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Chapter Author: Lawrence R. Klein

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6   The South Asian and Pacific Far East Countries in Project LINK

Lawrence R. Klein

6.1   Models for Developing Countries in the LINK System

The international model-building effort known as Project LINK was initiated some fifteen years ago with the objective of studying the international transmission mechanism. In effect, that meant model building for tracing trade flows and their effects on domestic economies of the major industrial nations. But virtually from the beginning, the project investigators realized that full world coverage would be necessary in order to obtain a meaningful assessment of trade flows in the industrial world. In order to extend coverage, in a model-building sense, to the entire world, models for developing countries and for centrally planned economies had to be introduced. This rounded out world coverage.

The specific treatment of developing countries within the LINK system has been stylized. In order to cover the vast number of developing countries, area models were introduced: (1) Africa, (2) Asia (South Asia and the Pacific Far East), (3) Latin America, and (4) Middle East.

An area model aggregates main economic variables measured in a common unit, 1963 U.S. dollars, and estimates behavioral, technical, and accounting relationships among the area totals in much the same way that it is done for individual countries. The only difference is that a country does not trade (exports or imports) with itself; an area, however, does. The intratrade for the area consists of the bilateral flows between country pairs within the area.[1]

A central feature of the LINK system is the passing of flows between countries and areas through the world trade matrix, which is a tabu-

Lawrence R. Klein is Benjamin Franklin Professor of Economics at the University of Pennsylvania.

lation of bilateral flows between exporting and importing pairs, measured in current U.S. dollars. The elements of the matrix are normalized into coefficients by dividing entries in each column by the column sum, which is total imports for the country or area designated in the column. The trade matrices are constructed for one-digit SITC groups and regrouped for LINK purposes into four merchandise classes: 0 and 1 = food, beverages, and tobacco, 2 and 4 = primary materials, 3 = mineral fuels, 5–9 = manufactures and miscellaneous.

In the manufacturing category, the coefficient matrix is not held constant but is changed, from year to year, on the basis of relative price movements, combined with RAS adjustments.

It would be natural to have separate (four in all) rows and columns of the world trade matrix devoted to each developing region, but at the present time they are grouped together into a single row and column for the developing world as a whole. In the LINK algorithm for solving the world model in the form of an accounting-balanced solution, the imports of each region $[M\$]^i$ ($i = 1, 2, 3, 4$) are estimated from the four regional models. Then a regional sum is formed:

$$[M(\$)]_{LDC} = \sum_{i=1}^{4} [M(\$)]\,^{(i)}_{LDC}.$$

This sum is placed in an entire import vector for a given category, together with the imports of OECD countries and centrally planned economies. The exports for the whole developing world are estimated from the standard equation:

$$[X(\$)]_{LDC} = \sum_{j=1}^{n} a_{ij}[M(\$)]_j,$$

where n is the total number of rows or columns in the trade matrix (individual countries and some areas), and i denotes LDC (less-developed country) in the present context. This export total is then adjusted for relative price change and by an RAS balancing calculation for the entire matrix.

This is the explicit treatment of export and import values. In effect it states that a country's or area's exports are a row-weighted average of partners' imports. The row weights are from the matrix of trade coefficients. Similarly, import prices are computed as a column-weighted average of partners' export prices.

The total exports so calculated from the trade matrix in country models in Project LINK override any calculations from country export equations that are separately estimated. This is done in order to achieve world consistency. In the case of the whole developing region, a different procedure is followed. The above estimate of $[X(\$)]_{LDC}$ comes

from the first iteration of a world solution to the equation system. In the next iteration, country or area models are solved once again with the newly generated export values (also with generated import prices) to get a new import vector (also a vector of export prices), and the next iteration is formed.

But before the export values obtained on the first iteration can be used in a successive iteration, they must be disaggregated into four separate regional totals, one for each of the main regions of the developing world. This procedure is not necessary for individual countries who occupy individual rows and columns of the world trade matrix. It would not be necessary for the developing countries if their four regions were individually entered into four separate rows and columns of the trade matrix. At present, in Project LINK developing-countries' trade is treated only in a single row and column of a given matrix.

In order to make the area disaggregation, we must solve each of the regional models with their own export equations, estimated as functions of total world trade. This gives ratios among the exports of the four regions, and the developing-world total obtained from the first iteration is split into four regional values on the basis of the ratios computed from the explicit export equation. Import prices are disaggregated on the basis of their ratios before linkage.

The treatment of centrally planned economies within Project LINK is similar to that of the developing countries. For the CMEA (Council for Mutual Economic Assistance) group (six Eastern European countries plus the USSR), there is one row and column in the trade matrix, and the individual country models for the seven CMEA countries are used just as we use the four regional models of developing areas in successive LINK iterations. The People's Republic of China is treated as a separate row and column of the trade matrix and is handled in the same way that models of the OECD countries are handled. In some respects the PRC is most closely allied with the centrally planned economies and in some ways with the developing countries, especially the Asian group. Since it is separately treated, there is no special problem as far as consistent trade linkage is concerned; it is only a question of model specification.

All the regional models of developing countries in the LINK system are designed in a similar way. Output from the supply side is a function of accumulated capital and of imports (machinery, equipment, and raw materials). Consumption, investment, and exports minus imports are all estimated as functions of real income levels and relative prices, with some special allowance for financial capital inflows. The components of GDP add to the total; so goods and services imported and exported must be estimated as well as separate types of merchandise. Invisibles are determined from the difference between total trade and merchan-

dise trade. Also, inventory investment is obtained as a residual from the GDP identity. Prices of exports in specific nonmanufacturing lines of activity are determined as weighted functions of key world commodity prices, where these key prices are generated by world market conditions or fixed marketing agreements.

The LINK system is based on the concept of completeness in world coverage and in accounting balance. The world totals of merchandise exports and imports are fully balanced by commodity groups. Since invisibles are determined in a way that is consistent with the GDP identity of each country or region, we have not allocated these flows on a complete bilateral basis and do not face up to the question of dealing with the discrepancy now prevalent in the amount of some $100 billion in the world's current account balance. But in order to achieve balance some countries or areas must be treated as residuals. For some time there has been a significant rest-of-the-world residual sector among OECD countries. Because Norway, Denmark, Greece, Switzerland, Spain, Ireland, New Zealand, and others have formally joined the LINK system, there are explicit models for virtually every OECD country, and the residual item is minimal. Within the developing and socialist worlds some difficult problems remain for dealing with Malta, Cyprus, Israel, Albania, Cuba, North Korea, and Vietnam. They are all treated in residual groups. The centrally planned economies of Asia and the Pacific (apart from the PRC, which is explicitly treated in its own model framework) are not investigated in any depth and are not part of the geographical model of Asia and the Pacific Far East. The regional model for the Asian group in LINK does distinguish, however, between OPEC and non-OPEC nations. Totals for Indonesia and Brunei, which are distinguished from the rest of the regional group, are tabulated separately.

6.2   Some Results for Asia and the Pacific Basin Group

With this methodological backdrop in mind, let us illustrate how the LINK model works by examining some results. The overall world outlook from Project LINK is for a continuing, moderate recovery from the 1980–82 recession (see table 6.1). Recovery begins during 1983, but the first full year of recovery is 1984. In projections through 1988, we look for about 2% or 3% growth in the world as a whole after 1984. This is decidedly slower than the good performances of the 1950s and 1960s. During the turbulent decade of the 1970s there was great variability among country and regional performances, but on average, it was a fair growth period, especially for the developing and centrally planned economies. The OECD countries experienced a setback as far as growth was concerned, and it was also a period of high unemployment with strong inflation.

Table 6.1   **The World Series** (percentages)

				Forecast[a]							
	1950–60	1960–70	1970–80	1981	1982	1983	1984	1985	1986	1987	1988
GDP:											
World total	4.9	5.3	4.3	1.7	0.9	2.3	3.7	3.0	2.7	2.3	2.9
OECD	4.1	5.3	3.5	1.5	−0.3	2.4	4.0	2.7	2.3	1.8	2.6
Developing	4.9	5.6	5.7	1.8	1.1	0.3	2.7	4.2	3.9	3.2	3.1
CPEs[b]	6.0	5.0	5.5	2.1	3.6	3.1	3.2	3.2	3.2	3.3	3.4
World trade volume	7.2	8.3	5.6	1.1	−1.0	1.0	4.7	5.1	3.6	3.3	3.4
Inflation in OECD	2.9	4.6	8.2	12.2	10.0	8.4	8.6	9.1	9.1	8.5	8.0

[a]These forecasts were prepared for LINK meetings in September 1983. New forecasts made in April 1984, based on March meetings of LINK, were somewhat higher for growth in most regions but lower for inflation in the OECD area. The patterns are basically similar, however.

[b]CPEs = centrally planned economics.

A principal feature of this forecast is the projected downgrading of the performance of the developing countries. Chronically low rates of growth in Africa and temporarily disturbed rates in Latin America, as a result of political instability and debt burdens, hold down the overall statistics for the developing countries. The Middle East is upset by the weakened oil market. However, the Pacific Far East has a promising economic outlook. Although they may complain and make nostalgic comparisons with results of a few years back, when many of these economies grew at double-digit rates, they are presently outstanding both at the world level and among developing countries (see table 6.2).

Price data are hard to obtain for developing countries, yet in the Far East some countries have good estimates, and it is remarkable that many of these economies have inflation rates well below 10% annually, and some are well under 5%. For the world as a whole these are excellent records, but among developing countries, particularly developing countries who are oil importers, they are truly extraordinary. That is not to say that these are trouble-free economies, but as a group they show excellent prospects as well as excellent present performance, with a great deal of self-discipline.

Indonesia is hurt by weak oil and other commodity markets; Hong Kong has to endure the insecurity worries vis-à-vis the Mainland; South Korea carries a very large debt (well over $30 billion); and the Philippines is experiencing serious political uncertainty, as well as debt and export problems.

As far as LINK results are concerned, the outlook is promising for the Asian and Pacific areas. In addition, general economic analysis of each country indicates a relatively favorable situation.

As far west as India and Pakistan growth has been occurring comparatively unnoticed, and there is a long way to go, but 3%–5% growth without undue inflation is a reasonable forecast. A softening of attitudes toward foreign capital in India may open the way for a new wave of expansion. Coming eastward, Bangladesh and Burma do not have an

Table 6.2　　　**GDP Growth Predictions for Developing Countries**
(for percentages)

	1983	1984	1985	1986	1987	1988
Africa	− 0.7	0.7	0.8	0.6	1.5	1.8
Asia	3.9	4.3	5.4	5.3	4.0	4.6
Latin America	− 2.6	1.4	3.9	3.2	2.4	1.2
Middle East	− 1.9	2.6	3.4	3.5	4.0	4.6
Developing-countries total	0.3	2.7	4.2	3.9	3.2	3.1

Note: See note to table 6.1.

impressive record or outlook, but what might be called the Pacific Basin developing countries (Thailand, Malaysia, Singapore, Indonesia, Hong Kong, the Philippines, Taiwan, and South Korea) are in the best overall situation in the developing world. It is also a well-integrated and balanced grouping containing many primary producers, a major oil exporter, and some strong manufacturing countries. They are generally oriented toward the United States and Japan, with a fair amount of interaction with Australia and Canada.

The populations are well educated, highly motivated, and very productive and aggressive in world services. They produce quality merchandise and services. The LINK results mainly reflect the underlying strengths of this region.

The principal LINK model characteristics that account for the good growth of the South Asian and Pacific area countries are the sensitivity of GDP growth to exports and good export growth through competitive price advantage. These characteristics are built into the model and are produced by the fitting of parameters to historical data.

The reasons why these economies have more favorable projections than the Latin American countries, for example, is that the latter are saddled with large debt service burdens—*initial conditions*—and their domestic policy reactions to financial difficulties have been to restrict imports severly. Mexico cut back imports in 1982 by about 40% through foreign exchange rationing. Low imports and an exogenous cutoff in financial capital inflows lead to low investment activity, which, in turn, leads to low GDP growth, in both *potential* and *actual* GDP. This reaction is part of model structure.

An additional impact is being felt in Latin American through shortfalls in raw material exports. The direct productivity effects of raw material imports are not well reflected in the LINK models of developing countries.

Africa fares less well than Asia in LINK projections because the export mix is unfavorable. Asian countries have higher proportions of fast-growing manufactured exports. This is part of model structure.

Middle East growth, being highly dependent on oil trade, does not look impressive in a period when oil prices are restrained because of world conditions. Also, we have exogenously held back Middle East growth because of military disturbances in the projection period.

The acceptance of wage flexibility for downward adjustment of growth of nominal wage rates in recent years, both in Japan and in many of the developing countries of the Pacific, has contributed significantly to a good price adjustment to the second oil shock. That is a good part of the reason why the record on inflation is so favorable. Of course, estimated productivity growth is another part of the explanation.

6.3   Some Individual Country Results

A major research thrust of Project LINK is to improve the methodological treatment of the developing countries, by introducing separate models for many of the larger countries and treating them on a par, as much as possible, with the industrial countries and the centrally planned economies. To this end, a number of individual country models have been prepared at Project LINK for developing countries. They are presently being simulated by themselves, using LINK inputs for projections of world trade volume and world inflation. Work is underway, and far along, to build an enlarged trade matrix with separate rows and columns for individual developing countries—some twenty-five to thirty cases. Even before the full integration takes place, it is worthwhile looking at single country results that are projected consistently with LINK world results, but without feedback effect from the developing countries to OECD countries or centrally planned economies. We are thus looking at individual developing countries in a satellite mode.

For purposes of our present investigations it is noteworthy that a large number of Pacific Basin countries are included indirectly in the first batch of estimates of LDC models. There are estimates for South Korea, Taiwan, the Philippines, Indonesia, Singapore, Malaysia, and Thailand. In addition there are results for India.

Each model has been fitted to data for the period 1960–78. Data from the United Nations on national income and product accounts, maintained on a uniform basis, have been used for the estimation of each model. They have then been extrapolated beyond the sample for the period 1979–82 and compared with the data available on the indicators to see if the model is functioning well outside the sample and if corrective factors can be devised which would improve model performance in this postsample observation period. In some cases, more recent data acquired from a country itself were used for monitoring the dynamic evolution of the model to 1981 or 1982. The models were then extrapolated to 1985 using LINK inputs when relevant.

It should be mentioned that the preparation of models on a uniform basis and using uniform data prepared by a third party (UN) is not necessarily an optimal method for proceeding. It is, however, feasible and efficient. In the next phase, individual country models maintained within a country will be substituted, where possible, for the first approximation prepared at LINK headquarters. This is in keeping with the basic philosophy of Project LINK, which maintains that resident model builders know their own countries best and that we are well advised to use their models, if made available to LINK. The departure from uniformity in model structure and design may be occasionally a

handicap, but it is compensated for by the richness of results. Uniformity, as with OECD countries in LINK, can be achieved through the trading relations.

Models are being made ready for use in LINK in South Korea, Taiwan, Hong Kong, India, Pakistan, and some countries in Latin America and Africa. These will be maintained on site in the countries mentioned. The project will use a mixture of small uniform models prepared at LINK headquarters and some models submitted on a regular and maintained basis from country research centers.

At the present time, I can report on preliminary results obtained by using the models built at LINK headquarters and cited above, using materials in LINK files. The results for Asian and Pacific Far East countries are given in table 6.3.

There is no country in this group that can be said to be doing poorly, in a macroeconomic sense. Some may have very high aspirations and be dissatisfied with these results, but from an outside view, they look quite favorable. South Korea has already outperformed the figure predicted for 1983, with about 9% growth, and they may be able to maintain a better pace than indicated in table 6.3 for 1985 although there could well be some degree of slowdown from their heated growth pace. The Philippines will be hard pressed to meet the good growth rates predicted for 1984–85, especially in view of the political situation, which is bound to create uncertainty in people's minds, including both business investors and household consumers.

Table 6.3   **Forecasts of Main Economic Indicators for Asian and Pacific Far East Countries** (percentages)

	1983	1984	1985
India GDP	2.8	4.9	5.7
Inflation	9.6	7.4	6.1
South Korea GDP	6.4	7.6	3.9
Inflation	7.9	5.6	4.3
Taiwan GDP	4.5	6.0	7.1
Inflation	5.2	5.3	6.0
Philippines GDP	3.2	5.2	5.6
Inflation	10.4	9.4	8.7
Indonesia GDP	3.0	4.7	7.4
Inflation	14.1	14.5	9.6
Singapore GDP	6.3	7.6	8.6
Inflation	4.3	5.4	6.4
Malaysia GDP	4.6	6.6	6.7
Inflation	5.6	5.8	6.1
Thailand GDP	6.1	6.4	7.2
Inflation	4.4	4.9	4.9

The inflation numbers projected in table 6.3 are outstanding for developing countries and would be the envy of several OECD countries. The Philippines, because of political uncertainty, and Indonesia, because of the poor balance-of-payments situation, have relatively high inflation rates in this group, but it was estimated that they will be brought under control by 1985.

It must be emphasized that the preliminary models used to generate these estimates are inadequately developed on the supply side and are not yet fitted out with debt simulators. These are being introduced on the next research round.

Some estimates from LINK participants who maintain country models on site or with area institutions should be considered alongside the results reported in table 6.3. These estimates are given in table 6.4. For the most part they are in line with the model estimates of table 6.3. Most of the estimates are a bit stronger on growth or better for inflation except for the Philippines, Indonesia, and Thailand (inflation only). The associated current balances are generally sound except for the Philippines and Indonesia. As mentioned in connection with table 6.3, the Phillipines should have poorer growth and more inflation. Taiwan should have stronger growth.

Table 6.4   **Forecasts of Main Economic Indicators from a LINK Conference Held in Tsukuba, Japan, September 1983** (percentages)

	1983	1984	1985
South Korea GDP	8.2	9.0	7.3
Inflation	3.5	7.0	7.8
Taiwan GNP	5.9	6.6	6.0
Inflation	4.3	5.9	3.8
Philippines GDP	2.0	4.2	5.6
Inflation	11.8	10.7	10.0
Indonesia GDP	2.0	5.0	6.8
Inflation	19.8	16.0	12.0
Singapore GDP	7.5	7.5	8.0
Inflation	3.5	5.4	7.0
Malaysia GDP	5.5	6.8	7.0
Inflation	5.3	5.2	5.8
Thailand GDP	6.0	6.4	7.0
Inflation	5.6	6.5	7.0
Hong Kong GDP	4.0	6.1	6.8
Inflation	8.5	8.0	8.0

Source: Vincent Su, City University of New York (Ministry of Education, Taiwan, summers of 1982 and 1983), made the estimates for Taiwan. The estimates for all the other countries are from Y. K. Wang, Chung Ang University, Seoul, and Asian Development Bank.

To get an idea of the sensitivity of the countries in this region to external shocks either from an increase in exports or from an increase in import prices, we have simulated each model and computed long-run elasticity responses for GDP and price with respect to shifts in exports or import prices (see tables 6.5 and 6.6). In the case of GDP sensitivity, the Asian countries respond positively to an increase in exports, generally with elasticity values between 0.4 and 1.0. The responses in the Philippines and Indonesia are surprisingly weaker than in the other countries of the area. The Indonesian response should be significantly positive. Import price rises sometimes depress domestic activity. In some cases they make home production and exports sufficiently more competitive that they lead to increases in production.

With two exceptions (Malaysia and Indonesia) export increases lead to upward price sensitivity, and without fail, import price increases show up in domestic price increases. The price sensitivities, expressed in elasticity form, are generally small.

These elasticities are expressed as reactions to general changes in exports and import prices, but we can be more specific about the changes. An export increase or decrease could be interpreted, both quantitatively and qualitatively, as the result of a change in protec-

Table 6.5   GDP Elasticity

	Change in Exports	Change in Import Price
India	0.69	−0.01
Indonesia	0.00	0.03
South Korea	0.26	0.02
Malaysia	0.47	0.28
Philippines	0.18	−0.16
Singapore	0.78	0.12
Taiwan	0.45	−0.01
Thailand	0.40	0.28

Table 6.6   Demand Price Elasticity

	Change in Exports	Change in Import Price
India	0.06	0.80
Indonesia	0.00	0.14
South Korea	0.28	0.25
Malaysia	−0.31	0.38
Philippines	0.09	0.10
Singapore	0.14	0.78
Taiwan	0.15	0.65
Thailand	0.16	0.39

tionism. Also, general import price changes could come about from oil or raw material price changes as well as from overall changes. By relating, in a quantitative sense, the changes in aggregate totals (shown in tables 6.5 and 6.6) to specific changes, we can study a variety of policy issues with these models in an elementary way.

This discussion would not be complete without some specific reference to the outlook for the People's Republic of China. As indicated above, the PRC is given separate treatment in the LINK system as a model on its own footing, with a separate row and column in the world trade matrix. Model building for this largest country in the world is in its infancy. Even the data base is enormously in need of development. It is both a developing and a centrally planned economy. Within the system, it is represented by a model constructed and maintained at Stanford University by Lawrence J. Lau. Many of the data series are smooth trends, and good price, employment, and labor force statistics are not available. Yet we do as much as can be done toward model building for this important country and monitor data of production and trade closely.

At the present time, projections by Professor Lau for LINK are quite favorable, similar to those for Pacific area countries and the other centrally planned economies. GDP growth is projected at 6%–7% for the next three years by Professor Lau, and good rates in this range have been estimated, ex post, for many of the past few years, since normalization of relationships. A slow steady growth for agriculture at about 4.0% is projected; stronger growth is predicted for industry. Exports are projected to grow as fast as GDP, while imports are more erratic, sometimes up by a wide margin and sometimes down, but there is no sign of prolonged imbalances or the carrying of an excessive external burden. Foreign economic relations appear to be very prudent.

6.4   Conclusion

There is no doubt that the Asian-Pacific countries are star performers in the present LINK system for the near and intermediate term. Some of the economies in the region have problems, but none appears to be on the verge of collapse or bankruptcy. Other developing areas have had similar bright outlooks—the Middle East in the mid-1970s and Latin America somewhat later—only to undergo rapid deterioration. But the foundation looks favorable in the Pacific area because it is based on good workmanship, intelligence, and high productivity. It is not based in a single-minded way on good terms of trade for one community alone.

India appears to be a solid economy but not as dazzling as the Pacific Basin countries. The other countries of South Asia who are not among

those denoted as Pacific Basin countries are less well off economically, and they hold the averages down, but with some years of peace with political stability, they too could show a great deal of improvement.

Note

1. A trade matrix analysis of flows within the Asian area is given in L. Klein and V. Su, ''Trade Linkages within the Pacific Far East'' (paper presented at a conference at Rutgers University, 16 April 1981).

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