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Economists have long searched for patterns that relate successful development to structure and policy. This article reviews the experience of growth and industrialization in the postwar period in more than 100 economies, drawing on time-series data over a three-decade period. Economies are classified according to their population size, the share of primary or manufactured goods in their exports, and the weight of exports in gross domestic product (GDP). We examine the composition of demand, trade, output, manufacturing type, and factor use overall and between sectors as they relate to income growth. Higher income growth and more marked transformation are found among the groups with large populations, a predominance of manufactures in exports, and a larger role of exports. We also find that the patterns suggested by cross-country analysis are robust when tested using the time series data now available. Although development experiences may vary over time and across countries, there is sufficient uniformity within them for the main features of structural transformation to emerge as clear and consistent patterns of modern economic growth.

Since its origins in the 1950s, the study of development economics has been concerned with similarities in the way countries grow. Uniform features of the development process, commonly known as "stylized facts of development," have been identified, but significant questions about the common processes remain and are addressed here. We draw on time-series data from three decades of observation to examine whether the patterns emerging from cross-country comparisons of structure and level of development actually reflect transformations that occur over time. This work also brings to light some of the causes of the typical shifts in the composition of production and employment as incomes rise. And finally, we begin to separate out the differential patterns linking economic growth to initial conditions and to development policies.

Early studies on these patterns were conducted by Clark (1940), Kuznets (1957, 1966), Houthakker (1957), Chenery (1960), Temin (1967), and Chenery and Taylor (1968). Kuznets identified the transformation of the structure

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of an economy as the main outcome of "modern economic growth." The comparative approach in the research program that Kuznets initiated was predicated on "the existence of common, transnational factors, and a mechanism of interaction among nations that will produce some systematic order in the way modern growth can be expected to spread around the world" (1959, p. 170). The principal transnational factors identifed by Kuznets are systems of production using technologies derived from the modern sciences, a "community of wants and aspirations," and the emergence of the nation-state in global economic relations. The way these factors affect the pattern of growth is conditioned by such features as a country's size, location, natural resources, and historical heritage.

We made an earlier initial attempt to quantify some of the patterns of "modern economic growth" and the differential effects of initial conditions and development policies on the basis of the 1950–1970 period of rapid growth and relative stability in the world economy (Chenery and Syrquin 1975). We analyzed processes that are commonly used to define structural transformation: accumulation of physical and human capital; shifts in the composition of demand, trade, output, and factor use; and such socioeconomic trends as urbanization, demographic transition and changes in income distribution.

A similar approach was used in the UNIDO studies of industrial change (1979, 1983), McCarthy, Taylor, and Talati's work on trade patterns (1987) and the studies of nineteenth-century patterns of development by Adelman and Morris (1984) and Crafts (1984). Individual country studies of growth and transformation that adopt a comparative approach can be found in Ofer (1987) on the U.S.S.R.; World Bank (1985) on China; and Syrquin (1986, 1987) on Israel and Colombia.

This article draws on much of the earlier work and uses the same analytical framework as our 1975 study. The current work looks only at processes of resource allocation. In the 1975 study two commodity-producing sectors were distinguished: primary and industry. The primary sector is divided here into agriculture and mining, and industry into manufacturing and construction. The relation of the composition of the manufacturing sector to the level of development is also analyzed, for a smaller sample, extending the results of previous studies (Chenery 1960; Chenery and Taylor 1968; Maizels 1963; and Prakash and Robinson 1979). In this study we extend our data base to 1983. We thus increase the coverage of our time series by more than 50 percent and include the more recent period of slower growth and greater instability. This makes it possible to test the robustness of our principal findings and to obtain more valid comparisons of cross-section and time-series estimates, which is a central issue in this type of analysis.

Patterns of development reflect the association of changes in structure and the level of development. In a cross-country framework, markets and prices are seldom studied directly. Therefore the links to policy are examined using indirect methods. Similarly, although the relations uncovered reflect some influence

of economic structure on growth, they do not quantify that impact. To do so, it would be necessary to introduce behavior more explicitly and to rely on more country-specific experience.

Patterns of development, based on intercountry comparisons, are average relations. The same overall pattern of transformation can accommodate significant differences in the timing and sequencing of particular aspects of change. Uniformities at a broad level of aggregation can hide wide variation in the behavior of individual components.

Finally, because we examine only the processes of growth, our findings are of little help in analyzing the causes of stagnation in countries with very low income. The average patterns of transformation, however, may serve as indicators of feasible paths to growth.

We account for some of these limitations in our analysis here and in other related work (Syrquin 1988). But others are inherent in the analysis and must be recognized as qualifications to it. We will address these limits as they arise in the following discussion.

We begin by outlining the data and procedures used, before reviewing the general patterns of structural transformation in section II. Several hypotheses are examined in section III that link differences in economic growth to differences in initial structure or government policy. Short-term patterns within countries are analyzed in section IV.

I. Econometric Procedures and Data

In the analysis, we initially estimate the relation of a series of variables reflecting economic structure with the countries' income and population. The available data set covers the period 1950–83 for a maximum of 108 countries (see appendix table A-1 at the end of the article). Because the centrally planned economies pursued a unique strategy of urbanization and industrialization that significantly altered their patterns of development in comparison with other economies (see, for example, Ofer 1980) they are excluded from our analysis. We also omit all countries with a population in 1965 of less than 1 million.

The variables selected reflect intersectoral demand, trade, production, factor use, and relative prices (table 1). They are expressed as shares of GDP, or, in the case of sectoral employment, as shares of the total labor force. Our findings concerning changes in relative prices are examined in section IV.

To facilitate comparison with previous studies we generally used the same methods as in our earlier work (Chenery and Syrquin 1975). Our basic cross-country regression, estimated for all variables,[1] is:

$$(1) \qquad x = \alpha + \beta_1 \ln y + \beta_2 (\ln y)^2 + \gamma_1 \ln N + \gamma_2 (\ln N)^2 + \Sigma \delta_i T_i$$

1. We also estimated a variant of equation 1 which included foreign capital inflow, measured by the deficit in the current account as a share of GDP (reported in Chenery and Syrquin 1975; Syrquin and Chenery 1989).

Table 1. *Sample Sizes*

Economic structure	*Countries*	*Observations*
Final demand (shares of GDP)	107	3,019
Private consumption	—	—
Government consumption	—	—
Investment	—	—
Exports	—	—
Imports	—	—
Food consumption	54	1,126
Merchandise trade (shares of GDP)	98	1,829
Merchandise exports	—	—
Primary exports	—	—
Fuel, minerals and metals	—	—
Other primary	—	—
Manufactured exports	—	—
Merchandise imports	—	—
Primary	—	—
Manfactured	—	—
Production (value-added as share of GDP)	104	2,360
Agriculture	—	—
Mining	—	—
Manufacturing (International Standard Industrial Classification codes)	70	1,043
Early = food, beverages, and tobacco (31)	—	—
textiles, apparel, and leather (32) other (39)	—	—
Middle = wood and furniture (33), chemicals,	—	—
petroleum and rubber (35), nonmetallic minerals (36)	—	—
Late = paper and printing (34), basic metals (37), metal products and machinery (38)	—	—
Construction	—	—
Utilities	—	—
Services	—	—
Employment (shares of total)	108	2,710
Agriculture	—	—
Industry (mining, manufacturing, construction, and electricity, gas and water)	—	—
Services	—	—
Relative price (1970 = 100)		
Demand	107	2,513
Production	92	1,764

where x = dependent variable (as shown in table 1), y = per capita gross national product (GNP) in 1980 dollars, N = population in millions, and T_i = dummy variables for four time periods where $T_1 = 1$ if $t \geq 1960$, $T_2 = 1$ if $t \geq 1967$, $T_3 = 1$ if $t \geq 1973$, and $T_4 = 1$ if $t \geq 1979$.

The time variables are defined in an incremental way. For example, the coefficient of T_2 measures any shift after 1967, over and above the post-1960 shift reflected in the coefficient of T_1. The oil shocks in 1973 and 1979 and the accompanying changes in the international economy are likely to have created structural changes which are represented by the dummy variables T_3 and T_4.

We use the semilog formulation because many of the processes we examine seem to follow a logistic or S-type function. In addition, the fitted equations

and predicted values derived for the components of an aggregate add up identically to the fitted equation and predicted value for the aggregate (provided all estimates refer to exactly the same sample).

Equation 1 was run for pooled samples combining the individual time series for all countries or for groups of countries according to the typologies described below. In general, most of the variance to be explained in these regressions is due to variation among countries, but to a lesser extent than in previous studies. This reduction in the between-country variation is the result of our longer time series and the substantial growth and transformation exhibited in the group of newly industrializing countries since the early 1950s.

The individual time series are also analyzed directly in two ways. Average time-series relations are estimated by allowing each country to have its own intercept:

$$x = \alpha_i + \beta_1 \ln y + \beta_2 (\ln y)^2 + \Sigma \delta_i T_i \tag{2}$$

where α_i = intercept for country i.

This eliminates all the variation between countries and pools the within-country variation. The estimated parameters are weighted averages of the individual time-series estimates, with weights related to the variance of the explanatory variables. In time series analysis any uniform change is indistinguishable from a time trend. Population growth would appear only as a trend, and thus it is omitted from the equation.

Individual time-series relations within countries are also estimated in all cases for which a minimal number of annual observations were available. In these regressions only the log of income, ln y, appears as an explanatory variable.

The quality of the data is not uniform across countries or over time. All the data come from the World Bank's data tapes and often incorporate adjustments made to remove discrepancies and inconsistencies evident in the original series. Although the series used are probably the best comparable data available for a large number of countries, undoubtedly errors of measurement still remain.

When such measurement errors are random with no systematic component, least-squares estimates are inconsistent and biased toward zero. This does not, however, apply to predictions based on the variables as measured, which remain unbiased. This problem is compounded when squared terms are used, as occurs with income, y, and population, N, in this study. In such cases the coefficient of the nonlinear term is biased as the square of the bias factor of the linear term. The principal effect of such errors in our study is the underestimation of income effects, so that the magnitude of the structural transformation and the strength of nonlinear effects during the process are larger than our estimates suggest.

Systematic nonrandom errors of measurement create effects similar to those arising from model misspecification due to omitted variables. An important instance of such a systematic association in this study is the effect of using exchange rates for converting local currencies to U.S. dollars instead of using

purchasing-power parities (PPPs) (see Chenery and Syrquin 1986 for a discussion of the effects). Attempts have been made to estimate real incomes (converted at PPPs rather than at exchange rates) for samples of countries (see, for example, Kravis 1984). The exchange-rate deviation indexes estimated tend to be higher for poorer countries, so that use of exchange rates rather than PPPs in comparing GDP tends to undervalue GDP for the low-income countries. The result of relevance for our study is that differences across countries in incomes converted at exchange rates tend to exaggerate the real differences in income. The transformation in the structure of an economy, therefore, takes place over a narrower range of real income than is implied by our estimates.

If the systematic effect causing the error in measurement is expected to continue, then it can be argued that the uncorrected estimates are the more relevant, even though they combine both (real) quantity effects and price effects.

The use of exchange rates may affect differently the various components of GDP. Reports of the International Comparisons Project (ICP) give information on the price structures of the countries studied (for an overview of the project, see Kravis, Heston, and Summers 1982). They show that the relative price of government consumption generally rises with income, whereas the relative price of investment declines. While the ICP does not examine sectoral production, we assume also that the relative price of services tends to increase with income.

The influences of the expected biases strengthen some of our results but qualify or even nullify others. For instance, we find that investment increases with income. The result is strengthened when one accounts for the undervaluation of investment at higher income levels created by use of exchange rate rather than PPP conversions. Conversely, the expected bias in valuation of services would undermine our finding that the share of services increases with income. The case of services is further discussed below.

Finally, if the systematic errors of measurement associated with income vary primarily between countries and are relatively invariant within a country over time, then in the average time-series formulation (equation 2) the omitted effects thus implied become part of the country-specific intercept, and correct for the specification bias.

These are the main expected effects from possible errors in measurement. A more extended discussion and references are provided in Chenery and Syrquin (1975, technical appendix).

II. Dimensions of the Structural Transformation, 1950–83

Average growth in total and per capita income during the three decades was significantly higher than in any comparable period in recent history (table 2). Average annual income per capita grew at 2.4 percent. At this rate income per capita would have doubled after thirty years. Of course, the rate was not uniform among countries or groups. Seven of the twenty-nine economies in the

Table 2. *Average Annual Rates of Growth: 1950–83*
(percent)

Group	Number of Countries	Per capita Income	GNP	Multiple of initial income per capita after thirty years
All	108	2.4	4.6	2.04
Low-income	29	0.8	3.0	1.27
Lower-middle-income	29	1.9	4.7	1.76
Upper-middle-income	29	3.6	6.0	2.89
Industrial	19	3.2	3.7	2.57

Note: Growth rates are computed by least-squares regressions for all observations available within a country. Sixty countries had thirty or more annual observations, forty-one countries had between twenty-four and twenty-nine observations, and seven had fewer than twenty-four observations (see appendix table A-1). Libya and Saudi Arabia are included only in the total.
Source: Calculations based on data from the World Bank.

low-income group had negative rates of growth. In the twenty-two with positive growth, the average rate equalled 1.4 percent. Developing countries experienced a clear acceleration of growth as income rose, reaching an average rate of 3.6 in the upper-middle-income group. At this rate the initial income level would increase by a factor of about 3 in thirty years. Several countries multiplied their starting income level by a factor of 4, or even 5.

This rapid rate of growth means that several countries traversed a large segment of the total range of per capita incomes seen across all countries. Accompanying this growth of income was a transformation of the structure of the economy. In our earlier work, we observed that about 75–80 percent of this transformation took place within the income interval of $100–$1,000 in 1964 U.S. dollars (Chenery and Syrquin 1975, p. 19). In this study we define the transition range in 1980 U.S. dollars as the interval from $300 to $4,000 per capita GNP. These revised figures account for inflation since 1964 and reflect the tendency for real exchange rates in developing countries to depreciate relative to the average for industrial economies—and the lower the income level, the greater the depreciation (Wood 1987).

Table 3 shows the predicted values for the shares of the various components of economic structure at different levels of per capita income. These figures are derived by estimating equation 1 for the 1950–83 period for a hypothetical country of average size ($N = 20$). In calculating the predicted values for the five levels of per capita income we incorporate uniform shifts up to the post 1973 period, but not any shifts after 1979. That is, we set $T_1 = T_2 = T_3 = 1$ and $T_4 = 0$. (The estimated regressions appear in Syrquin and Chenery 1989.) Because logistic functions are characterized by upper and lower asymptotes, at the two income extremes ($300 > y > $4,000 in 1970) instead of presenting the predicted values, we calculated the actual average shares for the intermediate period, 1960–72, which was more stable than the later period, and for which we had higher quality data. The difference between these two extremes,

Table 3. *Shares of Economic Structure Associated with Levels of Per Capita Income*
(percent)

Component of economic structure	*Income per capita (1980 U.S. dollars)*								
	Actual average	*Predicted*[b]					*Actual average*	*Total change*	*Midpoint of change*
	< 300[a]	*300*	*500*	*1,000*	*2,000*	*4,000*	*> 4,000*[c]		
Final demand									
Private consumption	79	73.3	70.2	66.4	63.1	60.3	60	−19	600
Government consumption	12	13.6	13.5	13.7	14.4	15.4	14	02	—
Investment	14	18.4	20.8	23.3	25.0	25.9	26	12	400
Exports	16	19.3	20.7	22.6	24.5	26.4	23	07	400
Imports	21	24.6	25.2	26.0	27.0	28.0	23	02	—
Food consumption	39	38.7	34.5	29.1	23.9	18.9	15	−24	1,200
Trade									
Merchandise exports	14	15.2	16.9	18.8	20.3	21.2	18	04	400
Primary	13	13.9	14.9	15.2	14.1	11.8	07	−06	—
Fuels	03	04.8	06.3	07.3	07.2	06.1	02	−01	—
Other	10	09.1	08.6	07.9	06.9	05.7	05	−05	1,250
Manufacturing	01	01.3	02.0	03.7	06.1	09.4	11	10	2,000
Merchandise imports	16	18.2	19.3	20.6	21.7	22.7	19	03	—
Primary	05	06.4	06.7	07.1	07.5	08.0	07	02	—
Manufacturing	11	11.8	12.6	13.5	14.2	14.7	12	01	—

Production (value-added)									
Agriculture	48	39.4	31.7	22.8	15.4	09.7	07	−41	700
Mining	01	05.0	06.6	07.7	07.5	06.1	01	0	—
Manufacturing	10	12.1	14.8	18.1	21.0	23.6	28	18	1,200
Construction	04	04.4	04.9	05.5	06.1	06.7	07	03	1,000
Utilities	06	06.7	07.4	08.1	08.8	09.3	10	04	900
Services	31	32.4	34.6	37.8	41.2	44.7	47	16	1,300
Manufacturing									
Early	07	06.8	07.6	08.3	08.3	07.8	07	0	—
Middle	02	03.3	04.3	05.3	06.0	06.5	06	04	500
Late	03	01.8	03.2	05.3	07.6	10.2	13	10	2,500
Labor force									
Agriculture	81	74.9	65.1	51.7	38.1	24.2	13	−68	1,300
Industry	07	09.2	13.2	19.2	25.6	32.6	40	33	1,600
Services	12	15.9	21.7	29.1	36.3	43.2	47	35	1,000

—Not applicable: change is not monotonic or significant.

Note: Expressed as shares of GDP, except for labor force variables, which are expressed as shares of total labor force.

a. Based on 1960–72 period for countries with per capita income less than $300 in 1970; mean approximately $180.

b. Assumes average population (20 million).

c. Based on 1960–72 period for countries with per capita income greater than $4,000 in 1970; mean $7,300. Countries with income only slightly over $4,000 in 1970 are excluded: these are Israel ($4,035), Ireland ($4,135) and Spain ($4,310).

Source: Calculations based on data from the World Bank.

which is a measure of the magnitude of change as income rises, is also shown. Finally, we indicate the differences in the timing of the change in these components. The last column shows the level of income at which half of the total structural change has taken place, for variables where change is significant and monotonic.

The evidence presented in table 3 suggests that the uniformity of the structural transformation revealed in our earlier work is quite robust. When we compare the goodness of fit of the former estimates for 1950–70 to the present ones through 1983, the standard errors of the estimates for the two studies are remarkably similar, and when different, they favor the new study (Syrquin and Chenery 1989).

The transformation in final demand is one of the most uniform features of the process of development. On average, the share of private consumption in GDP declines with the level of income, as the share of investment rises and the trade deficit declines. Food consumption drops by about 20 percentage points, while nonfood consumption (not shown separately) goes up. The shift from consumption to investment takes place at a lower income level; the decline in food consumption is spread over a wider income range.

Only a small part of the variation in aggregate trade can be related to income. In the composition of exports we do find a fairly steady increase in manufactures throughout and a decline in the share of primary products in the later periods. No such change takes place in imports, for which there is an increase in both components. Only in large countries do we find a decline in manufactured imports, which is clearly related to early import substitution.

Changes in final demand and trade reinforce each other. They combine with complementary changes in intermediate uses and productivity growth to produce a more pronounced shift in the structures of production and labor use.

The share of value added in agriculture declines sharply over the transition, whereas manufacturing, construction, and utilities double their share and the services sector share rises by about 50 percent. It has been argued that the rise in services is wholly a product of increasing services prices (Kravis, Heston, and Summers 1983). Although there is a significant price effect in the rising share of services, we will show in section IV that it does not account for all of the increase.

For the earlier period, the rising industrial output share surpassed the declining primary share at an income level of approximately $300 (1964 U.S. dollars), when both industry and the primary sectors accounted for about 26 percent of total value added. The same transition point was reached in the present study at an income of $1,500 (1980 U.S. dollars), when the two sectors equal about 25.5 percent of output. The rise in manufacturing and industry production shown here is smaller than that found for earlier periods, probably reflecting the deindustrialization of the developed countries.

The decline in the share of agriculture in employment is more pronounced than in production, but since it starts from a much higher level its percentage

decline is smaller than for agricultural production. Thus the relative productivity of labor in agriculture (share in value added divided by share in employment) drops through income levels of around $3,000 before the gap in average productivity begins to narrow.

The sectoral correspondence of the structures of demand, trade, and production in table 3 is only approximate. Strict comparability would require matching the classification schemes (International Standard Industrial Classification, and Standard International Trade Classification), and an interindustry framework to allocate expenditure categories to industries and to account for intermediate goods.

Over the course of the transition there is a significant shift in value added from primary production to manufacturing and nontradables. For each sector we analyzed the sources of this shift arising from changes in the composition of demand for intermediate and final goods and from changes in net trade (Syrquin and Chenery 1989). The average patterns thus derived show a very close correspondence with those shown in the directly estimated shift (table 3). Changes in domestic demand (Engel effects) seem to account directly for less than half of the change in structure, and changes in net trade for about 10 percent on the average.

Changes in the use of intermediate inputs as income rises push down the share of primary-sector value added in two ways (information on intermediate production comes from a comparative study of interindustry relations by Deutsch and Syrquin, forthcoming). First, as income rises, producers in all sectors substitute manufactured inputs for natural intermediates because of changes in prices and production technology, accounting for around 15 percent of the decline in the primary sector share. Second, producers in the primary sector increase their use of inputs relative to output, reducing the ratio of value added to gross output. About one-fourth of the decline in the share of primary sector output results from this increase in the use of inputs in the primary sector. In an input-output model, the variation in intermediate use can be further attributed to changes in final demand, trade, and input-output coefficients (see, for example, Chenery, Shishido, and Watanabe 1962, for Japan, or Chenery and Syrquin 1980 and 1986a, for a cross-country analysis).

Manufacturing: Disaggregated Results

During the process of industrialization, the composition of the manufacturing sector changes considerably. At a less aggregated level, country-specific features and policy become more prominent in determining the pattern of specialization. Large countries can better exploit economies of scale within their domestic markets and can more easily afford a strategy of import substitution. Variation in resource endowments is expected to generate differences in production patterns within manufacturing, particularly in small economies. Nevertheless, various studies have shown that a high degree of uniformity still remains in the pattern of change within the industrial sector.

There have been various attempts in the literature to group industrial sectors into homogeneous categories differing in their technology, their dynamism, or the demand for their products. Hoffmann (1958) stressed the systematic decline in the ratio of consumer to producer goods. At the Economic Commission for Latin America (1964) the labels became more emotive: dynamic and vegetative branches. In this study nine industrial branches were distinguished. The results in table 3 are aggregated into three industry groups "according to the stage at which they make their main contribution to the rise of industry" (Chenery and Taylor 1968, p. 409). *Early* industries are established at low income levels to satisfy the essential demands of the population (food, textiles, clothing). They are characterized by simple technologies and low income elasticities of demand. Their share in GDP remains static during the transition at an average about 7–8 percent. Within manufacturing their share goes down significantly, although there are some recent exceptions where the output of some branches in this group expanded rapidly for exports.

Middle industries typically double their share in GDP early in the transition, from about 3 percent to 6 percent, but show little further increase. A large proportion of their output is used as intermediate inputs by other sectors (chemicals, nonmetallic minerals). This source of demand expands at lower income levels when the matrix of interindustry relations becomes more dense. Income elasticities for the finished products from the group of middle industries are generally above unity.

The group of *late* industries accounts for virtually all of the increase in the manufacturing share in the latter stages of the transformation. This group includes investment goods (machinery), some intermediates (paper), and durable consumer goods with high income elasticities of demand (metal products). At low income levels this group typically accounts for less than 3 percent of GDP, whereas by the end of the transition it commonly reaches or exceeds 10 percent of GDP.

Shifts over Time

Some long-run processes of change proceed over time independently of variations in income. For example, changes in the level of technology, the international environment, or the strategies of development may lead to shifts in the dependent variables. To the extent that those long-run processes of change can be assumed to be universal and to affect all countries alike, their effect would be captured by the time dummy variables in equation 1. In a more general model the time-shift variables would be replaced by the processes for which they stand as proxies.

Some of the omitted variables vary primarily among countries and are relatively invariant within a country over time. If these variables are correlated with income across countries, the cross-country patterns will differ from time-series estimates and this difference may end up as part of the time trend in the intercountry estimates.

Finally, we have the case of random or unanticipated shocks, such as the quadrupling of the price of oil in 1973. If the impact of the shocks is uniform for all countries, it will appear in the time-shift variable. If it is random, it may impair the accuracy of the estimates. When the impact of the shock is different for different groups of countries, an additive time-shift variable will fail to represent the differential effect. If there is reason to believe that the effect of the change (in oil prices for example) varies systematically with income or some other characteristics, we could introduce interaction terms or split the sample to estimate separate regressions for the time periods before and after the change, and compare predicted values at various income levels.

The uniform time shifts up to the late 1970s shown in table 4 reinforce the income-related decline in food consumption and rise in investment, government

Table 4. *Uniform Time Trends in Economic Structure, 1950–83*
(percent)

Component of economic structure	*Coefficient of time variables (t)*			
	1965 < t < 1969	*t ≥ 1960*	*t ≥ 1973*	*t ≥ 1979*
Demand				
Consumption (private)	−2.1	−3.0	−1.0	1.2
Government consumption	2.2	2.8	1.2	1.0
Investment	1.3	2.2	2.6	−0.4
Exports	0.2	0.9	3.4	1.6
Imports	1.6	2.9	6.1	3.4
Imports less exports	1.4	2.0	2.7	1.8
Food consumption	−2.5	−2.7	0.2	−1.3
Trade[a]				
Exports				
Fuels, minerals, and metals	—	0.5	1.8	−0.3
Other primary	—	−0.6	0.5	0.0
Manufactures	—	0.7	1.1	1.8
Primary imports	—	−0.3	2.2	1.7
Production (value-added)				
Agriculture	−1.5	−7.1	0.1	−1.6
Mining		2.2	1.4	0.3
Manufacturing	−1.0	2.6	−0.7	−0.6
Construction		1.3	0.1	0.2
Utilities	0.6	1.7	−0.4	0.5
Services	1.9	0.7	−0.6	1.3
Employment				
Agriculture	—	−0.8	−0.9	−1.2
Industry	—	−1.3	−0.2	0.2
Services	—	2.2	1.1	1.0
Manufacturing				
Early	—	−0.3	−0.3	0.1
Middle	—	0.4	0.0	0.3
Late	—	−0.8	−0.6	−0.1

—Not available.
Note: t is the year of observation.
a. Data start in 1962.
Sources: Chenery and Syrquin (1975); calculations based on data from the World Bank.

consumption, trade shares and trade deficits. The large shift from agricultural production to all other sectors in the pre-1973 period can be explained by the nature of technological progress and the substitution of fabricated products for natural materials. The exogenous shift after 1979 from tradables to nontradables combines the effects of the depression and worsening terms of trade in oil-importing countries, with the changes in structure in oil-exporting economies known as "Dutch disease." Dutch disease results when a sudden drastic increase in foreign exchange earnings leads to currency appreciation and to an increase in the relative prices of nontradables. As a result exports become less competitive and, in general, output and employment in the tradable sectors fall.

To evaluate the uniformity of the time trends, separate regressions were run for the pre-1973 and post-1973 periods and predicted values compared at three income levels: $300, $1,000, and $4,000 (Syrquin and Chenery 1989). In general the predicted values for the two periods are not very different, so that the hypothesis of homogeneity cannot be rejected. The most significant nonuniform shifts are related to trade. The increase in manufactured and total exports after 1973 (holding income and size constant) is positively correlated with income, whereas the import surplus increases most at low income levels. The shares of manufactured output and industrial employment are almost the same before and after 1973 at low and middle incomes but fall significantly in the richer countries. The counterpart is a positive time shift in services employment in advanced countries.

III. Typology of Development Patterns

We review here the average patterns of economic transformation related to the initial conditions and policy objectives of each country studied. We consider some of the factors that lead to diversity in patterns of resource allocation, and we classify countries into more homogeneous groups by population size, share of manufactures in exports, and share of exports in GDP. We exploit the large samples to estimate separate regressions for each group, and we then define a typology of development strategies.

Country Classification

Countries are classified first as large or small based on their population in 1965. We then divide countries into two groups according to the predominance of primary or manufactured goods in their exports. This commodity composition is reflected in a trade orientation index (TO), which substracts the predicted difference between primary and manufactured exports (as a share of total merchandise exports) from the actual share:

$$TO = (EP - EM)/EMR - (\widehat{EP} - \widehat{EM})/\widehat{EMR}$$

where EP, EM, and EMR are primary exports, manufactured exports, and merchandise exports respectively, and the hat over a variable refers to predicted

values.[2] The TO index was calculated for data from 1965 and 1980 on the basis of separate regressions by country size (small and large) and period (pre- and post-1973). Countries with positive TO values were classified as *primary-oriented* and countries with negative TOs as *manufacturing-oriented.*

We also classify countries according to their observed share of merchandise exports in GDP relative to the predicted share for 1965 and 1980, on the basis of separate regressions by size and period. A high relative export level led to an *outward* classification whereas a low level resulted in an economy being classified as *inward.*

Although the relative export level is much influenced by trade policies, our simple measure of openness is not directly based on policy instruments but on realized levels of trade. Some studies rely directly on the policy variables for identifying trade strategies. A recent example is the analysis of trade orientation in *World Development Report 1987.* However, such a classification tends to vary significantly over time and, by ignoring initial conditions, implicitly assumes an unrealistic degree of flexibility in the structure of the economy. The correspondence between the typology in the *World Development Report* and the one below nevertheless is quite high. We aim to identify significant differences among broad groups and to provide relevant benchmarks for country analysis. For these purposes reclassifying a few countries among the types has only a marginal effect on the results.

All countries in our sample were classified on the basis of the three factors: size, specialization, and openness (see appendix table A-1). In the great majority of cases the classification resulted from adherence to fixed sets of criteria: one for small countries and one for large ones. But, the computed indexes for 1965 and 1980 at times gave conflicting results. Where a clear shift between the two points could be discerned, we gave a larger weight to the position in the terminal year in classifying the country for the whole period. In addition, the indexes of specialization and openness are based on merchandise exports only. In some cases we also considered exports of services and the trade balance as shares of GDP, especially where extreme values of the variables were recorded and where the classification was not a clear-cut one. (For more details on the classification see Syrquin and Chenery 1989.)

Variations in Patterns of Resource Allocation

Many of the variations from the average patterns of growth are a reflection of the interaction of comparative advantage with policy. For example, a great relative abundance of natural resources that are economical to exploit at given prices and technology (especially oil and other minerals), is expected to lead to a high share of primary exports. Although it is difficult to measure the availability of resources, a simple proxy for the proportion of resources to population

2. There are small definitional changes from the 1975 analysis that have little effect on the general conclusions. The TO index is illustrated in greater detail in Chenery and Syrquin (1986b).

is the density of the population. A high density has been shown to be significantly associated with lower trade shares and a higher share of manufactured goods in total exports (Perkins and Syrquin 1989).

The level of income affects the composition of exports in two ways. First, a higher income level is associated with greater absorptive capacity, so there is less surplus to be vented. Second, the ratio of capital (physical and human) to labor is positively associated with per capita income. As a country develops it tends to go through "stages of comparative advantage" moving from resource-intensive commodities to labor-intensive and then to more capital- and skill-intensive goods (Balassa 1979, Leamer 1984). Although the share of total exports seems to be only weakly associated with the level of income, the commodity composition shows a significant shift from primary to manufactured exports.

Size and specialization. We identify four categories of countries: small primary, small manufacturing, large primary and large manufacturing. Separate regressions were run for each group, and a summary of the most salient contrasts appears in table 5. The first column shows the expected level of a variable at an income of $1,000 derived from the average patterns in section II. The last four columns give the ratio of predicted levels from group-specific regressions to the average figures in the first column.

Large countries export a much smaller share of output than small ones. Among large countries there are significant differences. In the typical large primary-exporting (LP) countries, the relative abundance of natural resources is reflected in its trade composition. Many countries in this group followed an import substitution strategy for a large part of the period after 1950. One result of this policy was a failure to develop manufactured exports, which also shows up in the smaller share of industries classified as "early" and in the relatively low share of industrial employment. By contrast, among the large manufactured (LM) goods exporters, the overall share of exports is still low but manufactured exports are substantially higher than in the average pattern, as is the share of early industry in GDP. The exploitation of economies of scale is reflected in the high shares of investment and of middle and late industries.

In small countries trade is more important, but in the small primary-exporting (SP) economy, primary exports more than offset the shortfall in manufactured exports. In the small manufactured good exporters (SM), however, the high level of manufactured exports is accompanied by a high share of primary and manufactured imports. The high level of manufactured imports reflects input requirements, as well as final imports which are a concomitant of the higher degree of specialization and integration in the international economy of the resource-poor SM country.

For the average economy it was shown in table 3 that the major source of growth in manufacturing during the transition is in the late industries, characterized by high capital intensity and economies of scale. When we analyze

Table 5. *Index of Shares of Economic Structure of Country Groups Relative to Average Shares*

Component of economic structure	Average share[a]	Country size and export specialization			
		Small		Large	
		Primary	Manufactured	Primary	Manufactured
Merchandise trade					
Exports					
Fuels, minerals, metals	7.3	125	18	78	19
Other primary	7.9	147	106	63	29
Manufactured	3.7	49	389	35	262
Imports					
Primary	7.1	97	177	52	152
Manufactured	13.5	113	180	67	74
Demand					
Exports	22.6	115	141	63	67
Imports less exports	3.4	76	341	50	221
Investment	23.3	91	105	98	120
Production (value-added)					
Agriculture	22.8	102	105	113	93
Mining	7.7	109	66	109	43
Manufacturing	18.1	85	95	97	116
Services	37.8	108	104	96	102
Employment					
Agriculture	51.7	112	85	102	89
Industry	19.2	83	123	88	132
Services	29.1	90	111	104	98
Manufacturing					
Early	8.3	106	90	86	113
Middle	5.3	66	79	96	123
Late	5.2	62	85	96	163

Note: Shares calculated are percent of GDP except for employment variables which are shares of total labor force. Index is share for group divided by average share, times 100. Values over 100 indicate a share for that group and economic component that is greater than that predicted for the average; values below 100 reflect shares less than the average.

a. The average share is the predicted share for countries with per capita income of $1,000, based on regressions for the whole sample.

Source: Calculations based on data from the World Bank.

changes in the four groups, this result still holds, except for the SM group, in which the development of labor-intensive exports of manufacturers leads to an expected rise in the share of early industries of about 5 percentage points in the range $300 to $4,000 (for details, see Syrquin and Chenery 1989).

Export share. In the four-way typology analyzed above the degree of openness has not been explicitly considered. Further splitting the types would reduce the samples too much for statistical analysis. To assess the average effect of our openness measure (the relative share of merchandise exports in GDP) on the patterns of resource allocation, we add a dummy variable for openness to the regressions within the four types. The variable equals one for countries classi-

Table 6. *Relation of Higher Share of Exports with Economic Structure*

Component of economic structure	Country size and export specialization			
	Small		Large	
	Primary	Manufactured	Primary	Manufactured
Investment	5.8	0.2	1.3	1.2
	(14.8)	(0.5)	(2.7)	(2.1)
Imports less exports	−3.6	0.7	−2.0	−0.6
Primary exports	12.7	3.1	15.2	1.4
	(19.9)	(5.8)	(16.5)	(3.3)
Manufactured exports	0.4	15.8	1.2	4.7
	(2.1)	(15.7)	(5.4)	(8.9)
Production (value-added)				
Agriculture	−4.0	−5.3	3.7	−2.2
	(6.2)	(7.2)	(3.7)	(3.3)
Mining	7.8	0.1	11.2	1.6
	(13.5)	(0.4)	(18.8)	(3.5)
Manufacturing	−2.4	4.2	−9.0	3.2
	(7.9)	(7.5)	(20.5)	(4.5)
Construction	0.9	−0.2	0.1	−0.2
	(6.5)	(1.1)	(0.4)	(0.9)
Utilities	1.5	−1.4	−1.3	1.0
	(9.4)	(4.1)	(7.0)	(4.1)
Services	−3.8	2.5	−4.7	−3.4
	(8.2)	(3.9)	(6.4)	(4.9)
Manufacturing				
Early	−4.0	2.4	−3.1	0.0
	(11.8)	(9.3)	(11.2)	(0.0)
Middle	0.1	−0.4	−2.7	0.1
	(0.7)	(2.1)	(11.7)	(0.3)
Late	−0.1	0.1	−2.9	3.2
	(0.2)	(0.3)	(8.8)	(8.9)

Note: Values are coefficients of dummy variable for group with high share of merchandise exports in GDP; *t*-statistics are in parentheses.
Source: Calculations based on data from the World Bank.

fied as outward (in appendix table A-1). The coefficient of the dummy variable indicates the added effect of openness after controlling for size and specialization (table 6).

Some of the results follow trivially from the way we have classified countries. Thus trade ratios are strikingly higher in the more open subgroups. Greater merchandise exports are associated with lower trade deficits and higher investment shares, implying higher saving proportions. In the SP group the expected difference in the share of investment is close to 6 percentage points.

The relation with the degree of industrialization differs according to the type of specialization. In primary-oriented countries greater merchandise exports are associated with larger mining shares and lower shares of manufacturing, particularly among large countries. This pattern reflects the combined effect of the import-substitution strategy in inward-oriented countries, and the Dutch disease syndrome in mineral exporters.

In exporters of manufactures, the more open the economy the larger the share of industry in output. In the small economy (SM) this increase is located in early-light industries while in the large economy (LM) it appears as higher shares of late-heavy industries.

Structures and Strategies

We have classified economies into four general types according to their structural features and trade policies. The typology includes developing countries that are far enough into the transition to identify the strategy being followed and that have the data required for classification. The fifty economies in table 7 include all those identified as semi-industrial on the basis of the contribution of manufacturing to the growth of commodity production (the industry index); per capita GNP; and the share of manufactures in exports and production. It also includes some countries that satisfy only two or even one of the criteria, to enlarge the coverage of the classification (Chenery and Syrquin 1986b). Because the approach used here follows that of our earlier work, and the results of that work appear to be robust, we describe here only the main features of the strategies and structures.

Outward, primary-oriented economies. The countries in this category have very high export shares made up almost completely of primary commodities. The strong primary specialization appears to originate more in resource endowment than in a deliberate policy choice.

The continued primary specialization into the advanced phase of the transition can be characterized as a strategy of delayed industrialization. The production and exports of labor-intensive manufactures tend to lag in primary-oriented economies. (For a review of the development experience of such economies, see Lewis 1989.)

All the agricultural exporters are small economies. Large countries that might have been classified in this group in the past have usually pursued a strategy of inward development through import substitution. Among the most successful examples of an outward, primary-oriented strategy is Malaysia. It has maintained relatively neutral incentives among sectors; the result has been substantial growth of manufactured exports while primary exports have stayed at a high level.

The three large economies are mineral exporters. At low income levels (Indonesia and Nigeria) the abundance of mineral resources dominates the effects of large size which would normally lead to low shares of trade and high shares of manufactures in exports.

The cases of Indonesia and Nigeria illustrate well the importance of structural characteristics for determining a development strategy. In a study of very large countries (Perkins and Syrquin 1989), Indonesia and Nigeria had to be treated separately. Their patterns of development resembled more those of small economies than those typical of large ones. *World Development Report*

Table 7. *A Typology of Industrial Development*

Economy	GNP per capita, 1980	Relative export level		Trade orientation index[a]		Share of manufactured exports in GDP		Share of manufacturing value-added in GDP		Share of manufacturing in commodity growth[b], 1960–80
		1965	1980	1965	1980	1962	1980	1960	1981	
					Outward, primary-oriented					
Large										
Indonesia	470	80	270	7	22	0	1	9	12	30
Nigeria	990	207	171[c]	24	49[c]	1	0	5	6	28
Iran, I.R.	2,270	129	210[c]	35	89	1	0	11	11	42
Small										
Sri Lanka[d]	270	309	216	−2	−37	1	5	15	16	38
Liberia	520	151	155	12	24	2	2	4	8	17
Honduras[d]	640	109	143	21	20	0	4	12	16	40
Cameroon[d]	740	124	141	17	29	1	1	10	8	40
Papua New Guinea[d]	820	57	109[c]	14	33[c]	1	4	4	9	—
Côte d'Ivoire[d]	1,200	147	141[c]	32	1[c]	0	3	7	12	47
Ecuador	1,470	77	95	34	54	0	1	16	11	46
Malaysia[d]	1,650	211	217	17	2	2	10	9	21	48
Algeria	2,100	90	118	24	31	1	0	8	11	38
Iraq	3,000	155	208[c]	50	62[c]	0	0	10	6	26
Venezuela	3,800	134	122	39	33	2	1	11	15	80
					Inward-oriented					
Large manufacturing										
India	240	62	120	−115	−118	2	3	14	17	37
China	290	—	—	—	—	—	—	26	37	72
Pakistan	310	70	82	−54	−69	2	5	12	17	41
Large, primary										
Colombia	1,280	53	72	11	23	0	3	17	21	49
Turkey	1,310	40	37	25	8	0	2	13	22	55
Argentina	1,980	46	32	33	29	0	1	32	25	79
Mexico	2,620	50	22[c]	25	14[c]	1	2	19	22	75
Small										
Bolivia	760	85	88[c]	26	43[c]	1	1	15	14	46
Nicaragua	790	80	67	24	17	1	3	16	26	53
Guatemala	1,080	77	88	10	5	1	5	13	18	47
Peru	1,120	62	84	28	−15	0	3	24	28	67
Dominican Republic	1,160	56	61	31	12	0	3	17	16	51

Paraguay	1,360	43	35[c]	16	27[c]	1	1	17	17	41
Syria	1,510	54	67[c]	20	43[c]	1	1	21	12	36
Chile	2,400	57	69	46	40	0	2	21	22	60
Uruguay	3,540	53	28	47	−4	0	4	21	22	71
					Balanced					
Large										
Egypt, A.R.	580	105	138	−25	22	2	2	18	8	48
Thailand	710	90	132	7	−11	1	6	13	20	53
Philippines	730	103	111	8	−27	1	6	20	25	52
Brazil	2,000	120	58	30	−6	0	5	26	27	82
Spain	5,600	40	57	4	−29	1	7	26	24	85
Small										
El Salvador	740	112	137	2	−21	2	11	14	14	53
Morocco	950	70	57	1	−42	1	3	16	18	59
Tunisia	1,370	62	105	−1	−10	1	9	8	14	41
Costa Rica	2,050	59	56	6	−11	2	8	14	19	63
Greece	4,300	22	35	27	−16	1	5	16	19	71
Ireland	5,100	96	125	1	−33	7	27	17	23	66
					Industry-oriented					
Large										
Korea, Rep.	1,600	39	157	−96	−112	1	23	14	29	79
South Africa	2,670	135	186	−18	−71	7	26	21	23	—
Yugoslavia	3,050	94	75	−74	−57	6	10	29	25	63
Small, outward										
Kenya	410	148	108	−20	−30	2	3	9	13	48
Taiwan	2,270	—	—	—	—	—	—	22	40	90
Singapore	4,500	314	378	−26	−36	—	—	12	30	96
Hong Kong	5,470	218	220	−113	−94	49	66	22	23	100
Small, inward										
Jordan	1,140	50[c]	55	−21[c]	−18	1	6	12	14	46
Portugal	2,460	85	76	−84	−78	7	14	22	30	95
Israel	4,750	41	82	−66	−80	8	23	23	23	77

—Not available.

a. Indicates the predominance of primary or manufactured goods in merchandise exports, with positive values reflecting a primary and negative a manufacturing orientation.

b. Termed "industry index" in our earlier works.

c. 1975.

d. Agricultural exporters.

Source: Calculations based on data from the World Bank.

1987 classifies Indonesia as "moderately inward" during 1973–85 and Nigeria as "moderately inward" in the first period and then "strongly inward" in the second. As far as the system of incentives is considered, the classification appears to be accurate, but it ignores the abundance of natural resources that leads to the relatively high export and low manufacturing shares in these countries. Thus, the structures of their economies suggest that Indonesia and Nigeria are best classified as "outward, primary-oriented."

Most mineral (oil) exporters evidenced some signs of Dutch disease in the wake of the sharp increases in the price of energy. The share of mining in output increased at the expense of both manufacturing and agriculture (Ecuador, Iraq, Venezuela).

Inward-oriented economies. Among large, inward-oriented countries, two groups can be distinguished. The first comprises three very large countries of Asia with relatively low incomes. The second includes the large countries of Latin America plus Turkey. The Asian group has substantially lower incomes and has a poorer endowment of natural resources reflected in the much higher density of population.

The main difference between the Asian and Latin American economies is in their trade orientation. The large Asian economies here fall into the manufacturing-oriented category while Latin American countries start with a strong primary orientation. By 1980, however, in most Latin American countries manufactured exports had risen appreciably. This development of manufactured exports, hastened by the debt crisis of the 1980s, may not be unrelated to the earlier phase of inward-looking industrialization, during which the economy acquired a basic technological mastery which then facilitated the exporting of manufactures on a significant scale. Teitel and Thoumi (1986) argue that in the large countries of Latin America import substitution provided a preamble to the export stage. Bruton (1989) also calls for a more balanced appraisal of the import-substitution strategy.

Balanced economies. The countries in this group, except Egypt,[3] shifted from a primary to a manufacturing specialization in trade, while in most cases maintaining or increasing their normal trade shares. The difference between this group and the inward-orientation group is one of degree because both made extensive use of protection, even during the opening episodes.

Industry-oriented economies. The trade policy of these economies has been mostly outward-oriented, particularly in the Asian economies in the group (Republic of Korea, Taiwan, and the city-states of Hong Kong and Singapore). In most cases the rapid rise in manufactured exports followed an earlier phase

3. In Egypt between 1962 and 1980 the share of fuels, minerals, and metals in merchandise exports rose from 4 percent to 69 percent. In addition, by 1980 remittances and earnings from the canal allowed a deficit in the current account exceeding 15 percent of GDP.

of import substitution behind high protection. The initial inward-looking policies continued for a relatively short period in Korea and Taiwan; in Israel they were supplemented by export-promotion policies.

Performance

Among the alternative development patterns we categorize, the one that has elicited the most interest has been the relation between performance and the inward-outward distinction. Studies have found a significant positive relation between an outward orientation and strong macroeconomic performance, growth, efficiency in resource allocation or reallocation, higher labor absorption and factor productivity, and adjustment to external shocks (see for example, Balassa 1989, Krueger 1983, Feder 1983 and 1986, Chenery 1986, and World Bank 1987).

Besides the inward-outward distinction, we considered size and specialization and ended up with eight subgroups. This permits us to make four comparisons of average performance between economies we classify as less and more open with different combinations of initial conditions. Table 8 shows the average growth rate and sample size for the countries in each of the eight subgroups (as listed in appendix table A-1) based on data for 1950–83.

In each case, GDP growth is higher in the outward group, the difference between the outward and inward subgroups varying from a maximum of 1.4 percentage points for small primary exporters down to 0.2 points for large primary exporters. As for the other classifying criteria (size and specialization), the results are less conclusive but still indicate that a manufactured specialization performed better than a primary specialization and that large countries grew faster than small ones (for the relation of size and performance, see Perkins and Syrquin 1989). However, most of the very fast growers during this period were small or medium-size countries. The smaller countries, being more

Table 8. *Annual Growth Rate of GDP by Subgroups, 1950–83*
(percent)

	Large		*Small*		*All*
Country group	*Countries (number)*	*Growth rate*	*Countries (number)*	*Growth rate*	*Growth rate*
All		5.02		4.54	4.67
Primary		5.00		4.24	4.42
Inward	10	4.94	27	3.58	
Outward	5	5.12	23	5.01	
Manufacturing		5.04		5.11	5.09
Inward	6	4.73	17	4.74	
Outward	8	5.26	10	5.73	
Inward					4.28
Outward					5.22

Note: Growth rates within countries are ordinary least-squares estimates. The number of annual observations varies from 14 to 34 (see appendix table A-1).
Source: Calculations based on data from the World Bank.

specialized, were more subject to the commodity lottery. Within larger economies there is an internal averaging that masks the extremes of performance among separate regions, whereas the variance of growth performance has been higher among small countries.

The average rates of total factor productivity growth shown in table 9 were derived from a simple growth accounting framework in which increases in factor productivity are calculated as a residual. The estimates in the table are based on crude assumptions and data, but the differences for groups of countries are striking and proved to be quite robust under alternative assumptions.

Although tables 8 and 9 do not refer to identical periods, they suggest that differences in growth rates are related to differences in productivity growth and not just to differences in the growth rates of inputs. On average, productivity growth was positively associated with larger size, with trade specialization in manufacturing, and with an outward orientation.

These results are suggestive of interrelations between growth and structure, even if they do not point to the mechanisms involved or to the direction of causality. The results indicate some dimensions that have to be considered in any comparative assessment of performance.

IV. Time-Series Patterns

Empirical research on the characteristics of modern economic growth originally assumed that cross-country comparisons of less developed countries would be adequate substitutes for relations within countries over time. This now seems unrealistic. Cross-section analysis does not take into account technological innovations and changes in consumer tastes (Kuznets 1966, 1971), varying policies, other dynamic effects, and changes in the international environment. Thus attention has turned to the determination of average patterns over time, and to an exploration of the relation between time-series and cross-section patterns.

Average Time Series

To analyze the time-series experience within countries and still take advantage of the degrees of freedom afforded by the large cross-country sample, the individual time series can be pooled in a covariance framework to obtain average time-series patterns. Specifically, we let each country have its own intercept by using country dummy variables (using equation 2: $x = \alpha_i + \beta_1 \ln y + \beta_2 (\ln y)^2 + \Sigma \delta_i T_i$). This amounts to considering only the within-country variation over time, letting the different intercepts represent the longer-run variation among countries (due to endowments and history). The estimated income slopes are weighted averages of the within-country slopes, with weights related to the time variance of income in the different countries.

We used information on current and constant price shares to estimate average time-series relations for the structures of demand and production. There are

Table 9. *Estimate of Productivity Growth by Subgroup, 1960–70 and 1970–82*
(percent)

	Large		*Small*		*All*	
Country group	*1960–70*	*1970–82*	*1960–70*	*1970–82*	*1960–70*	*1970–82*
All	2.5	0.9	1.5	0.1		
Primary					1.5	0.2
Inward	2.0	1.3	0.8	0.1		
Outward	2.8	−0.6	1.8	−0.1		
Manufacturing					2.4	0.5
Inward	2.3	1.0	2.2	−0.1		
Outward	3.0	1.1	2.0	0.7		
Inward					1.6	0.3
Outward					2.2	0.2

Note: Productivity growth was calculated as the residual, λ, using the following growth accounting equation: G_y = MPK · (I/Y) + $E_L G_L$ + λ, where G_y = growth rate of GDP, MPK = marginal product of capital, I/Y = share of net investment in GDP, E_L = elasticity of output with respect to labor, G_L = growth rate of labor, λ = residual or growth of total factor productivity. We assumed MPK to be 0.12, and that the labor elasticity of output and the rate of depreciation vary systematically with income at the following rates:

Country group	E_L	*Depreciation rate*
Lower-income	0.52	0.08
Lower-middle-income	0.55	0.10
Upper-middle-income	0.60	0.10
Industrial	0.64	0.12

Source: Calculations based on data from the World Bank.

two sources of variation in relative prices in our sample: the variance across countries at a point in time, and the variance over time within a country. In the time-series analysis, in which only the within-country information is considered, the former type of variation is eliminated. The second source of variation is analyzed here.

We also accounted for the changes in relative prices within countries over time for demand and production. In the case of cross-country patterns, the effect of such price variation was minimal and was therefore not shown. We measure the average change in price structures during the period for the pooled sample, letting each country have its own intercept and adding a time dummy for $t \geq 1983$ (T_3):

$$\ln p = a_i + bt + d\,T_3 \tag{3}$$

where p stands for the price of a demand or production variable relative to GDP and p equals 1 for 1970. The estimated annual rate of change is given by b, whereas d stands for a one-time jump in the relative price associated with the oil price shock. The estimates of b and d in table 10 are averages of sometimes quite disparate experiences, but they are of help in the following discussion.

Average time-series estimates of equation 2 for current and constant price

Table 10. *Average Variation in Relative Prices*
(percent)

Relative price	*Annual rate of change*	*Shift after 1973*
Demand		
Private consumption	−0.06 (1.6)	−1.6 (2.5)
Government consumption	0.88 (14.3)	−6.8 (6.9)
Investment	0.04 (0.6)	3.1 (2.8)
Exports	−0.95 (9.8)	18.3 (12.0)
Imports	−0.52 (5.4)	12.6 (8.3)
Production (value-added)		
Agriculture	−0.63 (6.4)	4.9 (3.8)
Mining	0.59 (2.9)	5.4 (2.0)
Manufacturing	−0.48 (4.7)	−3.8 (2.8)
Construction	0.92 (8.8)	−4.0 (2.9)
Utilities	−0.63 (5.7)	−11.7 (8.1)
Services	0.24 (3.2)	−3.9 (4.0)

Note: *t*-statistics are in parentheses.
Source: Calculations based on data from the World Bank.

shares appear in table 11, where they are compared with the cross-country patterns. The results are presented in the form of expected total change in structure over the income range $1,000 to $2,000. This range corresponds roughly to the one traversed by the average middle-income country between the late 1950s and the late 1970s. We observe a high degree of similarity in the total change in final demand predicted from cross-country regressions and from the average time-series in current prices. The direct income effect implied by the short-run (time-series) patterns is larger than the one suggested by the cross-section; this is largely offset by the smaller time trends in the time series in current prices. The larger income effects in the time-series patterns appear in the cross-country regressions as time shifts. The interpretation of such shifts as reflecting changes in exogenous processes such as technology has to be broadened to admit also divergences between the short-run transformation reflected in the time series and the one implied by the accumulated experience of different countries at various levels of income.

The constant price regressions indicate that the increase in government consumption in the time series at current prices is predominantly a price effect. The trend in export prices during the earlier period was negative, but the events of 1973 drastically changed the picture. The income-related increase in export shares is composed of a significant real increase and a price effect. Because imports went up faster in current prices, the implications for the current account were negative.

The total change in commodities trade is generally more pronounced in the average time series than in the cross-country patterns. As in the case of demand, the greater income effects in the time-series show up as time trends in the cross-sectional regressions.

The period after 1950, and in particular after 1960, saw a remarkable

Table 11. *Predicted Changes in Economic Structure Associated with Income and Time: Comparison of Cross-Country and Time-Series Patterns*

Component of economic structure	Cross-country regressions			Time-series regressions					
				Current prices			Constant prices		
	Income effect	Time trend	Total change	Income effect	Time trend	Total change	Income effect	Time trend	Total change
Demand									
Private consumption	−3.3	−2.7	−6.0	−7.8	−1.4	−9.2	−2.5	−2.6	−5.1
Government consumption	0.7	2.5	3.2	−1.6	3.2	1.6	−3.4	3.7	0.3
Investment	1.7	3.4	5.1	6.9	0.9	7.8	8.0	0.3	8.3
Exports	1.9	4.3	6.2	7.7	0.5	8.2	4.9	0.7	5.6
Imports	1.0	7.4	8.4	5.2	3.2	8.4	7.0	2.1	9.1
Food consumption	−5.2	−0.8	−6.0	−8.4	1.2	−7.2	−10.4	1.0	−9.4
Trade									
Merchandise exports									
Fuels, minerals, and metals	−0.1	2.3	2.2	4.4	0.4	4.8	—	—	—
Other	−1.0	−0.1	−1.1	−1.6	−0.2	−1.8	—	—	—
Manufactures	2.4	1.8	4.2	4.3	0.4	4.7	—	—	—
Primary imports	0.4	1.9	2.3	−0.7	−0.2	−0.9	—	—	—
Manufactured imports	0.7	3.9	4.6	5.7	0.8	6.5	—	—	—
Production (value-added)									
Agriculture	−7.3	−1.5	−8.8	−5.2	−3.0	−8.2	−5.2	−3.4	−8.6
Mining	−0.2	1.8	1.6	1.8	1.2	3.0	0.1	0.1	0.2
Manufacturing	2.9	−0.7	2.2	2.0	0.7	2.7	4.5	0.5	5.0
Construction	0.6	0.2	0.8	1.4	−0.2	1.2	0.9	0.0	0.9
Utilities	0.7	−0.2	0.5	−0.2	0.3	0.1	0.7	1.3	2.0
Services	3.4	0.3	3.7	0.2	1.0	1.2	−1.0	1.5	0.5
Labor force									
Agriculture	−13.6	−1.8	−15.4	−5.8	−4.8	−10.6	—	—	—
Industry	6.4	−0.7	5.7	2.9	1.0	3.9	—	—	—
Services	7.2	2.5	9.7	2.9	3.8	6.7	—	—	—

—Not available.

Note: Income effect computed for per capita income levels from $1,000–$2,000. Time trend measured by the coefficients for time dummy variables for years after 1966 and 1972.

Source: Calculations based on data from the World Bank.

increase in world trade. Among the advanced countries the rapid increase of trade took the form of exchange of manufactures based on an increased intra-industry specialization, as reflected in the time trend growth for manufactures. The decline in prices of primary products other than oil also emerges in the time-series data.

The main differences between the short-run (time-series) and the long-run (cross-country) estimates of total change in sectoral production at current prices are the greater increase of the mining share and the much smaller increase in services in the time series. In the constant price estimates mining shows no significant increase, but the income effect for manufacturing is quite large, indicating a significant decrease in its relative price.

Income effects and total change in employment are lower in the time series than in the cross-country estimate. The transformation in the sectoral composition of employment in the last three decades fell significantly short of that predicted from the long-run patterns. The relatively low labor absorption in the industrial sector has been shown to be related to the nature of technological progress and to distortions in product and factor markets (see, for example, Little, Scitovsky, and Scott 1970, and Krueger 1983).

Individual Time Series

Have the average time series effects been representative of the individual experiences? To explore this question, we estimated simple regressions for the structures of output and employment in about one hundred countries. The equation estimated was:

$$x = a + b \ln y \tag{4}$$

where x stands for a share in GDP or employment and y for per capita income. The estimates of b are measures of structural change with respect to income per capita, giving the expected change in x over a thirty-year period during which y grows at an annual rate of 3.4 percent. Given the growth rate of 2.4 percent (the average for the whole period), to calculate the expected change in x, b has to be multiplied by $\ln 1.024^{30} = 0.71$. Table 12 shows the means and distribution of the estimated parameters for the individual countries and table 13 for countries grouped by level of development.

The most striking result is the almost universal inverse association of income and the share of agriculture in income and employment. Of the ninety-two countries for which adequate time series were available, the income coefficients for the share in value added at current prices come out positive in only seven cases. In three of them (Liberia, Nicaragua, and Zambia), statistically the estimated coefficient did not differ significantly from zero. In another three (Niger, Senegal, and Somalia), per capita income fell during the period; hence the positive coefficient signifies that the share of agriculture diminished in spite of the decline in income. The seventh, Burma, is the only true exception to this general phenomenon.

Table 12. *Estimated Time-Series Relations between Economic Structure and Income: Averages and Distribution*

Component of economic structure	Coefficient of income variable (b)					
		Number of countries for which:				
	Mean	$b < -0.1$	$-0.1 < b < 0$	$0 < b < 0.1$	$b > 0.1$	Total[a]
Production (value-added)						
Current prices						
Agriculture	−0.16 (.21)	57	28	3	4	92
Manufacture	0.02 (.09)	10	20	47	15	92
Services	0.06 (.14)	9	21	28	34	92
Constant prices						
Agriculture	−0.13 (.17)	40	31	4	3	78
Manufacturing	0.05 (.08)	3	12	47	16	78
Services	0.04 (.13)	6	23	27	22	78
Employment						
Agriculture	−0.17 (.15)	74	16	4	4	98
Industry	0.05 (.09)	4	18	53	23	98
Services	0.12 (.11)	3	6	34	55	98

Note: Numbers in parentheses are standard deviations of the estimates.
a. Total number of countries.
Source: Calculations based on data from the World Bank.

Table 13. *Estimated Average Time-Series Relations between Economic Structure and Income, by Income Group*

Component of economic structure	Coefficient of income variable (b)			
	Low-income	Lower-middle-income	Upper-middle-income	Industrial market economies
Production (value-added)				
Current prices	(27)	(28)	(19)	(18)
Agriculture	−0.24	−0.17	−0.12	−0.09
Number with b > 0	3	4	0	0
Manufacturing	0.06	0.05	0.03	−0.05
Number with b < 0	5	5	6	13
Constant prices	(18)	(28)	(16)	(16)
Agriculture	−0.19	−0.14	−0.11	−0.05
Number with b > 0	2	4	0	1
Manufacturing	0.07	0.04	0.06	−0.03
Number with b < 0	3	4	1	6
Employment	(28)	(31)	(20)	(19)
Agriculture	−0.10	−0.20	−0.22	−0.18
Number with b > 0	6	2	0	0
Industry	0.05	0.07	0.08	0.01
Number with b < 0	5	4	2	9

Note: Number in parentheses is number of observations for each group.
Source: Calculations based on data from the World Bank.

The average income slopes of the share of manufacturing at current prices is positive in developing countries but diminishes with the level of income. There are many more exceptions in this case than was true with agriculture. In almost one-third of the cases recorded, the estimated slope is negative. It is instructive to identify the main cases with negative income elasticities. Among the very-low-income countries we find some with negative growth (Niger, Somalia). In oil-exporting countries (Algeria, Congo, Egypt, Iraq, Iran, Libya, and Saudi Arabia), the decline in industry is the result of the oil boom—Dutch disease. In a third group the manufacturing share fell, but from extremely high values (Hungary, Israel, Yugoslavia). Finally, in virtually every industrial country there was evidence of deindustrialization. Negative slopes were estimated in thirteen of the eighteen countries defined as industrial for which the required data was available. For the sixty-two countries with positive coefficients, the average slope was 0.08.

The decline in the share of employment in agriculture follows the decline in value added but with a lag. It is interesting to note the steep slope of agriculture employment with respect to income in industrial countries.

Comparing the results for value added in current and constant prices we find that, in almost every case, the prices of agriculture and manufacturing relative to the price of total GDP declined in the period. At constant prices, the decline in agriculture's share was smaller and the increase in manufacturing larger than was true of the current price shares. Offsetting these changes in relative prices were the relative increases in the prices of mining and nontradables. A significant part of the shift in industrial countries from tradables to services was therefore a price effect. These results suggest that the association of growth with a reallocation of economic activity away from agriculture is among the most robust of the stylized facts of development.

Our figures show that only between a third and a half of the decline in agriculture's share was taken up by industry (which includes mining, construction, and public utilities). Has this pattern been different from the experience of the industrial countries? Information on the sectoral composition of employment in sixteen industrial countries for 1870 and 1950 produces average income slopes between the two dates of −0.27 for agriculture and 0.09 for industry (Maddison 1980). This suggests that the average response of industrial employment to income for middle-income countries has remained remarkably stable over time. The response of industrial employment may have declined somewhat, again reflecting recent deindustrialization in the wealthier economies.

V. Conclusions

In this article we examined a set of development patterns focusing on resource allocation or industrialization. The results confirmed the strong association of economic structure with the level of income. Instead of a dichotomy between less developed and industrial countries, each group with its own dis-

tinctive structure, we find that the changes in structure that accompany economic growth are a transition from a low-income agrarian economy to an industrial urban economy with substantially higher income. The transition may not be smooth and it may follow a variety of alternative paths, but the overall process of structural transformation has enough common elements to justify its representation by a set of stylized facts.

Development patterns are not invariant over time. Technological changes and other exogenous factors influence the patterns of structural change, especially at the micro level. Nevertheless, the main features of transformation, identified by Kuznets as the core of modern economic growth on the basis of long-term experience in advanced countries, can clearly be identified in the shorter time series of a large number of developing countries.

One limitation of the approach we used here is worth emphasizing again. Development patterns represent the expected changes in structure as a country develops. They are of little help in analyzing stagnation in countries with very low income levels, although in such countries the patterns may still be useful in charting possible routes of transformation.

In the early stages of modern economic growth, there was a distinct acceleration in the pace of growth. It was very significant in historical perspective, but it pales in comparison to the acceleration of growth in the postwar period in most regions and groups of countries. Since the association of structure and growth in this period resembles the historical pattern, the implication is that structural transformation has also been much more pronounced than in any previous period.

The typology of trade patterns used in previous studies was expanded here. In addition to size and trade orientation, the share of exports in GDP was used to represent the degree of openness in an economy. The results suggest that faster growth was associated with greater size, with a manufacturing orientation and with larger share of exports in income. This typology may help to explain divergences from a uniform path of transformation and may be useful as a frame of reference for country analysis.

Finally, the longer time-series data analyzed here show that long-term patterns are quite robust. The instability of the 1970s affected some of the results, increased the variability of experiences, and reinforced the view that there are significant common elements in the process of industrialization.

Appendix Table A-1. *Classification of Economies in the Study*

Classification	Years[a]	Population in 1965 (millions)	GNP per capita (1980 U.S. dollars)	Average annual growth of GNP per capita (percent)
LARGE				
Primary, inward				
Argentina	26	22.3	1,980	1.2
Brazil	24	34.3	2,000	4.4
Burma	34	24.3	175	1.9
Colombia	34	18.5	1,280	2.3
Ethiopia	26	22.6	130	1.4
Mexico	34	43.5	2,615	3.2
Philippines	34	31.8	730	2.6
Thailand	34	31.2	705	3.6
Turkey	34	31.2	1,310	3.1
United States	34	194.3	11,560	1.9
Primary, outward				
Canada	34	19.7	10,250	2.7
Indonesia	28	104.8	475	3.3
Iran	26	24.1	2,270	5.7
Nigeria	31	58.5	990	2.2
Zaire	34	19.5	205	−0.1
Manufacturing, inward				
Bangladesh	24	60.5	130	0.4
China	25	746.8	290	4.6
France	34	48.8	12,215	3.7
India	34	487.3	235	1.5
Pakistan	24	52.4	310	2.8
Spain	33	32.1	5,615	4.2
Manufacturing, outward				
Egypt	34	29.4	580	3.1
Germany	34	58.6	13,330	4.0
Italy	34	52.0	7,060	4.0
Japan	34	98.9	8,905	6.4
Korea	34	28.7	1,605	4.9
South Africa	34	19.5	2,665	2.3
United Kingdom	34	54.4	9,360	2.0
Yugoslavia	26	19.4	3,045	4.7
SMALL				
Primary, inward				
Afghanistan	23	11.1	224	0.2
Australia	34	11.4	10,060	2.3
Bolivia	25	3.8	760	1.1
Burundi	24	3.1	240	2.5
Central African Republic	24	1.7	350	0.2
Chad	23	3.3	115	−2.8
Chile	26	8.5	2,400	0.8
Costa Rica	24	1.5	2,050	2.5
Denmark	34	4.8	12,615	2.9
Dominican Republic	34	3.7	1,160	2.6
Ghana	34	7.8	375	−0.8
Guatemala	34	4.6	1,080	2.0
Haiti	25	4.0	275	0.5

Classification	Years[a]	Population in 1965 (millions)	GNP per capita (1980 U.S. dollars)	Average annual growth of GNP per capita (percent)
Madagascar	26	6.1	365	−0.7
Mali	34	4.6	200	0.9
Mozambique	31	7.3	325	−0.3
Nepal	26	10.3	135	0.3
New Zealand	34	2.6	7,290	1.6
Nicaragua	34	1.6	785	1.2
Paraguay	34	2.0	1,360	2.3
Peru	34	11.2	1,120	1.6
Rwanda	26	3.3	225	0.9
Senegal	24	3.9	500	−0.3
Somalia	24	2.8	275	−0.6
Sudan	30	12.4	370	0.6
Syria	26	5.3	1,510	3.3
Uruguay	34	2.7	3,450	1.0
Yemen	14	4.7	440	4.6
Primary, outward				
Algeria	34	11.9	2,110	2.3
Cameroon	26	5.8	740	2.0
Congo	24	1.1	990	2.8
Côte d'Ivoire	24	4.2	1,210	1.8
Ecuador	34	5.1	1,475	3.4
Guinea	24	4.1	300	1.3
Honduras	34	2.3	635	0.9
Iraq	29	8.0	3,045	4.3
Liberia	24	1.1	520	0.7
Libya	24	1.6	10,900	3.4
Malawi	30	3.9	200	2.2
Malaysia	29	9.5	1,656	4.0
Mauritania	24	1.1	435	1.8
Niger	24	3.5	325	−1.5
Papua New Guinea	24	2.1	815	1.9
Saudi Arabia	21	4.8	12,640	6.6
Sierra Leone	20	2.3	350	0.8
Sri Lanka	34	11.1	270	2.0
Togo	24	1.7	430	2.1
Uganda	34	8.4	235	−0.5
Venezuela	34	9.2	3,830	2.3
Zambia	34	3.6	620	2.0
Zimbabwe	24	4.3	760	1.4
Manufacturing, inward				
Angola	31	5.3	830	−1.3
Austria	34	7.3	10,105	4.3
Benin	25	2.3	335	0.7
Burkina Faso	25	4.6	220	1.1
El Salvador	34	3.0	735	1.1
Finland	34	4.6	10,260	3.7
Greece	34	8.6	4,300	5.3
Israel	34	2.6	4,750	4.3

(Table continues on the following page.)

Appendix Table A-1 *Continued*

Classification	Years[a]	Population in 1965 (millions)	GNP per capita (1980 U.S. dollars)	Average annual growth of GNP per capita (percent)
Jamaica	34	1.7	1,100	2.1
Jordan	14	2.0	1,140	6.5
Morocco	34	13.3	950	1.4
Norway	34	3.7	13,570	3.2
Panama	34	1.3	1,860	3.6
Portugal	34	9.2	2,465	4.6
Sweden	34	7.7	14,740	2.7
Tanzania	26	11.6	265	1.9
Tunisia	23	4.6	1,370	4.5
Manufacturing, outward				
Belgium	34	9.4	12,005	3.3
Hong Kong	26	3.6	5,470	7.5
Hungary	24	10.2	2,035	5.9
Ireland	34	2.9	5,095	2.8
Kenya	34	9.5	415	2.1
Lebanon	25	2.2	1,840	1.1
Netherlands	34	12.4	11,910	3.0
Puerto Rico	34	2.6	3,385	3.6
Singapore	24	1.9	4,510	7.1
Switzerland	34	5.9	16,620	2.3
Taiwan	34	12.4	2,270	5.6

a. Number of annual observations on income per capita.
Source: Calculations based on data from the World Bank.

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