

# Identifying the Effects of Structural Change

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## **A conceptual point of view**

It would be folly to analyze the economy from a static framework. The understanding of change is the essence of proper appreciation of what is going on in the economy, whether on a national, subnational, or supra-national perspective. But oftentimes economic analysts invoke aspects of change as a convenient cover-up for the proper understanding that would come with deeper analysis. My own bias would be to argue that there is more persistence and less change in the basic structure of the economic system than is commonly believed. I do not think that we should, when confronted with difficult questions, simply throw up our hands and exclaim that things are changing too much for the satisfactory application of usual economic reasoning.

A view of an economic system, which reflects my own biases, is that of a large equation system that has its own laws of dynamics. Sources of change in this system are from:

1. changes in values of external (or exogenous) variables
2. changes in legal rules or institutional practices
- 3.** changes in random disturbances
4. changes in technology
5. changes in parameters of economic behavior

Outcomes and performance characteristics surely change, but our analytical capabilities will be greatly affected by our assignment of sources of change to one of these five items. If the basic parameters in (5) remain stable, and if technical progress in (4) takes place smoothly, we may be able to go far in economic analysis with time-honored methods and systems of thought and without assuming that

things have changed so much that quite different approaches and perspectives must be used.

It is my feeling, as in applied econometrician, that structure remains relatively steady through time and that the main changes, under (1)-(3), can be isolated, within the concept of a system with stable patterns for assigning degrees of importance to particular sources of change.

There is a great deal of evidence that many fundamental economic patterns of saving behavior, spending behavior, price formation, and others can be formulated in sufficiently general terms to have survived upheaval of world wars, political revolutions, and many natural disasters. Engel's Law, for example, looks as sound today as it did when first discovered more than 100 years ago, and it can be used in a system with stable structure for useful economic analysis. All such stable relationships are not so general, simple, and elegant as Engel's Law, but there is much to rely upon from our inventory of statistical economics for the analysis of economic change.

## **The Problem**

Some major economic difficulties have led economists to assert that structural change has occurred. The macroeconomic events of the 1970s are considered to be evidence for structural change, after more than two decades of strong growth in a stable environment — a period that may well be considered, retrospectively, to have been a golden era of advancement. The 1970s were mainly a period of stagflation and culminated in a crisis of world proportions in 1982-83 — the LDC financial crisis. Perhaps we are still in this crisis situation, and in trying to find a stable recovery path, we encounter structural change. This is a statement of the problem.

In the period after 1976, we brought down unemployment (the "stag" part), only to find prices rising rapidly (the "flation" part). Price rises are now checked, considerably, but unemployment is very high. In addition, in the process of combatting inflation, interest rates were driven so high that heavy debt burdens were placed on developing countries that had borrowed large sums for growth programs.

In the world recession that ensued after the drive against inflation, some traditional industries were especially depressed — steel, autos, farm equipment, shipbuilding — and new service-oriented sectors are areas of expansion. This industrial shift is part of the problem of a structural change.

Other aspects of the problem of structural change are the persistence of large public deficits and wide swings in international currency values. The change in terms-of-trade between energy-exporting and energy-importing areas of the world is also an important aspect of structural change. I would, personally, rate its importance very high, but many economists regard it as a change that can be dealt with adequately by normal market forces.

An alternative interpretation of the last 15 to 20 years of economic history, which does not rely heavily on the concept of structural change, proceeds as follows: The failure to finance the Vietnam War generated significant inflationary pressures in the United States. The war was so costly in external spending that it also flooded the world with dollars. U.S. deficits in the face of German and Japanese surpluses led to a breakdown of the Bretton Woods system of fixed parities, to dollar depreciation, and to further worsening of inflationary pressures. Unusual combinations of food and fuel shocks produced widespread inflation in the United States and many other industrial nations. By adopting orthodox restrictive economic policies to combat inflationary pressures, large industrial countries generated recessions and high unemployment. In the beginning of the 1970s, unemployment resulted from the food and fuel price rises, but later, in the recession of 1981-83, unemployment was used in true Phillips-curve fashion to bring down wage increases and inflation.<sup>1</sup>

The unemployment rise was exacerbated in the United States during the second half of the 1970s by a rapid expansion in labor force growth, caused by the coming of working age of the baby-boom generation and an increasing desire to work on the part of women. In the early 1980s, labor force growth has slowed in the United States but remains high in Europe, where birth rates were high in the 1960s. These labor force developments are significantly affecting present unemployment rates and their expected future movements, but they are more in the nature of cyclical swings than structural changes. These cyclical swings also had impacts on the Phillips curve, temporarily obscuring its most simplistic manifestations, but they were not structural shifts, merely cyclical aberrations that can be accounted for in multivariate extensions of the underlying behavioral pattern.

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1. Many economists had prematurely discounted the very existence of the Phillips curve, but I believe that it is an example of structural stability that the Phillips curve persisted through a great deal of economic turbulence.

The run-up in oil prices, which contributed markedly to inflation after 1973, also led to the cumulation of extraordinary exchange reserves by OPEC nations, which did not want to bear the risk of investing all the funds, and so deposited them in the world's commercial banking system, where they were then to be invested at the bankers' risks. They were promptly, perhaps even hastily, loaned, in large measure, to a few developing countries, which then proceeded with their development programs. Many of these loans were at variable rates, and when rates escalated, many of the borrowers could not pay interest or cover amortization. The associated recession and weak oil prices made the problem unbearable for some borrowers. This explanation of the present financial crisis is straightforward and does not rely on appeal to structural change, but it does alter the "initial conditions" for the recovery process.

The change in terms of trade between the oil exporting and oil importing countries did have another effect on industrial performance. It forced many countries, especially the United States, to become more energy-efficient. In the process of making this adjustment — through insulation, down-sizing of cars, improvement of motor efficiency, reducing of speed limits, lowering of thermostats — the economy slowed and productivity deteriorated. This effort seems to have taken a decade or so in the United States. In the process, it slowed the overall economy and lowered productivity growth. The main thrust of the adjustment is completed, and the present recovery shows signs of bringing about a revival of productivity growth.

Investment, in total or as a fraction of GNP, did not fall during the adjustment period but spent its effort to a large extent in dealing with energy and environmental issues; therefore, it did not contribute much to productivity growth. At the present time, however, fresh investment should do more to enhance productivity and less to adapt to the energy situation.

The legal and institutional restraints in the economy have been changed in such a way that they are having a noticeable impact on the functioning of the economy. Tax laws have undergone three fundamental types of change:

- Capital gains rates have been lowered.
- The overall rate structure is lower.
- Capital accounting for tax purposes has been liberalized.

These legal changes have consequences for current and prospec-

tive performance. The lowering of capital gains rates has stimulated venture capital expansion. This augurs well for investment in the new technologies. But the lower overall rate structure achieved by the successive tax cuts of 1981, 1982, and 1983 have so eroded the revenue base of the federal government that it is going to require several years of steady expansion to get back to balance. It used to be a property of the tax system that full employment policies consistent with a balanced budget could readily be found; now it is extremely difficult to find such a policy mix.

Provisions for accelerated depreciation have created the potential for accumulation of large funds by business for capital expansion. This is a major factor in counteracting any tendency of large federal deficits to crowd out private investment.

In another sector of the economy, legal change has had a large impact on aggregate performance — namely, in the financial sector through deregulation. **Deregulation** so obscured the definition of money, the stability of the money demand function, and understanding of the functioning of money markets that attempts at monetarist control caused large fluctuations in conventional monetary aggregates and interest rates. The large run-up in rates caused damage as indicated already.

This short survey brings us up to date on some of the major issues related to the concept of structural and other change that has been taking place in the economy. Changes have occurred, and the economy of the future is likely to be quite different from that of the past, but I believe that most of the major events associated with these changes are not truly structural changes; they are changes in input values (some exogenous variables), in the legal restraints, and in some cyclical factors.

### **Projections of some changes**

The consensus forecast for the United States and for the industrial democracies, in general, is for slower growth by about 1.0 percentage point, higher unemployment by about 3 percentage points, and more inflation by about 3 percentage points than in the decades of the 1950s and '60s. The reasons for this poorer performance may be thought to be a structural change.

When simulation experiments are performed with the Wharton Model of the United States to try to obtain a balanced growth path for the 1980s, it is found that attempts to break out of the pattern of

slower growth with more inflation tend to generate imbalances in the form of internal deficits, external deficits, or inflationary pressures. The balanced growth path is one in which equality is found between real growth and real interest rates, with the budget deficit gradually declining towards zero. This type of incompatibility between balanced growth and an attempt to reach old targets has been characteristic of our decade projections ever since 1970. At first, it was simply because of an evident physical need for expanded oil imports, with little price rise contemplated. After 1973, it was because of a combination of price rises and larger import volume of oil. Labor market pressures added to the difficulties. These latter changes were perceived to be a shifting multivariate Phillips curve that was based on demographic shifts.

TABLE 1

The World Series, History and Forecast  
(percentage change)

	1950-60	1960-70	1970-80	1981	1982	Forecast			
						1983	1984	1985	1986
GDP world total	4.9	5.3	4.3	1.7	0.9	1.9	3.3	3.0	2.3
OECD	4.1	5.3	3.5	1.5	-0.3	1.8	3.6	3.1	2.0
Developing	4.9	5.6	5.7	1.8	1.1	-0.2	2.9	2.4	2.1
Centrally planned	6.0	5.0	5.5	2.1	3.6	3.5	3.0	3.1	3.4
World trade volume	7.2	8.3	5.6	1.1	-1.0	1.9	4.9	4.5	3.5
Inflation OECD	2.9	4.6	8.2	12.2	10.0	8.7	8.2	8.4	8.3

TABLE 2

Ten-Year Average Growth, United States  
(percent per year)

	1951-61	1961-71	1971-81	Forecast
				1981-91
GNP	2.7	4.0	3.0	2.6
Productivity	1.8	2.1	0.6	1.0
Employment	0.9	1.9	2.4	1.6
Labor force	1.3	1.8	2.6	1.5
Population	1.8	1.2	1.0	1.0
Inflation (GNP deflator)	2.0	3.3	7.4	4.9
Wage rates (all industries)	4.3	5.9	7.9	6.2
Real wages	2.3	2.6	0.5	1.3
Real per capita income	0.9	2.8	1.9	1.6

In Table 2 the growth slowdown in the 1980s is clearly discernible. To some extent, the decade averages are sensitive to particular starting and ending points, depending on their cyclical standings; nevertheless, the high rates of growth during the 1960s stand out as clearly dominant over the performance of the 1970s and the forecast for the 1980s. A partial recovery of productivity, a slowing of labor force growth, and downturns in wages and prices are all evident in this table of trends.

The forecast with some more detail, year by year, is summarized in Table 3. Here we find the growth rate near 3.0 percent at the end of the projection period, with an inflation rate of about 4 percent. The long-term interest rate settles down to about 8.0 percent and the short-term rate at a figure just above 6.0 percent. This puts the real interest rate at about 2 to 4 percent, just about in line with the overall growth rate. The after-tax real rate, which might be more relevant, is even lower, closer to zero, which is not far from its value some 25 years ago.<sup>2</sup>

Shifts in OPEC pricing, demographic swings, tax changes, and banking deregulation are major factors in explaining what happened in the 1970s and what is expected for the 1980s. It is also important to note that the business cycle downturns contributed significantly to the restraint of medium-term averages, especially since recoveries were generally weak or mild. The present recovery is expected to be milder than the historical average of recoveries, and the projection for the rest of the decade contains an estimated cyclical correction at about 1986.

If we probe more deeply into the composition of the Wharton forecast for the decade of the 1980s, we can find some interesting patterns. First let us look at the macroeconomic structure of sources and uses of funds. An important problem to be considered in this connection is whether a normal *timing* pattern of business cycles can be expected to prevail. Will the presence of a very large federal deficit in 1983 and beyond, crowd out private investment, causing interest rates to rise again and the cyclical recovery to abort? Some cynics believe that a new business cycle pattern prevails and that the short succession of recessions of 1980-1981 will be repeated. This would, indeed, appear to be a structural change, but I believe that the analysis of such structural shifts in the cycle are ill-founded.

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2. John D. Paulus, "How High are Bond Rates?" *Economic Perspectives* (New York: Morgan Stanley, June 1983).

**TABLE 3**

**The Wharton Long-Term Model  
(June 1983 forecast, United States, Selected Indicators)**

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Gross National Product (Cur \$) .....	3058	3292	3634	4011	4255	4682	5063	5432	5675	6153	6598
% Change	4.1	7.7	10.4	10.4	6.1	10.0	8.1	7.3	4.5	8.4	7.2
Gross National Product (72 \$) .....	1476.7	1520.4	1600.4	1671.1	1685.0	1753.2	1808.6	1862.1	1873.2	1945.2	1999.8
% Change	- 1.7	3.0	5.3	4.4	.8	4.1	3.2	3.0	.6	3.8	2.8
Gross Nat. Prod. Deflator (1972 = 100.0) .....	207.1	216.5	227.1	240.0	252.5	267.1	279.9	291.7	302.9	316.3	329.9
% Change	5.9	4.6	4.9	5.7	5.2	5.7	4.8	4.2	3.8	4.4	4.3
Population (Millions) .....	232.90	235.57	238.21	240.74	243.22	245.62	247.94	250.19	252.33	254.44	256.50
% Change	1.1	1.1	1.1	1.1	1.0	1.0	.9	.9	.9	.8	.8
Labor Force (Millions) .....	110.25	112.67	114.74	116.85	118.18	119.97	121.54	123.27	124.62	126.21	127.77
% Change	1.5	2.2	1.8	1.8	1.1	1.5	1.3	1.4	1.1	1.3	1.2
Participation rate .....	63.8	64.4	64.7	65.2	65.2	65.5	65.7	66.0	66.1	66.3	66.5
% Change	- .1	.9	.6	.7	.0	.5	.3	.5	.2	.4	.3
Employment (Millions) .....	99.53	101.38	104.47	107.67	108.01	110.58	112.89	114.93	115.41	117.58	119.30
% Change	- .9	1.9	3.0	3.1	.3	2.4	2.1	1.8	.4	1.9	1.5
Wage rate per week, all industries ...	358.6	377.7	403.8	436.8	466.0	500.3	530.6	556.4	582.9	615.8	650.6
% Change	5.9	5.3	6.9	8.2	6.7	7.4	6.1	4.9	4.8	5.6	5.6
Productivity — all industries .....	14.836	14.996	15.320	15.520	15.600	15.855	16.020	16.202	16.231	16.544	16.764
% Change	- .9	1.1	2.2	1.3	.5	1.6	1.0	1.1	.2	1.9	1.3
Productivity — all manufacturing....	17.888	18.656	19.353	20.052	20.268	20.777	21.393	22.043	22.307	22.961	23.638
% Change	.5	4.3	3.7	3.6	1.1	2.5	3.0	3.0	1.2	2.9	3.0
Real per capita GNP (thou 72 \$) .....	6.340	6.454	6.719	6.941	6.928	7.138	7.294	7.443	7.423	7.645	7.797
% Change	- 2.8	1.8	4.1	3.3	- .2	3.0	2.2	2.0	- .3	3.0	2.0
Real per cap disp inc (thou 72 \$) .....	4.530	4.653	4.744	4.850	4.841	4.939	5.023	5.103	5.137	5.217	5.303
% Change	.0	2.7	2.0	2.2	- .2	2.0	1.7	1.6	.7	1.6	1.6

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Corporate profits before taxes .....	174.0	212.6	296.0	354.9	300.8	360.0	368.0	390.6	348.3	442.6	488.1
% Change	-25.0	22.2	39.3	19.9	-15.2	19.7	2.2	6.1	-10.8	27.1	10.3
Moody's corporate bond rate,											
avg (%) .....	14.94	12.00	10.08	9.89	9.63	9.90	9.59	9.19	8.59	8.14	7.94
Lrg time dep (negot CD's), avg (%) .	12.27	8.41	8.53	8.91	7.82	8.30	7.44	7.07	5.86	6.53	6.35
Money supply, M2 basis (current \$).	1878.0	2133.0	2331.5	2525.6	2711.3	2953.3	<b>3212.8</b>	3458.6	3640.4	3904.6	4198.4
% Change	9.4	13.6	9.3	8.3	7.4	8.9	8.8	7.7	5.3	7.3	7.5
Unemployment rate (%) .....	9.72	10.01	8.95	7.85	8.60	7.83	7.11	6.77	7.40	6.84	6.63
Savings rate (%) .....	6.60	7.13	6.20	5.89	5.34	5.23	5.15	5.14	5.41	5.11	5.14
Surplusordeficit, Federal (cur \$)....	-149.3	-192.0	-171.5	-147.6	-159.1	-126.0	-100.7	-99.0	-130.7	-92.2	-74.0
Surplus or def, state & loc (cur \$)....	32.4	50.2	60.3	71.2	66.3	73.6	<b>74.1</b>	80.6	73.7	83.6	75.1
Compen. to employees to											
nat. income .....	76.2	75.0	73.8	73.7	74.6	74.5	74.7	74.4	75.4	74.8	74.9
Profits to national income .....	6.6	8.5	10.9	11.9	10.2	10.7	10.2	10.2	8.9	9.9	10.0

**TABLE 4**  
**Sources and Uses of Gross Saving**

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>
Gross saving .....	414.6	458.4	537.5	623.0	612.6	727.3	808.3	882.0	875.6	1006.9	1093.2
Gross private saving .....	531.5	600.2	648.7	699.4	705.4	779.8	834.9	900.5	932.6	1015.5	1092.0
Personal saving .....	143.2	167.1	157.1	162.8	156.8	166.6	175.6	186.4	205.9	207.1	221.5
Undistributed corporate profits .....	36.6	63.0	100.6	119.6	83.6	106.0	108.3	118.6	88.5	123.9	134.5
Capital consumption allowances....	<b>351.7</b>	370.2	391.0	417.0	465.0	507.2	551.0	595.5	638.2	684.5	736.0
Governmentsurplusordeficit .....	-116.9	-141.9	-111.2	-76.4	-92.7	-52.4	-26.6	-18.4	-57.0	-8.6	1.1
Federal .....	-149.3	-192.0	-171.5	-147.6	-159.1	-126.0	-100.7	-99.0	-130.7	-92.2	-74.0
Stateandlocal .....	32.4	50.2	60.3	71.2	66.3	73.6	74.1	80.6	73.7	83.6	75.1
Gross investment .....	416.3	458.4	537.5	623.0	612.7	727.3	808.3	882.1	875.6	1006.9	1093.2
Gross private domestic											
investment .....	420.6	472.3	561.8	640.7	620.5	740.5	823.2	903.6	865.5	1011.8	1099.5
Net foreign investment .....	-4.3	-13.9	-24.3	-17.8	-7.8	-13.1	-14.9	-21.5	10.1	-4.9	-6.3
Less: statistical discrepancy .....	1.6	<b>.0</b>	<b>.0</b>	<b>.0</b>	<b>.0</b>	<b>.0</b>	<b>.0</b>	<b>.0</b>	<b>.0</b>	<b>.0</b>	<b>.0</b>

A main reason that the Wharton forecast shows a normal cyclical recovery, as far as timing is concerned, is that adequate sources of funds are expected to be available to finance the joint requirements of deficit spending and private investment without excessive upward pressure on interest rates. The sources and uses table shows how corporate retained earnings increase by large amounts in those periods when there is more concern about the size of the federal deficit, 1983-1985. The business cycle recovery of 1983 would, under ordinary circumstances, support large profit gains because of the greater amplitude of profits relative to wages over the course of the cycle. In addition, the present cyclical phase is associated with an unusual amount of wage moderation, brought about by the high unemployment rate. Right after the profit surge, there is an increase in capital consumption allowances, phased in beautifully to supply funds when retained profits are expected to recede. The surge of capital consumption allowances occurs at the right time because of the accelerated depreciation allowances that were approved in 1981, applied to an expansion in fixed capital during the business cycle recovery.

These developments in corporate funding are aided in the overall approach to avoiding crowding out by the fact that the Wharton forecast is considerably more bullish, and slightly more inflationary than official forecasts on which official deficit figures are based. Our estimates show a cresting of the deficit near \$200 billion and then a gradual fall below official numbers, except in the periods of cyclical slowdown in 1986 and 1990. For many months it has been a case of the federal government's forecasts being raised to be more in line with actual developments, but steadily lagging and creating undue budgetary fears.

By reversing fiscal and monetary policies, the budget could be reduced and the level of unemployment cut to about 6 percent by 1986, but the calculated deficit would not reach balance before the end of the decade. In any event, a structural change in fiscal parameters would be needed, together with a more expansive monetary policy.

The preceding analysis deals with macroeconomic issues. Next, let us look at **sectoral** composition of the projected expansion for the decade. This involves an analysis of industrial structure generated by the input-output module of the Wharton model. Growth rates of output, employment, and labor productivity are presented in historical perspective and in extrapolation.

Some highlights of the industrial structure are that manufacturing grew faster than the economy-wide average in the 1960s and is now expected to conform more to the average pattern. Communications and finance insurance and real estate (FIRE) were also relatively high growth sectors, historically, and are expected to be so in the future. Among services, medical services are projected at a comparatively high growth rate. It would have been unwise to have rated the coal sector's performance on the basis of its relative decline in the 1950s, for it is now rebounding at a rate above average.

Government, as measured by value-added, was not a relatively fast-growing sector, contrary to much popular opinion. In employment, the fast-growing part was in state and local governments, not the federal government. For the future, however, government growth is restrained in the forecast.

In the 1960s, lumber (for housing), steel, aluminum, electrical machinery, and automobiles expanded rapidly. In this group of durables, metals should recede relatively, while the others hold their own or gain in industry as a whole. In the nondurables group, rubber (for cars), textiles (synthetics), and chemicals all expanded rapidly during the 1960s. They are expected to slow down for the forecast period, but rubber may hold its relative position.

Except for coal mining, there should be a drop in growth rates below the average, for the future, and agriculture is also kept on a fairly slow path. The latter is probably deliberate, in order to maintain farm prices and incomes.

While manufacturing output should meet average growth performance of the whole economy, the same is not true for jobs. Consequently, there should be a rise in labor productivity in manufacturing, a good sign for inflation restraint, but it will require shifts in the work force through retraining, attrition, and natural attraction of the new growth sectors.

As far as productivity is concerned, we can expect to see both a cyclical and a secular gain. Agriculture, manufacturing, and communications look like sectors of improvement in work efficiency. Commercial services and government are not leaders in this projection. Productivity, on average, should improve, but much more could be expected, and this is the point at which economic policy should become more specific, more structural, and more finely targeted to achieve results in certain industry groups and certain demographic groups.

TABLE 5  
 Real Value-Added Output  
 (percentage change, 1972 dollars)

	1951 1961	1961 1971	1971 1981	1981 1991
All industries .....	2.7	4.0	3.0	2.6
Statistical discrepancy .....	-2.2	2.6		
Sum of real outputs.....	2.7	4.0	3.1	2.5
<b>Agric.</b> forestry and fisheries .....	1.1	1.2	1.9	2.2
Mining .....	1.1	3.1	1.9	.2
Metal mining .....	2.4	1.6	.1	-2.7
Coal mining.....	-3.5	2.6	3.6	4.0
Crude petroleum and natural gas..	2.3	3.4	1.8	-1.1
Mining of nonmetallic minerals...	3.3	3.4	1.3	1.3
Manufacturing .....	1.7	4.5	3.0	2.7
Durable goods .....	1.0	4.6	3.2	3.1
Nondurable goods .....	2.6	4.3	2.7	2.1
Transportation .....	-.1	3.5	1.8	2.1
Communications.....	6.2	8.0	7.4	6.3
Synfuels .....				
Utilities, private .....	6.9	5.9	2.4	1.6
Electric .....		6.4	2.9	2.5
Natural gas.....		4.7	.3	-1.2
Sanitary.....		7.1	6.1	1.4
Public & private electric .....		6.2	3.0	2.8
Commercial and other .....	3.8	4.1	3.5	2.5
Commercial.....	3.8	4.1	3.3	2.6
Contract construction.....	3.7	2.2	-1.1	1.7
Residential .....		5.0	-4.7	3.2
Nonresidential.....		-1.0	-.5	.6
Other.....		2.7	1.5	1.5
Finance, insurance, & real estate	4.9	4.2	4.1	3.0
Services.....	3.6	4.9	4.4	2.6
Nonmedical.....	3.2	3.4	4.1	2.5
Medical.....	4.9	5.9	5.1	2.9

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Wholesale and retail trade .....	3.0	4.6	3.0	2.3
Rest of world .....	4.3	5.4	10.3	.3
Government .....	2.2	3.3	1.5	1.6
General government .....	2.3	3.3	1.3	1.4
Federal enterprises .....	2.4	3.7	1.3	2.2
Other federal enterprises .....		3.4	1.1	2.0
State and local enterprises .....	.5	2.5	3.6	2.5
Other S&L enterprises .....		1.8	3.7	1.7
Dummy industries .....				
Imports of goods and services .....				
Inventory valuation adjustment ...				
Manufacturing .....	1.7	4.5	3.0	2.7
Durable goods.....	1.0	4.6	3.2	3.1
Lumber .....	-.2	6.3	2.9	3.1
Furniture .....	1.3	3.6	4.0	2.5
Stone, clay and glass .....	1.7	2.9	1.5	2.2
Cement.....		1.4	2.2	1.9
Stone, clay, & gl. excl. cement .		3.0	1.4	2.2
Primary metals .....	-2.6	2.4	-.2	1.3
Iron and steel .....		4.2	-3.3	2.1
Aluminum .....		14.3	.5	1.2
Other nonfer. metals .....		-1.5	5.3	.3
Fabricated metal products .....	2.0	3.9	2.2	2.4
Nonelectrical machinery .....	.0	4.5	5.4	3.5
Electrical machinery.....	5.6	7.2	5.5	2.6
Motor vehicles.....	-.9	8.1	1.5	4.4
Nonauto. trans. eq., & misc.				
manufacturing .....	4.9	2.5	2.3	3.9
Nonauto trans. equip.....	5.9	2.1	2.0	4.6
Aircraft .....		.3	1.0	4.7
Other trans. equip.....		5.7	3.3	4.5
Instruments .....	4.2	5.5	6.0	4.3
Miscellaneous manufacturing ...	2.2	3.7	3.1	1.7
Nondurable goods .....	2.6	4.3	2.7	2.1
Food and beverages.....	2.5	3.2	2.7	2.1
Tobacco .....	1.8	1.5	1.4	1.9
Textiles.....	.7	7.0	1.6	1.9

Apparel.....	1.1	2.7	3.3	2.2
Paper.....	2.2	4.3	2.5	1.8
Printing and publishing .....	3.1	3.4	2.4	1.9
Chemicals.....	5.6	6.9	4.0	2.4
Organic and inorganic .....		6.0	-1.9	1.4
Other .....		7.4	6.0	2.6
Petroleum .....	3.6	3.9	.1	1.2
Rubber.....	2.2	7.0	3.6	3.0
Leather .....	-.7	.3	-.3	1.8
Transportation .....	-.1	3.5	1.8	2.1
Local and highway passenger .....	-5.1	-2.8	-.7	1.5
Motor freight and warehousing ...	5.0	5.5	2.5	2.2
Railroads .....	-2.0	.6	-.9	1.9
Water .....	-2.6	1.2	2.8	.6
Air.....	10.5	11.2	3.2	2.8
Pipeline.....	4.4	6.6	2.5	.6
Transportation services .....	-1.5	1.0	3.5	2.2

TABLE 5A

Employment  
(Millions, percentage change)

	1951	1961	1971	1981
	1961	1971	1981	1991
All industries .....	.93	1.90	2.38	1.59
Farm.....	-2.540	-4.177	-.077	-.074
Mining .....	-3.187	-.980	6.395	-.016
Manufacturing .....	-.041	1.325	.803	.163
Durable goods .....	-.021	1.606	1.312	.507
Lumber .....	-3.420	.854	-.003	.271
Furniture .....	.287	2.398	.522	.316
Stone, clay and glass .....	-.086	1.028	-.101	-.619
Primary metals .....	-1.709	.627	-.435	-1.404
Fabricated metal products .....	.193	2.281	.734	.090
Nonelectrical machinery .....	-.264	2.496	3.282	1.029
Electrical machinery.....	2.815	1.912	1.835	.739
Motor vehicles .....	-2.862	3.132	-.789	.745
Nonauto trans. equip. & misc. manu. ....	1.999	-.159	1.382	.938
Miscellaneous manufacturing .....	-.707	.852	-.024	-2.073
Nonauto trans. equip.....	3.318	-.581	1.963	1.875
Instruments .....	1.938	1.677	3.918	1.625
Nondurable goods.....	-.066	.964	-.086	-.374

Food and beverages.....	-.268	-.053	-.530	-.626
Tobacco .....	-1.336	-1.657	-.977	-.098
Textiles.....	-3.207	.666	-1.479	-.693
Apparel.....	.068	1.008	-.760	-.738
Paper.....	1.637	1.266	.086	-.870
Printing and publishing .....	1.798	1.656	1.591	-.056
Chemicals.....	1.595	2.011	.917	.122
Petroleum .....	-1.350	-.388	1.051	-.704
Rubber.....	1.161	4.458	2.403	.542
Leather .....	-.589	-1.787	-2.466	-1.135
Regulated industries .....	-.790	1.379	1.426	.558
Transportation.....	-1.675	.692	1.037	.169
Utilities.....	.904	1.275	2.015	.575
Communications .....	.978	3.269	1.930	1.329
Synfuels .....				
Commercial and other .....	2.070	2.406	3.310	2.391
Commercial.....	2.112	3.518	3.453	2.405
Contract construction .....	.812	2.623	1.207	1.953
Finance, insur., real estate .....	3.230	3.446	3.461	2.397
Services.....	3.226	4.468	4.654	3.189
Wholesale and retail trade.....	1.528	3.078	2.960	1.745
Self-employed workers. nonag .....	.836	-1.676	2.910	2.063
Unpaid family workers. nonag.....	5.252	-2.002	-2.873	-1.959
Conceptual diff., hf vs. estab. ....	-6.351	10.554	3.654	.291
Government.....	3.009	4.130	2.207	1.177
Federal .....	-.100	1.694	.278	1.313
State and local.....	4.447	4.896	2.668	1.148

TABLE 5B

Real Output Per Person  
(Thou 1972 dollars/person, % change)

	1951	1961	1971	1981
	1961	1971	1981	1991
All Industries.....	1.8	2.1	.6	1.0
Farm .....	3.8	5.6	2.0	2.3
Mining.....	4.5	4.1	-4.2	.3
Manufacturing.....	1.7	3.1	2.2	2.6
Durable goods.....	1.0	3.0	1.9	2.6
Lumber .....	3.4	5.4	2.9	2.8
Furniture.....	1.0	1.2	3.4	2.2
Stone, clay and glass.....	1.8	1.9	1.6	2.8

Primary metals .....	-2.5	1.8	.2	2.7
Fabricated metal products .....	1.8	1.6	1.5	2.3
Nonelectrical machinery .....	.3	2.0	2.0	2.5
Electrical machinery .....	2.7	5.2	3.6	1.9
Motor vehicles .....	2.1	4.8	2.3	3.6
Nonauto trans. equip. & misc. manu.	2.9	2.7	.9	2.9
Instruments .....	2.2	3.6	2.0	2.6
Nondurable goods .....	2.7	3.3	2.6	2.5
Food and beverage .....	2.8	3.2	3.2	2.7
Tobacco.....	3.2	3.2	2.4	2.0
Textiles .....	4.0	6.3	3.1	2.6
Apparel .....	1.0	1.6	4.1	3.0
Paper .....	.5	3.0	2.4	2.7
Printing and publishing .....	1.3	1.7	.8	2.0
Chemicals .....	3.9	4.8	3.1	2.3
Petroleum.....	5.1	4.3	-.9	1.9
Rubber .....	1.0	2.4	1.1	2.5
Leather .....	-.1	2.2	2.3	3.0
Regulated industries .....	3.4	3.8	2.3	3.2
Transportation .....	1.6	2.4	.7	1.9
Communications .....	5.2	4.6	5.4	4.9
Utilities .....	5.9	4.9	.3	1.0
Commercial and other .....	1.7	1.6	.2	.1
Contract construction .....	2.8	-.4	-2.3	-.2
Finance, insurance & real estate.....	1.6	.8	.6	.6
Services.....	.4	-.4	-.3	-.6
Wholesale and retail trade.....	1.5	1.4	.1	.5
Government .....	-.8	-.5	-.7	.4

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From this analysis it can be seen that there have been structural changes in the industrial composition of output and employment in the American economy and that additional changes of a similar sort are projected for the coming decade, but it is important to note that these changes are generated from a statistical model in which parametric structural change is largely absent. There are many changes in exogenous variables and legal restraints. These, when combined with the dynamics of a system with stable parametric structure, are capable of generating an economy in which industrial composition undergoes a great change — great enough to induce people to invest their funds or supply their services quite differently than in the past.

The input-output configuration of the total model has stable parameters but not fixed ratios of inputs to outputs. These ratios vary accordingly as relative prices vary. High energy prices, changing prices of other basic materials, and wages guided by productivity growth single out certain sectors that are favorably situated for the coming decade within the context of the Wharton model. While the model is stable, as a mathematical-statistical system, it produces a picture of an economy in transition. The transition of the 1970s, to more efficient use of energy, is emerging in the 1980s into an economy that favors certain service and high technology sectors — communications, health care, machinery, and some chemicals.

### **Some international dimensions**

The composition of production has been and is undergoing change throughout the world on much the same basis as is taking place in the United States. The service sectors, high technology sectors, and energy sectors are receiving worldwide attention. These changes have major implications for the developing countries and also for the centrally planned countries, some of which are in a stage of pre- or early industrial development. The figures for world growth in Table 1 show some significant changes in store for the international composition of production.

Almost all sectors of the world economy are in a slow-down pattern in this transitional era. Not only are the industrial countries expected to grow more slowly than in the past, but the same is true of the other main aggregates, the developing and the centrally planned economies. These aggregates mask underlying variances, and there are exceptional cases, but for the most part, the whole world econ-

omy is slowing down. Moreover, there is a changed international composition of growth in prospect, in the form of relatively slower growth for the developing countries and very average growth for the socialist countries. The former will probably grow more slowly than the world average, while the latter will probably grow at about the world average. If the Peoples Republic of China were to be excluded from the calculation of the total for the centrally planned economies, we would find below-average growth performance. This is a very different experience for countries that formerly dominated the average growth statistics.

Consider the problem of the developing countries. They aspire to strong economic performance in order to deliver improving living conditions to their citizens, but they are now restrained by debt burdens and poor export markets. Those that are primarily producers of basic materials have fared poorly since 1973, except for the oil exporters, and even some of the major oil producers are in economic trouble for the duration of this projection. With modest growth being forecast for the industrial countries, it is unlikely that developing countries that are primary producers of materials can expect to have export markets large enough to finance the capital imports that are essential for growth improvement. Among the developing countries, however, are a group known as the "newly industrialized countries" (NIC's). Many of these countries are already gearing up for a thrust in microprocessing, health care delivery system, bio-engineering, and some new agricultural products. They may purchase or license some parts of the technology from major industrial countries, but many are well situated for making their own way in some **particular** niches for these growing industries.

The NIC's have a good chance to grow on a relatively fast track, and some in the Pacific Basin are already doing so, in both the new lines of activity and in more traditional lines such as textiles, apparel, conventional electronics, and plastics. But in order to be competitive in the future and to grow, they will have to try to develop the new technologies. Given their well-educated population, their dedication to productivity, and work ethic, there are good prospects for progress. In some respects, they are lined up more evenly in the competitive effort to gain a foothold in the new sectors than they were in the 1960s and 1970s, when they had to develop the traditional lines in which Japan and other industrial nations were beginning to mature. Now they have a better chance to compete in the world as a whole and

also to participate in the potential expansion of South-South trade, not to mention their home markets. The extent to which developing countries as a group can trade more among themselves, they will increase trade in raw materials and spread some of the grain from the NIC's to the primary producing nations too.