.83</td>
</tr>
</tbody>
</table>

I. Trade Adjustment

| a. Export Expansion | 12.79 | 17.05 | 0.75 | 1.66 | -7.60 | -7.31 | 0.20 | -0.04 | -0.02 | 0.25 |
| Import Augmenting Effect | 9.09 | 11.60 | 0.18 | 0.55 | -5.41 | -5.23 | 0.19 | -0.10 | -0.91 | -0.58 |
| Difference (-(i) - (ii)) | 3.70 | 5.45 | 0.57 | 1.11 | -2.19 | -2.08 | 0.01 | 0.06 | 0.03 | 0.83 |

II. Modes of Adjustment

| a. Export Expansion | 12.79 | 17.05 | 0.75 | 1.66 | -7.60 | -7.31 | 0.20 | -0.04 | -0.02 | 0.25 |
| Import Augmenting Effect | 9.09 | 11.60 | 0.18 | 0.55 | -5.41 | -5.23 | 0.19 | -0.10 | -0.91 | -0.58 |
| Difference (-(i) - (ii)) | 3.70 | 5.45 | 0.57 | 1.11 | -2.19 | -2.08 | 0.01 | 0.06 | 0.03 | 0.83 |

III. Resource Mobilization

| a. Private | | | | | | | | | | |
| Public Consumption Restr. | -0.09 | 0.19 | -0.69 | -0.88 | -2.93 | -4.04 | -0.47 | -0.70 | 0.25 | 0.16 |
| Tax Intensification | 0.49 | 0.49 | -0.10 | -0.12 | 0.28 | 0.39 | -0.24 | -0.19 | -0.86 | -1.14 |
| Sum (-(i) + (ii)) | 0.40 | 0.68 | -0.79 | -1.00 | -2.65 | -3.64 | -0.71 | -0.89 | -0.61 | -0.98 |
| Sum (-(2a + 2b)) | 1.48 | 1.22 | -1.39 | -1.44 | -4.14 | -4.61 | 0.11 | -0.32 | -0.37 | 0.29 |

IV. Investment Slowdown

| -1.13 | -1.91 | -0.46 | -0.69 | 2.48 | 2.78 | -1.39 | -0.69 | -1.31 | -1.74 |

V. Net Additional Ext. Financing

| -1.09 | 0.83 | 2.45 | 3.01 | 3.41 | 4.88 | 3.02 | 4.06 | 0.97 | 2.34 |

VI. Total (-(1) + (2) + (3) + (4))

| 2.48 | 3.98 | 1.66 | 2.47 | 0.83 | 2.27 | 0.73 | 1.29 | -2.79 | -2.96 |
First, Argentina, Guatemala, India, Mali and Uruguay resorted to export expansion while exhibiting negative import substitution and negative public resource mobilization, which was significantly worse in the years 1979-81 compared to 1974-78. Second, and quite contrastingly, Honduras and Kenya adjusted through a combination of import substitution and public resource mobilization, with export expansion turning negative. Third, the remaining countries -- Brazil, Malawi, Thailand and Turkey -- relied on a combination of export expansion and import substitution, with negative public resource mobilization aggravating the balance-of-payments impact of disturbances from the international environment. For the group as a whole, negative public resource mobilization added 40% to external shocks. There was significant additional external financing, especially in countries such as Honduras, Mali, Guatemala, Turkey, Kenya and Thailand with this mode of adjustment exceeding external shocks by over 20% for the group as a whole. There was some increase in the share of investment in GNP in all countries except Mali, Kenya and Malawi.

3. Import Substitution and Negative Public Resource Mobilization: While Group 3 countries experienced shocks which were less unfavorable compared to either of the preceding groups, their composition was rather different. International price effects accounted for less than 30% of external shocks, while net interest rate effects exceeded 55% of shocks, largely because of their relative importance in Jamaica. The adverse balance of payments impact of negative public resource mobilization was over one-and-a-half times as large as that of external shocks in this group of countries, with this effect being extremely strong in Jamaica. Import substitution played a dominant role in all of them with export expansion being significantly negative. External
financing was much more important than in Groups I and II but much less so in the later years of the period. But the average conceals marked inter-country differences: while it played a prominent role in Portugal, it was much less important in Jamaica and virtually negligible in Yugoslavia.

4. Financing without adjustment: External shocks averaged 1.29% of GNP for this group of countries. Nearly 90% of this was made up of the recession-induced and net interest rate effects, principally due to their overwhelming importance relative to external shocks in El Salvador and Mexico. Table 1 clearly indicates the virtual lack of domestic adjustment across the board. Export expansion was negative in all but one countries, especially in Morocco and El Salvador. The exception was Mexico but this was due to petroleum. A major import and investment boom was underway in Morocco, and in relation to external shocks, in El Salvador. Public resource mobilization was positive in El Salvador but was more than offset by worsening performance in the other countries, especially Morocco and Spain. Additional net external financing was extremely important in all countries and was over three times as important as external shocks for the group as a whole.

5. Favorably affected countries: The countries of this group experienced favorable shocks usually because they have been exporters of petroleum or of other primary commodities where the boom in prices in the middle of the '70s allowed them to benefit over the period as a whole. International price effects alone exceeded total shocks by over a half. Of these, export-price effects, as a proportion of shocks, were extremely favorable in the nonfuel primary producers -- Bolivia, Tunisia, and Malaysia and Bolivia, followed by petroleum exporters -- Nigeria and Indonesia -- which were in turn succeeded
by Colombia. Import price effects, though significant in the Ivory Coast, were distinctly less important. Differences in the relative price movements of primary commodities during the 'seventies accounted for variations in the pattern and timing of adjustment among members of the group. On average, however, adjustment to favorable shocks took the form of an import boom which intensified in 1979-81 compared to 1974-78, a stepping up of the share of investment in GNP, a slackening of public resource mobilization effects and substantial additional external financing at the end of the period under review. Turning to particular countries, there was an import boom in Bolivia, Colombia, Malaysia and Tunisia and, to a somewhat lesser extent, in Indonesia and Nigeria. This was accompanied by an investment boom which was particularly marked in the Ivory Coast and Benin. There was a slackening of public resource mobilization efforts in the Ivory Coast and less so in Malaysia and Tunisia. Net real additional financing was important in Tunisia, Colombia and Bolivia, negligible in Indonesia and Nigeria and negative in Malaysia and the Ivory Coast.

4. Conclusion

The framework developed in this paper serves to impose a measure of analytical order on the richness and diversity of country experience. It has been applied to thirty four countries and the results aggregated to describe the broad contours of country group adjustment, both as an end in itself and with a view to placing individual country performance in perspective. With

1/ Export price effects were extremely favorable in Niger as well but here external shocks were positive in 1974-78, with the terms of trade improving sufficiently after that to yield negative shocks over the period 1974-81 as a whole.
this background in place, the next step of the analysis must be to discuss the relationships between observed modes of adjustment and the policy and other incentives which helped bring them about. The latter include such items as changes in trade-weighted real exchange rates, import tariffs and export subsidies, the real cost of borrowing the returns to saving changes in taxecum-subsidies and the size and composition of government consumption. It is clear, however, that policy questions are meaningfully treated at a country rather than at the group level. The detailed discussion of individual countries and an account of the policies used is therefore left for a subsequent occasion. 1/, 2/

1/ See Mitra (1984). A previous version of the framework was applied to thirteen semi-industrial countries in Mitra (1983a). Earlier efforts are Balassa (1981a,b,c) and Mitra (1981).

2/ Multisectoral policy focused models are being used to analyze this question in greater depth in four developing countries as part of the research project Adjustment in Oil Importing Countries being conducted at the World Bank.
Annex I: THE METHODOLOGY

I. An Appropriate Concept of Income

The national income identity in local currency is

\[ P_{c_p} C_p + P_{c_g} C_g + P_I I + P_X X - P_M M + F = P_N GNP \]  

(A.1)

- \( C_p \) = private consumption
- \( C_g \) = public consumption
- \( I \) = investment
- \( M \) = imports of goods and nonfactor services
- \( X \) = exports of goods and nonfactor services
- \( F \) = net factor service income from abroad
- \( GNP \) = gross national product at market prices

and the P's denote respective deflators.

Two corrections have been applied in moving from GNP thus defined to an appropriate concept of income. First, capital gains arising from inflationary erosion of the country's net debt need to be taken into account. Second, national income must reflect the effects of terms of trade changes.

Correction for inflation: Towards the first objective, the term \( F \) is broken down into
\[ F = \text{Net interest receipts} + \text{other net factor-service income.} \]
\[ = (\%_A - r_n D - \%_n S) + \text{other net factor-service income} \text{ (A.2)} \]

where

\[ D = \text{outstanding and disbursed medium and long term debt (in dollars)} \]
\[ S = \text{outstanding short term debt (in dollars)} \]
\[ A = \text{reserves (in dollars)} \]
\[ r_n = \text{nominal interest rate payable on medium and long term debt} \]
\[ \%_n = \text{nominal interest rate payable on short term debt and receivable on reserves.} \]

To isolate real interest payments and receipts, it is necessary to subtract international inflation from the nominal rates.

Let
\[ r = r_n - \hat{E}' \]
\[ \% = \%_n - \hat{E}' \]
\text{ (A.3)}

where
\[ E' = \text{a dollar index of international inflation (the unit value index of manufactured exports f.o.b. from OECD countries)} \]
\[ ^{\text{"\hat{\}"}} \text{denotes a proportional year-to-year change.} \]

Thus,
\[ \%A - rD - \%S = [\%_n A - r_n D - \%_n S] + \hat{E}'(D + S - A) \text{ (A.4)} \]

or,
\[ \text{(Real interest receipts)} = \text{(Nominal interest receipts)} + \text{(Inflationary erosion of net debt)} \]

where
\[ D + S - A = \text{net debt} \]
Thus, factor service income, corrected for inflation may be defined as

\[ F_c = F + e' \hat{E}'(D + S - A) \]  

(A.5)

where \( e' \) = exchange rate (units of local currency per dollar).

(A.1) and (A.5) imply that

\[ \frac{P_c C_p + P_c C_g + P_g I + P_c X - P_M M + F}{P_N GNP + e' \hat{E}'(D + S - A)} \]  

(A.6)

The right hand side of (A.6) is nominal GNP augmented by capital gains due to inflationary erosion of net debt. To convert this into constant prices, the right hand side of (A.6) is deflated by \( P_N \), the GNP deflator, while the first five terms on the left hand side are deflated by their respective deflators. This generates an implicit deflator for \( F_c \) and yields

\[ \frac{C_p + C_g + I + X - M + RF_c}{P_N} = GNP + \frac{e' \hat{E}'(D + S - A)}{P_N} \]  

(A.7)

where \( RF_c \) balances the two sides of (A.7). The right hand side of (A.7) is real GNP corrected for capital gains and losses on net debt.

Correction for terms of trade changes: To account for the effects of changes in import and export prices on income, it is necessary to revalue exports and imports. To preserve consistency with the earlier procedure, the numeraire

\[ \frac{1}{1} \]  

This procedure for deflating a transfer such as \( F_c \) should be seen as a shortcut dictated by considerations of data.
chosen for this purpose is a basket of manufactures exported by OECD countries.

Define

\[ X_c = \frac{P_X}{e_E} \]  
(A.8)

\[ M_c = \frac{P_M}{e_E} \]  
(A.9)

where \( e_E = \frac{e'E'}{e'O'o} \)

and \( e'O'o \) is the value of \( e'E' \) in the base year in which the country's national accounts at constant prices are expressed.

\( X_c \) therefore measures the purchasing power of exports over manufactures exported by OECD countries. Similarly, \( M_c \) measures the purchasing cost of imports in terms of the same numeraire. Write

\[ C + C + I + X_c - M_c + R_F = GNY + \frac{e_E (D + S - A)}{P_n} \]  
(A.10)

where \( GNY \), gross national income, is defined by (A.10), so that

\[ GNY = GNP + X\left(\frac{P_X}{e_E} - 1\right) - M\left(\frac{P_M}{e_E} - 1\right), \]  
(A.11)

which is a standard terms of trade correction, except that it is expressed in terms of an international numeraire.
Finally, define

\[ Y = GNY + \frac{e^D(D+S-A)}{P_N} \]  

Thus \( Y \) is gross national income corrected both for capital gains and losses on net debt as well as for terms of trade changes.

II. The Model

For every country, the following system of equations is estimated over the period 1963 to 1981.

\[
\begin{align*}
C_p &= \eta + \delta Z + (c + \phi Z)Y_f \\
C_g &= \eta + \delta Z + (c + \phi Z)Y \\
T &= \omega + \delta_t Z + (t + \phi_t Z)Y \\
M &= \alpha + \delta_m Z + (m + \phi_m Z)Y \\
X &= \beta + \delta_x Z + (x + \phi_x Z)Y^* 
\end{align*}
\]

where

\( Y^* \): export trade-weighted average of GDP in the three most important trading partner countries

\( Z \): a dummy variable assuming the values

\[ \begin{align*}
= 0 & \text{ for 1963 to 1973} \\
= 1 & \text{ for 1974 to 1981}
\end{align*} \]

\( T \): indirect taxes less subsidies

\[ Y_f = Y - T \]  

Thus, \( Y_f \) may be thought of as gross value added at factor cost.

All variables are measured in constant prices.

Substitution of definitions (A.8) and (A.9) and relations (A.13)-(A.18) into the national income identity derived from (A.10) and (A.12), viz.
\[ C_p + C_g + I + X_c - M + RF = Y \]  \hspace{1cm} (A.19)

allows the latter to be solved for \( Y \).

Introduce the notation

\[ \eta_p^o = \eta_p, \quad \eta_p^1 = \eta_p + \delta Z \]

\[ c_p^o = c_p, \quad c_p^1 = c_p + \phi Z \]

for the variables in equation (A.13) and analogously for equations (A.14) to (A.17). Then \( Y \) may be written

\[ Y = \frac{\eta_p^1 + \eta_p^2 + \gamma^1 \frac{P_X}{e_E} + \gamma^2 \frac{P_M}{e_E}}{1 - (1-t^2) - \gamma} + \frac{m^1 P_M}{e_E} Y^* \]

The system (A.13)-(A.17) is estimated using nonlinear two-stage least squares, where the first stage is applied to equation (A.20) with \( \frac{P_X}{e_E}, \frac{P_M}{e_E}, I, RF_c \), and \( Y^* \) assumed exogenous.

The values of \( \frac{P_X}{e_E}, \frac{P_M}{e_E}, I \) and \( RF_c \) are taken directly from the data. The values of \( Y^* \) are estimated from the following equation over the period 1963-81:

\[ Y^* = \gamma + \delta h Z + (g + \phi h) t \]  \hspace{1cm} (A.21)

where

\[ t = \text{time} \]

\[ Z = \text{dummy variable defined as above.} \]

The reason for estimating \( Y^* \) will become clear in the next subsection.
3. Shock-Adjustment Methodology

The macroeconometric model described above can be put to a number of uses. In this paper, its output is summarized in measures of shock and adjustment which are defined in relation to certain counterfactual developments. The counterfactual chosen here assumes

(1) on structural parameters: all $\delta$ and $\phi$ coefficients on the dummy variable $Z$ in (A.13)-(A.17) are zero, i.e., no change in structural parameters prevailing during 1963-73;

(2) on exogenous variables: (a) the $\delta$ and $\phi$ coefficients on the dummy variable $Z$ in (A.21) are zero, i.e., continuation of the growth of $Y^*$ at the rate attained in 1963-73; (b) $\frac{P^*}{e}$ and $\frac{X^*}{e}$ are assumed to stay at their 1971-73 values; (c) $r$ and $\lambda$ are assumed to stay at their 1971-73 values; (d) the $\frac{I}{Y}$ ratio is assumed to stay at its value for 1971-73; and (e) $RF_C$ on the counterfactual is taken to equal the actual value of $RF_C$ every year.

Denote values of variables on the counterfactual by the superscript "T". Then $Y^T$ may be written, following (A.20) as

$$Y^T = \frac{\eta_p^0 + \eta_g^0 + \beta^0(\frac{P^*}{e})^T - c^0(\frac{M}{e})^T + T + RF^T + \Gamma^0(\frac{P^*}{e})^T Y^*T}{[1- c^0(1-t^0) - c^0] + m^0(\frac{M}{e})^T}$$

(A.22)

1/ Although the period 1971-73 did witness a world boom, the terms of trade of developing countries during this period were somewhat less favourable than in the 1960s if fuel, the price of which started rising in 1973, is excluded.

2/ This assumption is made for simplicity only. It clearly introduces a bias in cases where significant movements in items such as workers' remittances could be related to external shocks.
The resource gap, corrected for terms of trade changes and augmented by real interest transactions, may be written

\[
\frac{R}{eE} = \frac{P_M}{eE} M - \frac{P_X}{eE} X \left( \frac{rD}{E^T} - \frac{S}{E^T} \right) e_0
\]

(A.23)

where \( e_0 \) is the exchange rate in the base year in which the country's national accounts at constant prices are expressed.

The corresponding equation for the counterfactual is

\[
\left( \frac{R}{eE} \right)^T = \left( \frac{P_M}{eE} \right)^T M^T - \left( \frac{P_X}{eE} \right)^T X^T + \left( \frac{rD}{E^T} \right)^T - \frac{S}{E^T} \right) e_0^T \]

(A.24)

Subtract (A.24) from (A.23) to get

\[
\left[ \left( \frac{R}{eE} \right) - \left( \frac{R}{eE} \right)^T \right] = \left[ \frac{P_M}{eE} \right]^T M + \left[ \frac{P_X}{eE} \right]^T X

+ \left( r - r^T \right) \frac{D e_0}{E^T} - \left( S - S^T \right) \frac{Se_0}{E^T}

\]

(A.25)

\[
- \left( \frac{P_M}{eE} \right)^T [M^T - M] + \left( \frac{P_X}{eE} \right)^T [X - X^T]

\]

\[
- \left( \frac{D e_0}{E^T} \right) r - \left( \frac{Se_0}{E^T} \right) S^T

\]

The next step is to substitute the value of \( Y \) from (A.20) into (A.16) to solve for \( M \). A similar exercise has to be done for the counterfactual, this time substituting from (A.22) into (A.16), remembering that all \( \delta \) and \( \phi \) coefficients are zero. Some rearrangement of terms then yields the following decomposition.
\[\begin{align*}
A & = \left(\frac{P^X}{e^E} - \frac{P^X}{e^E}\right) \left(1 - \frac{-\beta}{s^0 + \frac{\beta}{2}}\right) X + \left[\frac{P^M}{e^E} - \frac{P^M}{e^E}\right] \left(1 - \frac{-\beta}{s^0 + \frac{\beta}{2}}\right) M \\
B & = \\
C & = + \left(1 - \frac{-\beta}{s^0 + \frac{\beta}{2}}\right) x^0 \left(Y^* T - Y^*\right) + (r - r^T) \frac{D_0}{E} - \frac{\beta}{2} \frac{S_0}{E} = \\
D & = \\
E & = \\
F & = \\
G & = \\
H & = + \frac{-\beta}{s^0 + \frac{\beta}{2}} \left[- \delta z + \phi z Y (1 - t^1) Y - \omega^1\right] + \frac{-\beta}{s^0 + \frac{\beta}{2}} \left[- \delta z + \phi z Y\right] \\
I & = \\
J & = + \frac{-\beta}{s^0 + \frac{\beta}{2}} \left[\delta z + \frac{\phi z}{z^2}\right] + \frac{-\beta}{s^0 + \frac{\beta}{2}} \left(I^T - I\right) + \\
K & = \\
L & = \\
\end{align*}\]

where \(s^0 = 1 - c^0_p (1 - t^0) - c^0_g\) (savings propensity on the counterfactual).

\[\begin{align*}
\frac{P^M}{e^E} & = \left(\frac{P^M}{e^E}\right) T m^0 \quad \text{("revalued" import propensity on the counterfactual)} \\
\frac{P^X}{e^E} & = \left(\frac{P^X}{e^E}\right) T x^0 \quad \text{("revalued" export propensity on the counterfactual)}
\end{align*}\]
and

A. Export Price Effect
B. Import Price Effect
C. Recession-Induced Effect
D. Interest Payments Effect
E. Interest Receipts Effect
F. Export Expansion
G. Import Substitution
H. Private Resource Mobilization
I. Public Consumption Restraint
J. Tax Intensification
K. Investment Slowdown
L. Net Real Additional External Financing

External Shocks

Modes of Adjustment

(D + E) equals Net Interest Rate Effect

(G + H) equals Public Resource Mobilization

The decomposition (A.26) measures the effects on the balance of payments of external shocks and modes of adjustment. The results are printed out as 1974-1981 averages.

To derive the 1974-1978 averages, the equations (A.13) to (A.17) are estimated over the period 1963 to 1978. The rest of the procedure is identical.
Annex II: DATA

Data on national accounts, price deflators and exchange rates are taken from the World Bank's World Tables. The index of international inflation, E, is the unit value index of manufactured exports f.o.b. from developed countries and is taken from various issues of the UN Monthly Bulletin of Statistics. Export and import trade weights are taken from the IMF's Direction of Trade Statistics.

The calculations distinguish public and publicly guaranteed medium and long term debt from short term debt. The latter has a maturity of less than one year. Outstanding medium and long term disbursed debt belongs to different vintages and carries different interest rates. Data on interest payments therefore reflect such terms and conditions. In the absence of a detailed breakdown, the nominal interest rate, $r_n$, on medium and long term debt has been calculated as

$$r_n = \frac{\text{Interest Payments}}{\text{Outstanding and Disbursed Debt}}$$

Both numerator and denominator are taken from the World Bank's Debtor Reporting System (DRS), which however, only reports public and publicly guaranteed medium and long term debt.

It is assumed that $z_n$, the rate payable on short term debt as well as that earned by the country's interest-bearing assets, equals LIBOR. This has been taken to be that corresponding to six months' maturity (Source: Salomon Brothers up to 1978 and the International Financial Statistics (IFS) of the IMF thereafter). Short term debt data is derived from the Bank for
International Settlements' **Maturity Distribution of International Bank Lending.** Interest bearing assets, S, are defined as follows: [Total Reserves minus Gold (line 1% in the IFS) LESS Use of Fund Credit (line 2 e.s. in the IFS), expressed in dollars].

---

1/ Gold has not been included as part of reserves.
Annex III: The Methodology Applied to a Country

The shock-adjustment methodology underlying the analysis of the paper was formally derived in Annex I. Here it is applied to Thailand, a middle income primary producing country with a per capita GNP of $770 in 1981. The purpose of this annex is not to provide a discussion of Thailand, but to use it as an example to illustrate the methodology. The results are shown in the annex table as well as in the accompanying charts. 1/

External Shocks

External shocks averaged 3.47% of GNP during the 1974-81 period. International price effects accounted for 55% of this figure. Import price effects, which reflect the impact of increased petroleum prices, amounted to 77% of shocks. However, the country was cushioned by an export price boom which explains the difference between the above two numbers. Nearly 30% of shocks came from the slowdown in Thailand's three major partners: Japan, the USA and the Federal Republic of Germany. The remainder was due to the net interest rate effect which, though negative up to 1979, became significant later, amounting to 3.84% of GNP in 1981. This simply reflects the substantial borrowing undertaken towards the end of the decade following the second round of petroleum price increases.

1/ For a detailed discussion of Thailand using the methodology, the reader is referred to Sierra (1984), who also looks at the year-to-year variation in the shock/adjustment numbers. Individual country experience is also the subject of Mitra (1984).
Modes of Adjustment

Nearly 80% of Thailand's adjustment to external shocks can be attributed to export expansion. This occurred with respect to both traditional and manufactured exports, with the latter playing an increasingly important role. Import substitution also proceeded apace, so that total trade adjustment came to exceed external shocks.

Thailand witnessed an investment boom, both public and private, the balance-of-payments effect of which averaged \(-1.3\%\) of GNP over the entire period. This was not matched by a corresponding resource mobilization effort in the public sector, which was characterized by lack of restraint in consumption, especially in the later years. The public sector increasingly relied on transfers from the private sector through the banking system and on foreign borrowing. Indeed, notwithstanding vigorous trade adjustment, additional external financing accounted for nearly 94% of Thailand's total adjustment effort.
### Annex Table

**BALANCE-OF-PAYMENTS EFFECTS OF EXTERNAL SHOCKS AND MODES OF ADJUSTMENT: THAILAND, 1974-78 AND 1974-81 AVERAGES**

*(Percentage of Local Currency GNP)*

<table>
<thead>
<tr>
<th>I. External Shocks</th>
<th>74-78</th>
<th>74-81</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. International Price Effects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Export Price Effect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) Direct Effect</td>
<td>-1.83</td>
<td>-1.42</td>
</tr>
<tr>
<td>(ii) Indirect Effect</td>
<td>-0.87</td>
<td>-0.68</td>
</tr>
<tr>
<td>Difference (= (i) - (ii))</td>
<td>-0.96</td>
<td>-0.75</td>
</tr>
<tr>
<td>b. Import Price Effect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) Direct Effect</td>
<td>4.14</td>
<td>5.09</td>
</tr>
<tr>
<td>(ii) Indirect Effect</td>
<td>1.97</td>
<td>2.43</td>
</tr>
<tr>
<td>Difference (= (i) - (ii))</td>
<td>2.17</td>
<td>2.67</td>
</tr>
<tr>
<td>Sum (= la + lb)</td>
<td>1.21</td>
<td>1.92</td>
</tr>
<tr>
<td>2. Recession-Induced Effect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Export Volume Effect</td>
<td>1.33</td>
<td>1.88</td>
</tr>
<tr>
<td>b. Import Saving Effect</td>
<td>0.63</td>
<td>0.89</td>
</tr>
<tr>
<td>Difference (= 2a - 2b)</td>
<td>0.70</td>
<td>0.98</td>
</tr>
<tr>
<td>3. Net Interest Rate Effect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Payments Effect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) Medium and Long Term</td>
<td>-0.04</td>
<td>0.36</td>
</tr>
<tr>
<td>(ii) Short-Term</td>
<td>0</td>
<td>0.35</td>
</tr>
<tr>
<td>Sum (= (i) + (ii))</td>
<td>-0.04</td>
<td>0.71</td>
</tr>
<tr>
<td>b. Receipts Effect</td>
<td>-0.03</td>
<td>0.14</td>
</tr>
<tr>
<td>Difference (= 3a - 3b)</td>
<td>0.01</td>
<td>0.57</td>
</tr>
<tr>
<td>4. Total Shock (= 1 + 2 + 3)</td>
<td>1.90</td>
<td>3.47</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>II. Modes of Adjustment</th>
<th>74-78</th>
<th>74-81</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Trade Adjustment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Export Expansion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) Direct Effect</td>
<td>1.83</td>
<td>5.14</td>
</tr>
<tr>
<td>(ii) Import augmenting Effect</td>
<td>0.87</td>
<td>2.45</td>
</tr>
<tr>
<td>Difference (= (i) - (ii))</td>
<td>0.96</td>
<td>2.69</td>
</tr>
<tr>
<td>b. Import Substitution</td>
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<td></td>
</tr>
<tr>
<td>(i) Direct Effect</td>
<td>3.08</td>
<td>2.00</td>
</tr>
<tr>
<td>(ii) Indirect Effect</td>
<td>1.47</td>
<td>0.95</td>
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<tr>
<td>Difference (= (i) - (ii))</td>
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<td>1.05</td>
</tr>
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<td>Sum (= la + lb)</td>
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<td>3.74</td>
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<tr>
<td>2. Resource Mobilization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Private</td>
<td>-1.48</td>
<td>-1.80</td>
</tr>
<tr>
<td>b. Public</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) Public Consump. Restraint</td>
<td>-0.18</td>
<td>-0.58</td>
</tr>
<tr>
<td>(ii) Tax Intensification</td>
<td>0.11</td>
<td>0.16</td>
</tr>
<tr>
<td>Sum (= (i) + (ii))</td>
<td>0.07</td>
<td>-0.42</td>
</tr>
<tr>
<td>Sum (= 2a + 2b)</td>
<td>1.55</td>
<td>-2.22</td>
</tr>
<tr>
<td>3. Investment Slowdown</td>
<td>-0.93</td>
<td>-1.30</td>
</tr>
<tr>
<td>4. Net Additional Ext. Financing</td>
<td>1.81</td>
<td>3.26</td>
</tr>
<tr>
<td>5. Total (= 1 + 2 + 3 + 4)</td>
<td>1.90</td>
<td>3.47</td>
</tr>
</tbody>
</table>
EXTERNAL SHOCKS IN THAILAND
(Percentage of Local Currency GDP)

- Total External Shock
- Export Price Effect
- Import Price Effect
- Recession Induced Effect
MODES OF ADJUSTMENT IN THAILAND
(Percentage of Local Currency GNP)

- Resource Mobilization
- Additional External Financing
- Investment Slowdown
- Export Expansion
- Import Substitution

Year: 1974 to 1981
Annex IV: Composition of Groups

Group 1: Chile, Costa Rica, Philippines, Korea, Taiwan, Singapore

Group 2: Argentina, Brazil, Guatemala, Honduras, India, Kenya, Malawi, Mali, Thailand, Turkey, Uruguay

Group 3: Jamaica, Portugal, Yugoslavia

Group 4: El Salvador, Mexico, Morocco, Pakistan, Spain

Group 5: Benin, Bolivia, Colombia, Indonesia, Ivory Coast, Malaysia, Niger, Nigeria, Tunisia
References


