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Changes in Comparative Advantages and Paths of Structural Adjustment and Growth in Sweden, 1975-2000

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CHANGES IN COMPARATIVE ADVANTAGES AND PATHS OF STRUCTURAL ADJUSTMENT AND GROWTH IN SWEDEN, 1975–2000

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FOREWORD

Declining rates of national population growth, continuing differential levels of regional economic activity, and shifts in the migration patterns of people and jobs are characteristic empirical aspects of many developed countries. In some regions they have combined to bring about a relative (and in some cases absolute) population decline of highly urbanized areas; in others they have brought about rapid metropolitan growth. During the 1970s many industrialized countries have experienced slower economic growth and reduced productivity increases, combined with sustained relatively high rates of unemployment. There is a widespread belief that the causes of this development are external to the country, a rather natural assumption to make for small, open economies.

This report is part of a series focusing on the analysis of the impacts of various growth and adjustment consequences for urban areas in the small, open economy of Sweden and of external and internal changes in its comparative advantages. The report is a joint study of the Urban Change Task of the Human Settlements and Services Areas and the Economic Modeling Task of the System and Decision Sciences Area. It has been partially supported by a grant from the Industry Fund of the US National Academy of Sciences.

A list of related IIASA publications appears at the end of this report.

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SUMMARY

The purpose of this study is to identify possible future development paths for the Swedish economy in a context where world market conditions, domestic factor accumulation, and technical change are explicitly taken into account. The main analytical tool used in the study is a general equilibrium model of the Swedish economy. World market prices and trade flows as well as domestic factor accumulation and productivity change are exogenous to the model. The sectoral allocation of capital and labor as well as domestic consumption, foreign trade, and the domestic price system are endogenously determined variables.

The study's projections indicate that Sweden is entering a period of considerably slower economic growth than occurred during the earlier part of the postwar period. Underlying this result is an assumed slowdown of the productivity growth rate. The assumed rates of productivity change do not differ significantly between the sectors. Consequently, reallocation gains can be achieved mainly through a reduction of the intersectoral differences in the marginal productivity of capital, characterizing the initial year of the projection period.

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1 BACKGROUND AND AIM OF THE STUDY

The research presented in this report is inspired by the slowdown of economic growth and the emergence of new "problem" industries and regions in Sweden, as in many other industrialized countries, during the 1970s. Only to some extent do these problems seem to be of a short-term, business cycle nature. One of several long-term reasons might be a sustained gradual shift in the pattern of comparative advantages of industrialized countries. There may be many possible reasons behind such a shift. One is that developing countries are becoming increasingly competitive in several markets where industrialized countries previously dominated as suppliers. Other reasons are, for instance, differential

growth rates among countries, differential rates of factor accumulation, and differential technical changes among sectors. Changes in the internal functioning of the economy, however, may also have contributed to a bad aggregate performance.

In some, and perhaps most cases, the sources of comparative advantage changes in the long run tend to bring about increased productivity of the world economy as a whole. In the short run, however, changes in comparative advantages induce structural adjustment in national economies. If this adjustment is significant, the problems that arise might be, or at least might seem to be, larger than the potential long-term benefits of a complete adjustment to the new pattern of comparative advantages. Moreover, the individual country does not necessarily gain from the comparative advantage changes even in the long run.

The experiences of the Swedish economy in the 1970s are often interpreted as a partial or temporary loss in the ability to adjust rapidly to changing external conditions. Whether this is true or not, Swedish economic policy in the past few years has been largely redirected to ensure that the reallocation of capital and labor from stagnating to expanding industries does not lead to increased unemployment at national, regional, and sectoral levels. (See Ohlsson 1980a, for an analysis of Swedish industrial, labor market, and regional policies with respect to their possible resource allocation effects.)

Policies with such far-reaching aims easily lead to inefficient use of the economy's resources. If they are carried out on a large scale, conflicts are likely to emerge between goals related to economic growth and those related to regional and local employment. One way of reducing the significance of these problems is to create a system of "early warning signals." The rationale of such a system is that if changes in comparative advantages can be foreseen reasonably well, much of the necessary adjustment is taken care of by "normal" market forces and is carried out gradually over an extended time period. Moreover, in such a case there is a better chance that policies for structural change, compatible with various social goals, can be designed and implemented early enough to become efficient and thus reduce demand for protectionism.

Obviously it is not possible to foresee the future. But it is possible to design forecasting methods that are focused on important factors for the development of comparative advantages and that can provide insights into the long-term adjustment behavior of the economy. This is particularly important in economies, like Sweden, that have a large foreign trade dependence but a limited influence on world market conditions.

So far, however, long-term forecasting in Sweden has been focused on capital accumulation, labor supply, and productivity growth. Obviously such factors are very important determinants of economic development, especially if producers face a world market situation that can be characterized as a "seller's market," as was the case in the 1950s and 1960s.

In this paper we nevertheless switch the focus to the development of externally induced comparative advantage changes. This switch is partly motivated by the increasing degree of price competition on world markets, but is also made to find out how external and internal changes in Sweden's comparative advantages interrelate and affect the long-term performance of the economy with regard to a particular policy interest.

Consequently, the purpose of this study is to identify possible future changes in Sweden's comparative advantages and to analyze how these changes might affect the rate and pattern of full employment economic growth, particularly in terms of the sectoral and regional composition of employment. More specifically, we analyze how Sweden's

comparative advantages might be affected by specified development paths for world market prices and trade flows and what a complete and smooth adjustment to changing comparative advantages would mean in terms of changes in the sectoral and regional composition of production and employment. In addition, we analyze to what extent alternative scenarios for capital accumulation, labor supply, and productivity growth make significant differences to these dimensions. Apart from highlighting these substantive issues, we develop an approach to the long-term forecasting of comparative advantage changes in a small, open economy.

2 THE MODEL

The model used in the analysis is a computable general equilibrium model of a small, open economy. It belongs to the "family" of such models, which are fully described in Bergman and Pór (forthcoming). Since it is a pure equilibrium model, it does not explicitly incorporate various obstacles to structural change, reflecting the short-run rigidities in capital and labor markets. Thus the main output of the model analysis is a set of conditional estimates of the structural changes of the Swedish economy that would result from a complete adjustment to changes in comparative advantages over a period of 15–25 years.

The model does not have an explicit regional dimension. Thus the regional impact analysis has to be carried out by means of exogenous information concerning the regional distribution of the production units of sectors identified in the model.

In this section the basic structure of the model is briefly described, as are the modifications of the model made for this particular study. For brevity, however, some aspects of the model (for instance the treatment of indirect taxes and tariffs) are simply left out. The growth of the labor force as well as net capital formation for the economy as a whole are exogenous to the model. The same applies to technical change and world market conditions in terms of international prices and production of traded goods in the rest of the world. Thus for a given point in time, world market conditions and the domestic supply of capital and labor are given.

In the model, 23 production sectors and 20 groups of traded goods are identified. In each production sector, capital, labor, fuels, and electricity are substitutable factors of production, whereas the use of non-energy intermediate inputs is proportional to output. The technology exhibits constant returns to scale. The model determines endogenously a sectoral allocation of labor and capital, consistent with equilibrium on all commodity and factor markets at prices equal to marginal (and average) production costs. Accordingly, production, consumption, foreign trade, and price formation are endogenous to the model. By connecting solutions for different points in time, a development path for the economy can be generated.

The model describes an open economy that is "small" in the sense that it faces an elastic supply of imports at parametric prices and cannot influence the export prices of competing countries. In general, however, products with a given classification supplied by domestic producers are treated as imperfect substitutes for products with the same classification supplied by producers in other countries. This approach, which is due to Armington (1969), implies that users of products of a given classification, in the "home country"

and elsewhere, actually use a composite of imported and domestically produced goods of that particular classification. The function determining the composition of the composite good, following Armington, is assumed to be homothetic. Moreover, domestic users are all assumed to minimize the unit cost of each type of composite good.

The adoption of this so-called Armington assumption has several implications. One is that there will not be complete specialization in the trade-exposed part of the economy, even though the number of tradable goods exceeds the number of factors of production, and the technology exhibits constant returns to scale. Another is that there will be intra-industry trade. A third implication is that the "home" country will have some influence on its own export prices.

The model describes an economy with $n + 3$ production sectors producing $n + 3$ goods of which n are tradables. There is no joint production, and each good is produced in one sector only. The production sectors are numbered from 0 to $n + 2$, 0 being the electricity sector and 1 the fuels production sector. Since this study is not primarily concerned with energy issues, however, the fuels and electricity sectors are aggregated into one energy sector with index 1. Sector $n + 1$ is the housing sector and $n + 2$ the public sector. There is also a "bookkeeping" sector, $n + 3$, in which different goods are aggregated into one single capital good. Since the number of production sectors is 23 in this particular application, n is set to 21.

Assuming competitive conditions, the prices, P_j, of domestically produced goods are equal to their unit production costs. Thus

$$P_j = \kappa_j(P_1^D, \ldots, P_i^D, \ldots, P_n^D, W_j, R_j, t) \qquad j = 1, 2, \ldots, n + 2 \tag{1}$$

where $\kappa_j(\cdot)$ is the unit cost function, and P_i^D the price of composite good i, W_j the wage rate in sector j, R_j the user cost of capital in sector j, and t a time index. The heterogeneity of labor is roughly accounted for by an exogenous wage structure, i.e.,

$$W_j = \omega_j W \qquad j = 1, 2, \ldots, n + 2 \tag{2}$$

where W is a general wage index and ω_j are constants. The user cost of capital is defined by

$$R_j = P_{n+3}(\delta_j + R) \qquad j = 1, 2, \ldots, n + 2 \tag{3}$$

where P_{n+3} is the price of the aggregated capital good, δ_j the rate of depreciation in sector j and R the real rate of interest. The price index of capital goods is defined by

$$P_{n+3} = \sum_{i=1}^{n} P_i^D a_{i,n+3} \quad ; \quad \sum_{i=1}^{n} a_{i,n+3} = 1 \tag{4}$$

As a consequence of the technology assumptions, the unit cost function $\kappa_j(\cdot)$ can be written

$$\kappa_j(\cdot) = \kappa_j^*(P_1^D, W_j, R_j, t) + \sum_{i=2}^{n} P_i^D a_{ij} + Q_j \bar{b}_j \qquad j = 1, 2, \ldots, n + 2 \tag{5}$$

where the first part reflects the minimum cost of energy, labor, and capital per unit of output, and the last two parts reflect the cost of non-substitutable inputs per unit of output. Thus the constants a_{ij} represent the input of composite good i per unit of output in sector j, and $\bar{b}_j$ is the corresponding parameter for complementary imports. The world market price, $\bar{Q}_i$, of complementary imports is expressed in the domestic currency unit.

The "net unit cost" function $\kappa_j^*(\cdot)$ is derived from a nested Cobb–Douglas–CES production function, where energy, labor, and capital are variable inputs. Thus there is a constant elasticity of substitution between a composite capital–labor input, defined by a Cobb–Douglas function, and energy. In the original model the aggregated energy good is replaced by a composite fuels–electricity input, defined by a CES function.

The equilibrium prices of the composite goods are given by the unit cost functions of the composites:

$$P_i^{\mathrm{D}} = \phi_i(P_i, P_i^{\mathrm{M}}) \qquad i = 1, 2, \ldots, n \tag{6}$$

where P_i^{M} is the exogenously given world market price of import good i in the domestic currency unit.

Having defined all prices in the model and the unit cost functions $\kappa_j^*(\cdot)$ and $\phi_i(\cdot)$, the derivation of the model is straightforward. Thus there are two types of demand for composite goods: intermediate demand and final demand by the household sector. In addition there is export demand for production sector outputs.

By Shephard's lemma and the assumptions regarding technology, intermediate demand is given by

$$X_{ij} = \begin{cases} \dfrac{\partial \kappa_j^*}{\partial P_i^{\mathrm{D}}} X_j \text{ when } i = 1 \\ \\ a_{ij} X_j \text{ when } i = 2, 3, \ldots, n \end{cases} \qquad j = 1, 2, \ldots, n+3 \tag{7}$$

Household demand is given by

$$C_i = C_i(P_1^{\mathrm{D}}, \ldots, P_n^{\mathrm{D}}, P_{n+1}, E) \qquad i = 1, 2, \ldots \; n+1 \tag{8}$$

where E is total household expenditures. In the original model, functions $C_i(\cdot)$ are derived from a utility function such that the resulting demand equations can be represented by a linear expenditure system estimated on the basis of 10 consumer commodity groups and a matrix defining each of the consumer commodity groups as a convex combination of composite goods. Lack of data, however, prevented the use of that version of the model. Instead a system of demand equations with constant expenditure shares for each of the composite goods in household consumption was used. Observe that household demand for energy is derived from the demand for housing services, that is, C_{n+1}.

As a consequence of the Armington assumption, foreign demand for domestically produced goods can be written

$$Z_i = Z_i(P_i, P_i^{\mathrm{W}}, t) \qquad i = 1, 2, \ldots, n \tag{9}$$

where P_i^W is the exogenously given world market price, in the domestic currency unit, of goods with the classification i. In the model it is assumed that the trade-off between goods with different origins is represented by a CES function. Consequently, the function $Z_i(\cdot)$ becomes

$$Z_i = A_i(P_i/P_i^W)^{\epsilon_i} e^{\sigma_i t} \qquad i = 1, 2, \ldots, n \tag{9'}$$

where A_i is a constant, σ_i is the annual rate of change of production of good i in "the rest of the world," and ϵ_i is an elasticity of substitution parameter.

On the basis of Shephard's lemma the equilibrium conditions for the product markets can be written

$$X_i = \frac{\partial \phi_i}{\partial P_i} \left(\sum_{j=1}^{n+3} X_{ij} + C_i \right) + Z_i \qquad i = 1, 2, \ldots, n \tag{10}$$

$$X_i = C_i \qquad i = n+1, n+2 \tag{11}$$

$$X_{n+3} = I + \sum_{j=1}^{n+2} X_j \frac{\partial \kappa_i^*}{\partial R_j} X_j \tag{12}$$

where C_{n+2} is the exogenously given public consumption, and I is the exogenously given net investments.

The demand for competitive imports is given by*

$$M_i = \frac{\partial \phi_i}{\partial P_i^M} \left(\sum_{j=1}^{n+3} X_{ij} + C_i \right) \qquad i = 1, 2, \ldots, n \tag{13}$$

Since $\phi_i(\cdot)$ is derived from a CES function, eqs. (10) and (13) yield the following expression for competitive imports

$$M_i = B_i(P_i/P_i^M)^{\mu_i}(X_i - Z_i) \qquad i = 1, 2, \ldots, n \tag{13'}$$

where B_i is a constant, and μ_i is the elasticity of substitution between imports and domestically produced goods with the classification i. With this formulation the symmetry between the export and import functions becomes obvious. The formulation also shows that here, the small-country assumption implies $X_i - Z_i \approx X_i$ in the rest of the world, i.e., the small country's imports are negligible in relation to production in the rest of the world.

*When solving the model, the functions $\phi_i(\cdot)$ are approximated so that $\partial\phi_i/\partial P_i + \partial\phi_i/\partial P_i^M = 1$. This simplifies some expressions and leads only to minor approximation errors.

Current account equilibrium implies

$$\sum_{i=1}^{n} P_i Z_i = \sum_{i=1}^{n} P_i^{M} M_i + Q_1 \bar{b}_1 X_1 + D \tag{14}$$

where D is an exogenous variable representing imports to the electricity sector, net transfers, and net interest payments. Observe that complementary imports are used in the energy sector only, the main item being crude oil.

Since capital and labor are inelastically supplied, the equilibrium conditions for the factor markets become

$$K = \sum_{j=1}^{n+2} \frac{\partial \kappa_j^*}{\partial R_j} X_j \tag{15}$$

$$L = \sum_{j=1}^{n+2} \frac{\partial \kappa_j^*}{\partial W_j} X_j \tag{16}$$

where K is capital and L is labor.

After some appropriate substitutions these expressions yield $6n + 10$ equations in the $6n + 10$ unknowns: $X_1, \ldots, X_{n+3}$; $C_1, \ldots, C_{n+1}$; $Z_1, \ldots, Z_n$; $M_1, \ldots, M_n$; $P_1, \ldots, P_{n+3}$; $P_1^D, \ldots, P_n^D$; E; W; and R. Thus the model is determinate. It should be added that the price system is normalized so that the general price level is kept constant over time.

3 SECTORAL CLASSIFICATION AND SCENARIOS

In order to apply the projection model described in the preceding section to the present context, two requirements should be satisfied. The first is that the sectoral breakdown should be consistent with both the theoretical principles underlying the model and the problem focus of the empirical analysis. In the first subsection below the sectoral breakdown used in the study is presented and discussed against the background of this requirement.

The second requirement is that an empirical basis for the definition of exogenous variables and parameters of the model can be established. In order to understand the outcome of the projections, it is also important to sort out the economic rationale behind the relationships between different scenarios. Our base case, to be used as a norm of comparison for projections with other scenarios, is presented in the second subsection below. The alternatives are presented in the third subsection.

3.1 Sectoral Classification

Because of computational considerations and data availability, the number of sectors is restricted to 23. The analytical focus on the impact that changing comparative

advantages will have on Swedish economic development suggests more detail in the industrial breakdown than in the corresponding breakdown of the nontradable-goods sectors. Consequently, 15 industrial sectors are given a separate treatment in the model. The classification of these sectors is based on the expected origins of future changes in comparative advantages.

In the model there are three explicitly treated causes for changes in comparative advantages that are related to supply. The first two are differential growth rates of primary factors (capital and labor) and pure technical change (within and outside the industrial sector). A third partially independent determinant originates in the specification of the production functions. Thus technical change is neutral only with respect to the use of capital versus labor but is "primary factor saving" in terms of the relative use of intermediate factors of production.

Causes related to demand that have altered comparative advantages are introduced through the impact of differential growth rates of world markets and changes in world market price structures.

According to these determinants, both demand and supply characteristics of industrial products should influence the aggregation principles. Here supply characteristics are given priority in most instances. In addition, earlier studies of Sweden's changing international specialization (Ohlsson 1977 and Chapters 6, 7, and 10 in 1980b), as well as the nature of the world market scenarios, indicate that the development of human capital or skills also has an important role in this context. Since that factor could not be explicitly incorporated in the production functions, it was instead taken into account in the classification of sectors. In special cases, backward and forward linkages due to transportation costs or technical integration have influenced the sectoral definitions.

Instead of strictly applying a single aggregation principle, we tried to take all these considerations into account in accordance with our best judgment. The following presentation of the sectors provides information about how various factors affected the sectoral classification. The sectors are all listed in Table 1. The table is organized so that the primary sectors (and those strongly related) appear first, followed by the secondary and tertiary sectors.

The energy sector comprises not only all kinds of energy production but also petroleum refineries and asphalt, coal, and oil industries. There is one pure primary sector; mining and quarrying (sector 4). This sector has been a large Swedish export sector for centuries, producing a relatively homogeneous output. Thus it almost exclusively produces iron and pellets of iron rather than more highly priced minerals. Consequently, aggregation causes no particular problems.

There are two mixed primary–secondary sectors: the agriculture, fishery, and basic food sector (number 2) and the forestry, wood, pulp, and paper sector (number 3). Obviously, one of the principles for aggregation has been the strong input–output relationship between primary and secondary production. Moreover, there are so-called economies of integration between them, which in the case of the "agri-food" sector are attributable to transportation costs and policy-imposed ties.* In the case of the forest based sector,

*The agricultural sector is to a high degree excluded from foreign competition in Sweden. Moreover, there is a subsidy system for the basic food industry, which compensates for the otherwise too high input prices created by the agricultural policy. Finally, much of the ownership of the basic food sector is in the hands of farmer cooperatives, which in fact suggests the existence of monopolistic or oligopolistic competition.

TABLE 1 The sectors in the projection analysis.

Number	Production Sector
1	Energy[a]
2	Agriculture, fishing, basic foods
3	Forestry, wood, pulp, paper
4	Mining and quarrying
5	Other foods, beverages, liquor, tobacco
6	Textile, clothing, leather
7	Paper products
8	Chemical products[b]
9	Non-metallic mineral products except petroleum and coal
10	Metals
11	Fabricated metal products
12	Non-electrical machinery, instruments, photographical and optical equipment, watches
13	Transport equipment except ships and boats
14	Electro-technical products
15	Ships and boats
16	Printing and miscellaneous products
17	Hotel and restaurant services, repairs, letting of premises other than dwellings, private services other than banks, insurance, business services
18	Construction
19	Wholesale and retail trade, communications
20	Transport and storage
21	Financial and insurance services
22	Housing services
23	Public services
	Capital goods[c]

[a]Including petroleum refineries and asphalt and coal products.
[b]Excluding petroleum refineries and asphalt and coal products.
[c]The capital goods sector is not a production sector but a "bookkeeping" sector, which aggregates different kinds of capital goods (primarily machinery and buildings) in fixed proportions to an aggregate capital good used in all "real" production sectors.

transportation costs and technical integration economies motivate the aggregation into one sector. The forest based sector is strongly export oriented; the agri-food sector is sheltered from international competition by policy measures.

Apart from these characteristics the primary and primary based sectors also have high or extremely high capital and energy intensities in common. In addition they are all producing relatively standardized products that, with the exception of the products of the agri-food sector, are sold in internationally competitive markets.

There are four semi-raw material based sectors, of which one is foreign trade-exposed: other food, beverages, liquor, and tobacco industries (number 5). The backward linkages of this latter sector are less strong than those of basic food production relative to agriculture. Moreover, the trade-exposed sector 5 is not based as much on domestic raw materials.

Another semi-raw material based sector is the industry for non-metallic mineral products (number 9), which excludes petroleum and coal products. This industry is in part a foreign trade-sheltered sector, particularly because of high costs of transportation.

The remaining two industries within this category are the chemical (number 8) and the metal (number 10) industries. Both contain large parts that have earlier been characterized by more pronounced backward linkages than those appearing to prevail nowadays. It would, however, have been more satisfactory to divide both sectors into at least two parts, one of which would then have been producing the more highly manufactured products. Unfortunately, the present data base did not allow such a breakdown.

Except for one industry, the remaining eight industries (6, 7, and 11–16) are clearly so-called footloose industries; they both are foreign trade-exposed and are little dependent on the location of raw materials production. Three of the seven footloose industries are labor intensive in their production methods: the textile, clothing, and leather industry (number 6), the fabricated metal products industry (number 11), and the electro-technical industry (number 14).

In many product fields of the first of these footloose industries, the high market shares of less-developed countries (LDCs) suggest the emergence of a price leadership position of low wage countries. The other two sectors have segments in which LDCs have already acquired a substantial competitiveness, but their overall market share is still not high. (See, for instance, OECD 1979, and references and the analysis in Ohlsson 1980c.) The fabricated metal products industry has, for instance, subindustries, that are intensively using semi-modern manual skills and to some extent also technical personnel. Finally, the electro-technical industry contains parts that are among the most technical personnel intensive in relatively "young" technology fields. In other words, these two industries should ideally have been broken down into two or more sectors.

Three of the remaining five industries (7, 12, 13, 15, and 16) have somewhat higher capital intensities. They are primarily distinguished from other footloose industries because of their high human skill intensities (technical personnel and skilled manual workers). The latter feature is most pronounced for the machinery industry (number 12) and also for the transport equipment industry (number 13). Ships and boats (number 15) require less human skill. This industry is at present a government-regulated industry across the world, a characteristic that also holds for the aircraft producing part of the transport equipment industry.

The paper products sector (number 7) was rather dynamic in the 1960s and 1970s with respect to the growth rate of domestic demand. It has an intermediate position on three of the factor intensities discussed above, i.e., on capital, technical personnel, and skilled manual worker intensities. Finally, the miscellaneous industrial production sector (number 16) also includes the printing industry, which has been exposed to a measurable degree of international competition only in the past five years.

All the remaining sectors belong to the tertiary sector, except for capital goods, which was constructed for "bookkeeping" purposes (see footnote *c* of Table 1). Given the focus of the study, we abstain from commenting on these more trade-sheltered sectors.

In summary, the sectoral breakdown is not exactly the most desirable one. It incorporates, however, certain basic technology differences that can be associated with changing comparative advantages. Additional information about the possible sectoral developments can only be introduced in the projections through adjustments of the sectoral values of exogenous variables and parameters. The next two subsections outline the scenarios for these variables and parameters.

3.2 Base Case Scenario

The projections of the model are made for the relatively long periods 1976–1990 and 1991–2000. Our base year is 1975, the last year from which a complete data base is obtainable. With such long time horizons, it is impossible to claim that a particular projection is the most likely one. Instead it is more useful, in terms of policy implications analysis, to establish alternative scenarios in order to find a possible range of structural adjustment and growth paths. The analytical philosophy behind the alternatives can be described as follows.

As mentioned in section 1, there are external and internal causes that change comparative advantages. The main differences between the two, for a small, open economy, are that (a) the external causes can affect the internal ones but the opposite direction of influence can be ignored, and (b) the causes that are controllable for domestic economic policies are all internal. This latter distinction suggests that the policy strategy analysis can be incorporated in the model projections through variations in the values of exogenous variables that belong to the internal cause category.

There are two ways of incorporating changes in comparative advantages through changes in the numerical values of parameters or exogenous variables. One is to change individual sectoral values and the other is to change uniformly all values across sectors. Both ways may have macro as well as structural impacts, but there is one major difference in that the latter, "magnitude" change, does not alter the sectoral comparative advantage ranking, changing only the strength of advantages and disadvantages.

The most obvious example of this is a more rapid accumulation of capital than of labor, which, *ceteris paribus*, strengthens the comparative advantage of capital intensive industries. Indirectly, other magnitude changes, such as the overall rate of world demand growth or of technical change, may also have similar consequences.

Against this background, it was regarded as natural to construct a base case, which combined certain world trade scenarios with those of internal reasons for changing comparative advantages based on the official Swedish long-term forecasts. This means, in turn, that the "domestic scenarios" in the base case more or less project the future causes in comparative advantage changes to be similar in magnitude and structure to those of the past two decades.

As is clear from section 2, the world market scenarios consist of assumptions about growth rates of the world market for trade-exposed sectors, and changes in world market relative prices. The most globally comprehensive and consistent set of estimates of the two sets of variables is found in Leontief (1977) in Scenario A, which is the most "endogenous" of that study. Except for a few regions, neither the gross domestic product (GDP) nor employment are assumed to attain target values. Instead those magnitudes are endogenously determined under the constraints incorporated in the global model system utilized in the study.

The world market price assumptions are based on projections of production costs in the economy of the United States. Implicitly, therefore, it seems to presuppose that US producers are able to maintain much of the same price leadership role in the world economy as they had in the 1950s and 1960s. Although the European and Japanese challenges altered this role in the ten years before our base year and the industrialization of LDCs is about to alter it in one or two sectors, this basic assumption will not be

questioned in the present study. The issue, however, is important enough to be a topic for another report. For the sake of brevity it is not treated here.

This limitation on the realism of our world market scenarios is perhaps not as serious as it might first appear. The reason is that the use of historical data on US production costs for projections of world market relative price changes is also possible in another case. Suppose that US industry acts as a price taker on the world market but as a consequence of its size has no factor-biased intra-industry specialization. Then its domestic prices and costs of production follow those established by the world market.

The second set of world market variables obtained from the same source is the growth rates of world market by commodity groups. There is not much to say *a priori* about these figures in terms of their theoretical or empirical underpinnings. Both sets of variables are presented in Table 2 together with some other scenario variables.

If the cross-sectoral differences in the two sets of world market variables are evaluated, however, two rather surprising changes compared with historical experience should be noted. One is the extremely favorable development for exporters of textiles, clothing, and leather with respect to both the relative price change (a moderate decrease) and the world market growth rate. This sector and three others have the most dynamic growth rate: paper products, non-metallic mineral products,* and printing and miscellaneous products.

Given the above-mentioned nature of the relative price forecasts, it appears that Leontief's price forecast may be subject to a bias from an intra-industry specialization in the US on less price sensitive segments of the textile and clothing sector. Thus for this particular sector we consider the price leadership role of the US economy and the assumption that no factor-biased intra-industry specialization is unrealistic. This may follow as a consequence of successful LDC market penetration. The associated relative cost increases in the US industry have then a built-in upward bias if taken as a projection of the world market relative price. In turn, this may explain the rather high projected world market growth rates for these products. For this reason the projections of the Swedish textile industry must be considered to be rather optimistic both from the price and the world market growth points of view.

Another remarkable projected change is the comparatively low market growth figures for certain engineering sectors (non-electrical machinery, transport equipment, and electro-technical products) and the chemical sector compared with both shipyards and certain raw material based sectors (sectors 3, 9, and 10).

With these two projected changes in mind, it may be concluded that Leontief's study has used a constellation of assumptions that is very favorable for an industrial composition of a typical developing country. Consequently, the world market scenarios utilized in the present study must be interpreted as being on the pessimistic side for Sweden's high skill intensive, footloose industries and overly optimistic for its raw material, raw material based, and raw labor intensive footloose sectors. Accordingly, the projected structural adjustments must be considered to be smaller than expected from the history of the first five years of the projection period.

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*This sector also appears to obtain a remarkably favorable world market future, although this judgment is based more on the composition of the domestic industry than on past trends in world trade.

TABLE 2 Sectoral specifications of world market scenarios, price elasticities, and productivity growth.

Sector number	Production sector	Percentage growth in world trade		Relative price in the year		Import price elasticity	Export price elasticity	Yearly rate of productivity growth in percent
		1975–90	1990–2000	1990	2000			
1	Energy	–	–	2.71	3.05	–	–	1.0
2	Agriculture, fishing, basic foods	0.0	1.0	1.07	1.11	1.5	–2.5	1.0
3	Forestry, wood. pulp, paper	7.0	6.0	0.91	0.90	0.8	–1.5	1.0
4	Mining and quarrying	4.0	4.0	1.00	1.00	1.0	–2.0	1.0
5	Other foods, beverages, etc.	1.0	1.0	0.95	0.93	1.0	–2.0	1.0
6	Textile. clothing, leather	8.0	7.0	0.93	0.92	1.5	–3.0	2.0
7	Paper products	8.0	7.0	0.87	0.86	0.3	–0.6	2.0
8	Chemical products	6.0	5.0	0.98	0.99	1.0	–1.5	4.0
9	Non-metallic mineral products	8.0	7.0	0.93	0.94	0.5	–1.0	1.0
10	Metals	4.0	3.0	0.97	0.96	0.8	–1.5	3.0
11	Fabricated metal products	4.0	3.0	0.97	0.96	1.5	–2.5	2.0
12	Non-electrical machinery, etc.	6.0 (5.0)[a]	6.0 (5.0)	1.00 (0.89)	1.00 (0.89)	1.8	–2.5	2.0
13	Transport equipment	6.0	5.0	0.95	0.94	0.6	–1.0	2.0
14	Electro-technical products	7.0	6.0	0.90	0.93	0.8	–1.2	2.0
15	Ships and boats	5.0	5.0	0.85	0.82	1.0	–1.5	2.0
16	Printing and miscellaneous products	8.0	7.0	0.87	0.86	0.8	–1.2	2.0
17	Hotels, restaurants, etc.	4.0	4.0	1.00	1.00	0.2	–0.3	0.5
18	Construction	4.0	4.0	1.00	1.00	–	–	1.5
19	Wholesale and retail trade, etc.	4.0	4.0	0.91	0.91	0.2	–0.3	1.5
20	Transport and storage	5.0	4.0	0.95	0.96	0.2	–0.3	1.5
21	Financial and insurance services	4.0	3.0	1.01	1.00	0.2	–0.3	0.5
22	Housing services	–	–	–	–	–	–	1.0
23	Public services	–	–	–	–	–	–	0.0
24	Capital goods	–	–	–	–	–	–	–

[a]The figures in parenthesis are from Leontief (1977).

Moreover, the same conclusion holds for any country as far as the structural influence of changing relative prices is concerned because of the rather small spread in projected prices within the industrial sector. The only exception to this latter observation is the energy sector, where the relative price level more than triples compared with all other sectors.

As can be seen from Table 2 we have adjusted the market growth rate from 5 to 6 percent and assumed a more favorable relative price development for the non-electrical machinery sector. It is not the above-noted possibility of changes in the US price leadership role that motivates the adjustments in this case. Instead, it is the Swedish intra-industry specialization in investment goods for raw material and raw material based production, etc., that constitutes the basis for these adjusted figures. According to the Leontief projections the rapid growth of these latter sectors should be associated with a more than average rate of increase in their demand for investment goods. Moreover, the production of such heavy machinery has had a lower rate of technical change than, for instance, computer and office machinery production, which is also part of the non-electrical machinery sector. For this reason the relative price decrease of the cited study appears to be biased downward for a machinery sector with the present Swedish output mix.

Table 2 also provides the sectoral relative price elasticities of imports and exports and the annual rates of productivity growth. The former two sets of figures have been chosen on the basis of estimates in Hamilton (1979) on import share relative price elasticities for the period 1960 - 1975. Generally speaking, the price elasticities of this study seem to be rather low. Combined with the small relative price changes, this is likely to produce a rather low impact on structural change.

The price elasticities estimated by Hamilton were changed for only three sectors: chemical, non-electrical machinery, and transport equipment. The elasticities were adjusted downward for the first two and upward for the last sector. The assumed high elasticities for chemicals and non-electrical machinery are probably due to the combination of low tariff barriers and rapid intra-industry trade and specialization in the 1960s and 1970s rather than particularly high substitutability with similar products produced in other countries. Similarly, the estimates of the transport equipment industry are presumed to be low because of the development of favorable relative tariff rates (see Ohlsson 1980b, chapter 6).

The import price elasticities have the same rank ordering as the export price, but lower absolute values. This is attributed to proximity advantages in the home market for domestic producers. Since Sweden is geographically rather isolated from its main foreign markets and because of the large surface over which the economy is spread, the differences between exports and imports are usually large in absolute terms. Small relative differences were introduced for homogeneous industries with highly tradable products. Needless to say, these differences introduce a stronger element of arbitrariness for export price elasticities than for the import price elasticities.

Finally, the assumed annual growth rates of productivity presented in Table 2 are based on projections by the Swedish Ministry of Economic Affairs (see Restad 1976). These projections have since been revised downward. The revised values, however, were unavailable to us in some of the more detailed sectors. For these sectors we made proportional downward revisions. The forestry, wood, pulp, and paper sector has been attributed an even lower figure. This is because the decreasing availability of domestic raw material supplies is assumed to increase the costs of additional supplies.

In accordance with the figures obtained from the Ministry of Economic Affairs we have assumed a yearly increase of 1.8 percent in real public consumption throughout the period 1975–2000. The corresponding figure for the real capital stock of the economy is set at 2.5 percent per year. Labor supply measured in man-hours is assumed to remain constant at the 1975 level. This last assumption allows for the fulfillment of ambitious goals about increased labor participation rates in an almost stable Swedish population, mainly through an enhanced degree of part-time work. Consequently, the differential growth rates for the two primary factors induce, *ceteris paribus*, a more capital intensive specialization.

This concludes our presentation of the base case assumptions. The principles and figures for the alternative scenarios are discussed next.

3.3 Alternative Scenarios

Early computations suggested that macroeconomic development and the sectoral distribution of employment were rather insensitive to reasonable changes in relative prices *or* price elasticities. In order to alter the results substantially, the magnitudes on both had to be altered considerably. Instead the projections turned out to be more sensitive to changes in rates of world market growth and domestic productivity. For this reason, the alternative scenarios are built on alternative assumptions about the latter two sets of exogenous variables.

The simplest change is to alter the magnitudes across all sectors and not the sectoral differences in world market growth rates and productivity rates. It is reasonable to adjust the magnitudes downward by 1 percent per annum for all tradable sectors, i.e., to let the world market growth rate be even lower than was projected in Leontief (1977). Given the historically low rates of productivity growth, the 1 percent change in productivity rates results in an upward change. Even so, the rate of productivity growth falls below that of the 1960s. Calling the base case number I, three alternative combinations of assumptions are used:

- Case II the same as the base case in all respects except for a 1 percent higher annual productivity growth rate in all sectors
- Case III the same as the base case in all respects except for a 1 percent lower rate of world market growth in all tradable sectors
- Case IV combines the two adjustments of cases II and III, i.e., compared with the base case both a 1 percent higher general, annual productivity growth rate and a 1 percent lower general rate of world market growth.

Apart from these cases, the sensitivity of certain macroeconomic results to alternative assumptions concerning capital accumulation and labor supply is also analyzed. For simplification these alternative assumptions have been condensed and are not discussed in detail.

4 PROJECTIONS

The results of the model simulations are given in the following subsections. In subsections 4.1 and 4.2, base case results are presented for the projected macroeconomic

development and sectoral development, respectively. Subsection 4.3 deals with the consequences of altered world market and productivity assumptions at the macroeconomic level, whereas the ensuing subsection deals with the corresponding sectoral consequences. In order to avoid repetition and to acquire a better tie to the subsequent analysis of regional implications in section 5, the sectoral consequences are described in terms of employment consequences.

4.1 Macroeconomic Developments: The Base Case

The model was solved for the years 1990 and 2000, but in most cases we prefer to present the macroeconomic results in terms of annual percentage rates of change during the periods 1976–1990 and 1991–2000. It was assumed that the intersectoral profit differences prevailing initially will be eliminated by 1990. Consequently, the first of these subperiods can be regarded as a period of adjustment, both from a disequilibrium to an equilibrium state of the economy and to certain exogenous changes inside and outside the economy.

To begin with, we focus on the projected development of GDP, aggregate real consumption, industrial production and employment, the functional distribution of income, and relative size of the public sector.

Table 3 contains the projected growth rates for real GDP and aggregate private consumption during the two subperiods 1976–1990 and 1991–2000. These data contain three striking results: the rate of economic growth is considerably lower than the postwar

TABLE 3 Projected annual growth rates for real GDP and aggregate private consumption, 1976–2000.

	Projected growth rates in percent	
Variables	1976–1990	1991–2000
GDP	2.2	1.8
Private consumption	3.0	2.6

average, the two subperiods are different, and finally, the share of private consumption in the gross national product (GNP) increases over the whole period. In what follows, possible explanations of these three results are offered.

During the period 1950–1975, the average rate of economic growth (growth of GDP) in Sweden was 3.6 percent per annum. If the "bad" years in the beginning of the 1970s are excluded, the average rate for 1950–1970 becomes 3.8 percent per annum. This means that, according to our projections, Sweden has entered a period with considerably slower economic growth than was experienced during the earlier postwar period.

There are many factors behind this development: slower rate of capital formation and technical change, stagnation in the supply of labor* (in man-hours), and a relatively

*Observe that the labor force is assumed to be fully employed in all model simulations.

fast growth of an already large public sector, which, in accordance with national accounting conventions, is here attributed a zero productivity increase. In addition, some private service sectors, with a relatively slow rate of productivity increase, grow faster than GDP.

The second startling feature of our results is the difference between the two subperiods; the rate of growth is considerably higher from 1976 to 1990 than from 1991 to 2000. The explanation is simple and straightforward. The initial year, 1975, shows many features of a disequilibrium situation. The average rate of profit was very low and the intersectoral differences in terms of profit rates were significant. In two of the 23 aggregated sectors, losses were revealed by the data. Thus a sectoral reallocation of resources could produce substantial efficiency gains. This is exactly what happens between 1975 and 1990 in our projection.* Net investments are concentrated in a few relatively profitable sectors, and old capital is not replaced in some sectors. This development tends to equalize profit rates and thus the marginal productivity of capital in the different sectors. This equalization leads to an increase in the average productivity of the economy's resources. During the second subperiod, however, these potential reallocation gains are already exploited, and capital accumulation and technical change are the main sources of economic growth besides the reallocation gains associated with changing world market prices.

With this background even the low growth rates displayed in Table 3 might be too optimistic in practice. In a process where efficiency in resource allocation is a significant source of economic growth, labor and capital markets have to function quite smoothly; without much delay, resources have to be reallocated from stagnating to expanding sectors. The present institutional framework of the Swedish economy does not seem to be well-suited for fostering such a process. In particular, the interregional and intersectoral labor mobility may be substantially lower in the future than in the 1950s and 1960s. This might be a result of changes in the institutional framework of the labor market in the 1970s and the implementation of very ambitious policy goals aimed at stabilizing employment on the regional or county, and sometimes even the firm, level.

As mentioned in section 3.2, one factor that suggests growth rates are too low is the relatively small amount of incentives to structural adjustment hidden in the Leontief (1977) world economy projections. This reduces the intersectoral differences in terms of comparative advantage changes and thus the contribution to economic growth from intersectoral reallocation of resources.

Another feature of our 1976–1990 projection is that the profit level in the private sector of the economy, measured as total *pre-tax* net profits in relation to the replacement value of the capital stock, increases from 3.8 to 4.7 percent. This increase contributes to the growing share of capital income in total national income. It can be questioned whether such a development would be politically accepted in Sweden without a negotiated change in the distribution of ownership in the industrial sectors.

This is a very crude way of posing the income-distribution problem, however; the marginal productivity of capital need not be equal to the *after tax* income from capital. The critical point of the analysis is therefore whether the rate of profit after taxes is high

*In Bergman and Pór (1980) the potential reallocation gains are estimated, using the same model and data base. The results indicate that full exploitation of the potential reallocation gains in 1975 would lead to a GDP that would be 4 percent higher than the actual value.

enough to bring about the assumed annual 2.5 percent increase in the economy's stock of capital.

The third striking result is the relatively fast growth of private consumption. (As will be discussed in some detail in section 5, this result does not conform to the long-term projections carried out by the Ministry of Economic Affairs.) By assumption, investments grow by 2.5 percent per annum and real public consumption by 1.8 percent per annum. Since GDP grows by an average of 2.0 percent per annum, an average rate of private consumption growth of 2.8 percent per annum implies that exports grow slower than GDP. This is exactly what takes place in our base case projection. Due to a significant terms-of-trade improvement (1.9 percent per annum despite increasing real oil prices), external balance is maintained although real exports only grow 1.7 percent per annum.

The terms-of-trade improvement is a consequence of the fast growth of world market trade in relation to Swedish economic growth together with the incorporation of explicit price-dependent export functions in the model. Thus external demand increases will be met by a combination of export supply and export price increases. A projected reallocation of exports toward commodities with relatively increased world market prices has a similar effect on the terms of trade.

From an empirical point of view, however, this result should be interpreted with care. The projection includes a considerable gap, about 40 percent, between Swedish and world market prices for some commodity groups. We have no such experiences from the estimation period, and consequently we do not know whether our estimates of price elasticities in the export and import functions are still valid for the price relations prevailing in our projections for the year 2000.* Another reason for caution when interpreting this result is the rapid net accumulation of foreign debt in Sweden in the past five years, which has led to a new goal for economic policies: the repayment of the outstanding foreign debt in the 1980s. Therefore the current account is targeted to yield a surplus, which cannot be achieved unless, *ceteris paribus*, there is a deterioration of the terms of trade. Finally, the terms-of-trade development projected by the model is sensitive to world market assumptions: slower world market growth worsens the terms-of-trade development.

Table 4 contains some results on the semi-macro level. Industrial production grows slower than GDP and industrial employment decreases during the entire projection period. Energy consumption grows considerably slower than the 5.5 percent per annum experienced during the period 1950–1972. A few comments should be made about these results.

During the postwar period, industrial production has, in general, been growing faster than GDP in Sweden. According to our projection, the reversed relation would hold in the future. The consumption of industrial goods, however, continues to grow faster than GDP. Thus the basic difference is that the import share in the domestic supply of industrial goods increases considerably: from 27.8 percent in 1975 to 40.2 percent in

*Section 6 gives a critical appraisal of this approach. Chapters 5 and 7 of Ohlsson (1980b) show considerable differences between unit prices of exports and imports at a detailed level of industrial breakdown compared with that used in the present paper. Intra-industry specialization appears, furthermore, to be characterized by exports of higher priced product variants and imports of lower priced ones compared with other OECD countries. The market share implication of this specialization, however, is not as simple as the one used above.

TABLE 4 Projected annual growth rates for industrial production and employment and total energy consumption, 1975–2000.

	Projected growth rates in percent	
Variables	1975–1990	1991–2000
Industrial production	1.9	1.5
Industrial employment	–1.0	–2.3
Total energy consumption	1.1	2.2

2000. This is, of course, the mirror image of the above-mentioned terms-of-trade improvement and slow export expansion. The much slower growth of exports and production for the domestic market explains, in turn, why industrial employment decreases at a fast rate. By the turn of the century, the industrial sector would then have lost about 30 percent of its 1975 employment (in man-hours) to primarily service-producing sectors. Another way of expressing the causes behind this development is to say that the industrial sector is squeezed between competition with foreign producers in commodity markets and foreign trade-sheltered producers (particularly the public sector) in the (primary) factor markets. The latter is the result of the absence of (or low) productivity growth rates in tertiary sectors and the lack of strong demand-restricting factors when production costs increase.

The relatively slow growth in the rate of energy consumption is, of course, partly a result of the slow growth of industrial production. It is also, however, a result of substitutions of capital and labor for energy, induced by an increasing relative price of energy. Between 1950 and 1972, the real price of energy decreased by nearly 3 percent per annum. In our projection the average rate of increase between 1975 and 2000 is 1.0 percent per annum. Most of the price increase, however, takes place during the first subperiod, primarily as a result of oil price increases but also as a result of the rate of interest increase, which affects the capital intensive energy sector more than other sectors. The uneven development of the relative price of energy explains the differences in energy consumption growth between the two subperiods.

On *a priori* grounds, it cannot be ruled out that the projected slow growth of industrial production in the Swedish economy is the result of increasing energy costs, but a closer look at the results does not support such a hypothesis. The share of energy costs in total production costs is generally low in the industrial sectors, between 5 and 10 percent at the terminal point (the year 2000) compared with 3 and 8 percent in 1975. This means that the projected energy price increase still has a relatively minor impact on the development of production costs in industrial sectors.

Moreover, as long as Swedish energy prices change in the same way as energy prices in other countries, the development of Sweden's comparative advantages should not be affected much by increasing relative prices of energy. To put it another way, the tripling of world market energy prices should also be reflected in Leontief's estimates of the world market prices for sectors requiring energy. In the base case projection, we have assumed an "unchanged energy policy" in Sweden; that is, we have not assumed any major changes in production technology in the energy sector or in the taxation of energy. The world market price projections, obtained from the Leontief study, rest on similar assumptions.

During the 1970s, a conflict arose between private and public consumption. In accordance with the projections obtained from the Ministry of Economic Affairs, we have assumed that real public consumption will increase by 1.8 percent per annum between 1976 and 2000. In our projection, this leads to an increase in public employment of 1.8 percent per annum. As a result, the share of the labor force employed by the public sector increases from 22.6 to 36.9 percent. The price index for public consumption increases by 2.2 percent per annum in relation to the general price level. Thus, in our projection, the share of public consumption expenditures* in the nominal national income increases from 26.8 percent to 36.9 percent in 2000. The impact of this development on the share of private consumption expenditures is somewhat mitigated by an annual 0.6 percent decrease in the relative price of capital goods, which in conjunction with fixed development of real investment expenditures leads to a gradual decrease of the gross savings ratio. As can be seen in Table 5, however, the projected development implies a slow growth of disposable income for the household sector.

TABLE 5 Aggregate demand categories as a percentage share of GDP in constant and current prices.

	Constant prices		Current prices	
Demand categories	1975	2000	1975	2000
Private consumption	51.8	64.6	51.8	44.7
Public consumption	26.8	25.4	26.8	36.9
Gross investments	22.3	25.7	22.3	18.5
Net exports	−0.9	−15.6	−0.9	0.0

To sum up, the projection based on base case assumptions implies a considerably slower rate of economic growth in Sweden in the future than during the first postwar decades. Moreover, there is a significant shift of demand and reallocation of resources from the industrial sector to the service sector.

4.2 Projected Sectoral Developments: The Base Case

Slow growth of the industrial sector as a whole does not prevent a substantial variation among industrial sectors. This can be seen in Table 6. The figures can be compared with the annual growth rate of GDP, which amounts to 2 percent for the whole 25-year period. As many as seven of the industrial sectors have higher projected growth rates than 2 percent; the most outstanding ones are paper products and electro-technical products. Apart from the latter industry, however. the growth rates of the engineering sectors (11–15), which are the growth sectors, are unfavorable considering the expectations in Sweden, as well as in other industrial countries. A rapid decline of the ships and boats sector is expected and after five years has already been partially fulfilled, despite the rapid world

*The share of transfer payments in nominal national income is presently about 30 percent.

TABLE 6 Projected annual growth rates of real production and of employment by sector 1975–2000.

Production sector	Projected growth rates in percent	
	Production	Employment
Energy	1.8	–3.2
Agriculture, fishing, basic foods	2.1	–1.7
Forestry, wood, pulp, and paper	1.9	–0.1
Mining and quarrying	–0.2	–3.3
Other foods, beverages, etc.	2.1	–0.7
Textile, clothing, leather	0.8	–2.4
Paper products	4.7	0.2
Chemical products	2.2	–3.2
Non-metallic mineral products	2.1	–0.7
Metals	–0.4	–5.1
Fabricated metal products	0.0	–3.0
Non-electrical machinery, etc.	0.8	–2.3
Transport equipment	1.1	–1.8
Electro-technical products	2.5	–2.6
Ships and boats	–1.9	–5.0
Printing and miscellaneous products	2.1	–1.0
Hotels, restaurants, etc.	2.1	0.5
Construction	2.4	0.4
Wholesale and retail trade, etc.	1.7	–1.1
Transport and storage	1.9	–0.8
Financial and insurance services	1.9	0.8
Housing services	2.7	–2.6
Public services	1.8[a]	1.8[b]

[a] Assumed to be exogenously given.
[b] Follows from assumptions of zero rate of productivity change and no possibilities of factor substitution.

market growth rate. Consequently, it is the combination of bleak relative price developments and moderate productivity increases that explain this result.

Despite the absence of powerful external incentives for structural change embedded in the world market scenarios based on Leontief, the typical stagnant industries are those that were recognized as such in the later 1970s. Along with the ships and boats sector mentioned above, we can expect negative growth rates for the mining and quarrying industry and the metals industry. The forestry, wood, pulp, and paper industry continues to have a relatively good growth performance, a result which appears attributable to Leontief's high world trade projections as well as to rapidly expanding deliveries to the most spectacular growth sector: the paper products industry.

In summary, the structural adjustments within the industrial sector appear to continue with regard to stagnating industries, but the trends from the 1960s and 1970s for some of the expected Swedish future growth industries are altered. This is especially the case for the non-electrical machinery industry. It is the combination of rather "pessimistic" world market scenarios for these industries and possibly the projected competitive domestic market for primary factors of production (especially from service sectors), that are probably accounting for this bleak outcome. Consequently, the small external

incentives for structural change reduce the growth of the likely expansive sectors but do not protect the problem sectors from stagnation or contraction. This result explains the poor outlook for industrial employment. Even at the assumed historically low rates of productivity increases, the industrial sectors cannot maintain their employment levels, except in the expansive paper products industry.

In the following section we dwell upon this issue in more depth. Let us only direct attention here to the discussion in the preceding section about the terms of trade increase and the related slow growth of real exports compared with real imports, industrial production, and GDP. These features would mark the ending of a long historical record of export-led growth; Sweden would lose market shares rapidly, domestically as well as abroad.

4.3 Macroeconomic Developments: Alternative Cases

At this point in the analysis of the projections, we have obtained a fairly evident perception of the main causes behind economic development at large: reduced domestic sources of economic growth, smaller than expected external incentives for intersectoral structural adjustments in the trade-exposed sector of the economy, and rapidly growing world markets. It should also be clear by now why the alternative assumptions of cases II–IV were chosen using increased productivity growth rates and decreased rates of world market growth; both influence the industrial sector in the same way, by reducing the pressures incurred through the improvement in Sweden's terms of trade. Thus we alter two of the three major growth pattern determinants mentioned above, but keep the third (i.e., the incentives for structural change between industries) fundamentally unchanged.

Table 7 summarizes the projected development of the aggregate demand components and the terms of trade between 1976 and 2000 in the base case and the three other cases described in subsection 3.3. The results in Table 7 clearly indicate that the projected rates of change of the macro variables are quite sensitive to variations in productivity and world market assumptions. Although the variations made in these assumptions are arbitrary, they are well within the range given by the uncertainty of the long-term projections utilized in the construction of the scenarios. The results indicate that the uncertainty in

TABLE 7 Projected annual growth rates 1976–2000 for selected macroeconomic variables.

	Projected growth rates in percent			
Variables	Case I	Case II	Case III	Case IV
Private consumption[a]	2.9	4.0	2.2	3.6
Public consumption[a]	1.8	1.8	1.8	1.8
Gross investment[a]	2.6	2.6	2.6	2.6
Exports[a]	1.7	3.4	2.0	3.7
Imports[a]	3.4	3.7	2.6	3.0
GDP[a]	2.0	3.2	2.0	3.2
Terms of trade	1.9	0.4	0.7	0.6

[a]In constant (1975) prices.

these exogenous conditions leads to a significant uncertainty in the long-term projections of GDP, real consumption, and other macroeconomic variables.

One of the most interesting results obtained from these experiments is the remarkable difference the variations of underlying assumptions made in terms of changes in the export growth rate. According to Table 7 the rate of export growth is mainly determined by the productivity increase (compare cases I and II with cases II and III, respectively). Observe here also that even this higher productivity growth rate falls below the earlier postwar experience.

In summary, it is quite likely that the contributions to economic growth of the overall productivity change are lowered in comparison with the contributions from factor accumulation in two ways: low sectoral productivity growth rates and small external changes in comparative advantages. In this respect future economic development would substantially deviate from past records. As has been shown by Åberg (1969) and in the updated figures in IVA and IUI (1979), the percentage contribution of the so-called technique factor has increased over the postwar period at the expense of the contributions of capital and labor accumulation.

This shift in the role of factor accumulation is not at all a consequence of higher accumulation rates. On the contrary, both primary factors of production increased more in supply before the projection period than during it. Against this background it is interesting to investigate the sensitivity of the projections with respect to the supply of capital and labor. Such a sensitivity analysis for the results in the year 2000 can be easily revealed in the form of elasticities of endogenous variables with respect to the total supply of capital and labor (base case assumptions). The main findings are summarized in Table 8. The elasticities are valid within a range of ±10 percent for variations of the exogenous variables in question.

TABLE 8 The calculated elasticity of GDP and real private consumption with respect to selected exogenous variables.

	Elasticity	
Selected exogenous variables	GDP	Real private consumption
Total supply of capital	0.33	0.35
Total supply of labor	0.74	0.83

Again the projections turn out to be quite sensitive to assumptions about exogenous conditions. Apparently the conclusion that the Swedish economy has entered a period with a *significantly* slower rate of economic growth than during the earlier postwar decades holds only under scenario definitions I and III but not with more normal rates of technical progress and higher capital and labor accumulation rates. In all projection cases, however, the rate of GDP growth is lower than the 3.6 percent per annum during the period 1950–1975.

Another important result obtained under base case conditions is that industrial production is projected to grow more slowly than GDP in the future. This result, which

represents a change in postwar trends, holds in all cases except case IV where industrial production grows by 3.4 percent per annum and GDP by 3.2 percent per annum. In all cases, however, total employment (in man-hours) in the industrial sectors declines by more than 1 percent per annum. The overall impression given by the table is that the best results for GDP and private consumption growth would be achieved if the supply of labor could be increased. It can only be substituted for with a more than double rate of increase in capital productivity.

4.4 Projected Sectoral Developments: Alternative Cases

As mentioned in the introductory part of this section the sectoral implications of the four cases will be analyzed in terms of employment composition changes. The intersectoral variation is not much affected by variations in the rate of productivity and world market increases. In addition, a study of compositional changes in employment puts more of the results in a policy perspective because of the priority of various employment goals in Sweden. The full employment equilibria projected here, however, do not allow an analysis of the full employment goal.

Table 9 presents the sectoral breakdown of employment in 1975 as well as in the year 2000 according to the four alternative cases. Let us first concentrate our attention on the broad changes in the employment composition.

The tertiary sector contributed to more than 60 percent of the national employment in 1975. About 25 percent of the labor force was occupied in the production of public services. The base case projects the tertiary employment share to 76 percent in the year 2000 with 39 percent in the public service sector. A service economy will have arrived, and a large part of it will be organized as public services between privately and publicly produced goods and services, according to the present division of labor in Sweden.

Cases II and III have in common a 1 percent per annum higher productivity growth in all sectors, including the public sector. Evidently, this makes quite a difference in terms of employment shares. Tertiary employment will then only expand from 62 to about 70 percent, mainly because of the much lower rate of growth of employment in the public sector. Its employment share of the whole tertiary sector increases from 40 to 44 percent compared with more than 50 percent in the base case projection.

Accordingly an overall and (in absolute terms) equal rise in the rate of productivity growth improves the employment situation for primary and secondary sectors *vis-à-vis* the tertiary and for private services employment compared with public services employment. Apparently, it is the decline in sectoral differences in the rate of productivity growth that accomplishes this change in our results. The more optimistic the scenario concerning productivity growth in the tertiary sector compared with the commodity producing sectors, the less the employment shift toward more service-producing jobs.

Finally, it is worth noting the changes in the composition of employment between primary and secondary sectors. Table 10 gives a proper overview of the summary figures.

Only the ships and boats sector is excluded from the overview. According to all projections this sector is the most dramatically declining one in terms of employment shares, despite rather optimistic projections of world market growth rates.

TABLE 9 The sectoral contribution to total employment in 1975 and in the year 2000 for cases I–IV.

	Employment shares in percent				
Production sector	1975	Case I 2000	Case II 2000	Case III 2000	Case IV 2000
Energy	1.0	0.5	0.6	0.5	0.4
Agriculture, fishing, basic foods	7.0	4.6	5.9	5.7	4.3
Forestry, wood, pulp, and paper	4.9	4.8	5.8	6.0	5.0
Mining and quarrying	0.5	0.2	0.3	0.4	0.3
Other foods, beverages, etc.	0.8	0.7	0.9	0.8	0.6
Textile, clothing, leather	1.9	1.0	1.5	1.6	1.1
Paper products	1.1	1.2	1.2	1.1	1.1
Chemical products	2.1	0.9	1.2	1.3	1.0
Non-metallic mineral products	1.1	0.9	1.0	1.0	1.0
Metals	2.2	0.6	0.8	0.9	0.7
Fabricated metal products	3.0	1.4	1.9	2.2	1.7
Non-electrical machinery, etc.	4.5	2.5	3.4	3.9	3.0
Transport equipment	2.5	1.6	2.0	2.1	1.7
Electro-technical products	2.4	1.3	1.6	1.6	1.3
Ships and boats	1.2	0.3	0.4	0.4	0.3
Printing and miscellaneous products	2.1	1.6	1.9	1.9	1.6
Hotels, restaurants, etc.	9.7	11.1	12.8	12.2	10.4
Construction	9.9	10.8	9.3	9.3	10.8
Wholesale and retail trade, etc.	7.3	5.6	6.7	6.8	5.7
Transport and storage	5.8	4.7	5.2	4.9	4.3
Financial and insurance services	3.6	4.4	4.6	4.6	4.3
Housing services	0.7	0.4	0.5	0.4	0.3
Public services	24.9	39.0	30.6	30.6	38.9
Total employment	100.0	100.0	100.0	100.0	100.0

TABLE 10 Employment shares in selected sector groups in 1975 and in the year 2000 for cases I and II.

	Employment shares in percent		
Sector groups	1975	Case I 2000	Case II 2000
Primary and raw material based sectors (1, 2, 3, 4)	13.4	10.1	12.6
Semi-raw material based sectors (5, 9, 10)	4.1	2.2	2.7
Raw labor intensive footloose sectors (6, 11, 16)	7.0	4.0	5.3
Paper, chemical, and most engineering products (7, 8, 12, 13, 14)	12.6	7.5	9.4

The projected sectoral employment shares summarized in this way have the same story to tell. The intersectoral changes in primary and secondary sectors are surprisingly small. In fact the employment share decline is considerably smaller in the primary and raw material based sectors than in the remaining categories of secondary sectors. This outcome stands in sharp contrast to historical records for at least the last three or four decades.

Another contrast to past developments is that the chemical and engineering sectors (9–15) have such a mediocre future. As mentioned earlier this result is mainly attributable to the world market scenarios in Leontief (1977). These scenarios do not provide much incentive for structural changes within the industrial sector. In fact it appears as if Leontief's relative price and market growth projections show an opposite tendency for future structural incentives than has been experienced in the last several decades. There is, therefore, good reason to wonder whether these projections are compatible with both our general knowledge about the secular trends and the projected trends in our own model toward a more service producing economy.

5 REGIONAL IMPLICATIONS

The projected full employment equilibria presume smoothly adjusting commodity and factor markets in the 25-year time horizon. Even though the time period is long, there might be adjustment rigidities that are strong or long-standing enough to prevent the projected reallocation of resources from taking place. Such rigidities may be endogenous to the economic system or policy imposed. Compared with several other small, open economies, Sweden differs in its spatial extensiveness; even the industries themselves are spread over most of the country and scattered in many, often relatively dispersed, villages or small towns.

The combination of a small, open, and spatially extensive economy may impose adjustment rigidities in two ways. First, the geographical mobility of factors and products may be more limited than in other small economies. Second, the regional population and employment goals may have a relatively high priority compared with other goals.

This report focuses on the latter type of rigidity. Instead of making quantified projections of the regional developments associated with the projected national–sectoral one, we have settled for a more qualitative approach. By comparing the regional implications

of sectoral employment presented in section 4.4, it is possible to draw some general conclusions about the nature of the future regional labor market adjustment problems. The magnitude of the adjustment problems suggests, in turn, whether or not the projected developments are politically feasible in the sense that they could be acceptable with the current goal priorities.

The discussion on this point must combine two regional adjustment problems. One is historically associated with the contraction of the primary sectors in northern Sweden and the other with the rapid metropolitan growth of especially the Stockholm region, which is attributable to the expanding tertiary sector. Both these sectors incorporate many production units that are not as footloose as the corresponding establishments in the manufacturing industry.

The historical concentration of the tertiary sectors in metropolitan Sweden is shown in Table 11. The three metropolitan counties surrounding Stockholm, Gothenburg, and Malmoe in 1975 had about 36 percent of Sweden's total population and 39 percent of

TABLE 11 Population and employment shares (in percent) for three metropolitan counties (Stockholm, Gothenburg and Bohus, and Malmoehus) in 1970 and 1975.

	All three metropolitan counties		The metropolitan county of Stockholm, capital city of Sweden	
Production sector	1970	1975	1970	1975
Agriculture, forestry, fishing	15.6	15.7	3.4	3.4
Mining and quarrying	9.7	5.7	4.3	3.1
Manufacturing	31.0	30.1	13.4	12.5
Electricity, gas, heat, and water production	44.4	39.9	24.4	21.2
Construction industry	35.9	35.2	18.2	17.2
Wholesale and retail trade, hotels, restaurants	47.1	46.3	25.0	24.5
Transport and communications	47.4	48.7	25.5	25.4
Finance, insurance, housing services, consulting	61.1	57.8	40.6	38.2
Public services	42.3	43.0	24.2	24.7
Total employment in above sectors	38.3	38.7	19.9	20.1
Total population	36.1	35.9	18.3	18.2

SOURCE: Table 3.6 in Göteborgs kommun (1978).

its total employment. Their combined share of total employment was substantially higher in each one of the tertiary sectors. This was particularly the case for the finance, insurance, housing services, and consulting sector.* Moreover, most of this location bias was due to the high shares of the capital city of Stockholm.

*The decline in the employment concentration of this sector between 1970 and 1975 is probably due to a decentralization of certain large insurance companies and commercial banks. This decentralization was made possible by the relatively early and rapid introduction of computers and computerized information systems of Swedish insurance companies and banks.

Against this background it appears safe to conclude that each one of the sectoral employment projections in section 4.4 is bound to clash with present regional population and employment goals, if each region roughly maintains its 1975 sectoral employment shares. The base case projections appear incompatible with the regional employment goals because it seems unlikely that enough successful policies can be organized for the outmigration of the production of public and private services from Stockholm to distant cities. All four cases also forcefully induce a more concentrated urban settlement, even if the regional balance is restored through countervailing market forces or policies.

Our conclusion is that the higher the rate of productivity growth in the tertiary sector (especially in the public services sector) compared with the manufacturing sector, and the more labor saving its technical progress, the better the possibilities are of both attaining a rapid economic growth *and* restoring a more balanced development of regional labor markets.

According to the sectoral projections, the main structural adjustment in Sweden up to the year 2000 is associated with the declining importance of the manufacturing industry compared with the tertiary sectors in particular but also with the primary sectors. Since the primary sectors and the raw material based industries have a projected slower employment decline than other manufacturing sectors, the adjustment pressures of northern Sweden merely emanate from the same problem as all Sweden compared with the metropolitan regions: the pronounced concentration of tertiary production in the Stockholm area in particular and the disruptively strong projected expansion of such production.

One feature of this projected sectoral development is the almost equiproportional contraction of all parts of the manufacturing industry. Thus according to our projections, there are no marked differences between the earlier expanding parts of the manufacturing industry and those parts that have already been contracting for some time. This feature of the projections, which is attributable to the chosen world market scenario, is in our opinion rather unrealistic. All information about the emerging changes in the international division of labor in the world market for manufacturing products suggests strong incentives to structural adjustments in industrialized countries. At present we must unfortunately accept the sectoral projections. This implies that the regional adjustment associated with these projections will be small unless both the interregional division of labor is different *within* the investigated industrial sectors *and* the growth rates differ a great deal between the subsectors at more disaggregated levels. We know from the development in the 1960s and 1970s that this is likely (Ohlsson 1979, 1980d). The projected sectoral growth pattern, however, constitutes a break with earlier sectoral trends, which makes it difficult to bring the analysis further on this point by utilizing information at more detailed subsector levels.

In conclusion, the projected sectoral changes within the manufacturing industry do not give rise to problems concerning major additional impacts from this sector on the regional balance of the domestic labor market. The world market scenarios used for the projections, however, leave much doubt about the rather optimistic outlook for raw material and raw material based production as well as raw labor intensive production compared with more technologically sophisticated products.

6 EVALUATION AND POSSIBLE ELABORATIONS OF THE METHODOLOGICAL APPROACH

The main purpose of this study is to identify possible future development paths for the Swedish economy in a context where both world market conditions and domestic factor accumulation and productivity growth are explicitly taken into account. A second purpose is to apply a slightly new approach in the analysis of these issues. Thus after the presentation of our findings concerning the substantive issues, it is appropriate to evaluate the adopted methodological approach and to point out some future directions of research.

The basic idea in our approach is to focus on the interaction between domestic and world market factors within a general equilibrium framework. This framework is represented here by a general equilibrium model of the Swedish economy. The model analysis generated two results that are suitable points of departure for an evaluation of the approach.

The first of these is the projected improvement in Sweden's terms of trade, which takes place despite a considerable projected increase in oil prices. In a technical sense our result is the combined effect of three factors: the relatively low values of the price elasticity parameters in the import and export functions, a relatively fast projected growth of world market trade, and a relatively slow domestic economic growth. That these were the key factors was confirmed by an extensive sensitivity analysis of the results.

These findings suggest that it is important to take both the supply side (world market prices) and the demand side of the rest of the world explicitly into account in the analysis. Thus the terms of trade of the Swedish economy can be determined from world market prices, in foreign currency units, only when the rates of growth in Sweden and Sweden's trading partners coincide. When this is not the case, which is the normal situation, projections of world market prices become an uncertain basis for projections of the terms of trade.

Obviously our results for the projected development of the terms of trade depend on price elasticity parameters in the import and export functions. A rather extensive sensitivity analysis, however, with relatively large variations of the import and export price elasticities around the adopted values, indicated a substantial robustness of the results with respect to these parameters. Nevertheless the treatment of foreign trade in the model might be the crucial factor behind our results. This is because the very existence of downward sloping price-dependent import and export functions can be questioned for a country like Sweden, which to a large extent conforms to the concept of a small, open economy.

In such an economy the producers in the trade-exposed sectors in general can be regarded as price takers on international markets. Available econometric evidence, however, does not generally support the small, open economy assumptions for Sweden. We will not dwell on this issue here* but only point out that both our results and the specification of the model depends on the existence of downward sloping import and export functions.

The other result that was interesting from the methodological point of view was the limited structural change within the trade-exposed sector in our projections. Thus there were only two trading sectors with a considerably different development than the trade-

*A fairly extensive discussion about this issue can be found in Bergman and Pór (forthcoming).

exposed sector as a whole. These were the shipyards and the metal industry. That is, most of the projected reallocation of resources within the trade-exposed sector can be regarded as an adjustment to comparative advantage changes that have already taken place. This points to the basic difficulty with our approach: the projections of domestic factor accumulation and productivity change might well reflect the same expectations as those underlying the projections of world market prices and trade flows. If that is the case the two sets of projections cannot be used to generate projections of future changes in comparative advantages.

Thus our limited knowledge of the expectations underlying the projections of exogenous conditions used in this study makes it difficult to draw conclusions regarding future structural change in Sweden on the basis of our results. There seems to be two ways to approach this issue. One is simply to make a closer investigation of the scenarios for domestic factor accumulation and, particularly, for productivity growth. Another is to expand the representation of the rest of the world in the model in such a way that world market prices and trade flows can be generated from explicit assumptions of production accumulation, productivity change, and demand changes in the rest of the world. These approaches are not mutually exclusive, and neither can be preferred on *a priori* grounds.

It is clear that our approach rests on the assumption that the projection of world market conditions is independent of the projection of exogenous domestic conditions. Even if this assumption is satisfied one way or another, however, the usefulness of the exercises presented in this report to a large extent depends on the properties of the model used in the analysis. Obviously the model used in this study has definite limitations. A general equilibrium model of the type used here, i.e., where factors of production can be reallocated between sectors without friction, can be used to identify the degree of structural imbalance in the economy. If, however, the equilibrium allocation of resources at one point in time differs considerably from that at another point in time, it can only be concluded that some kind of structural change process must take place if both equilibria are to be realized; the model does not say anything about the nature of this process.

Consequently, a desirable improvement of the model would be to incorporate some of the rigidities that characterize the real world. The most natural elaboration of the model in this context would be to incorporate a "putty–clay" nature of capital, thus giving the model an explicit time dimension and a specification such that sectoral reallocations of capital take place through investments.* Further elaborations could involve an explicit regional dimension and a subdivision of the labor market into a number of more or less isolated submarkets.

From our results it is obvious that the public sector plays a crucial role in industrial development projections. Little is known about the rate of productivity change of the public sector and the determinants behind this change. Perhaps even more crucial from the methodological point of view is that no policy imposed rigidities could be taken into account. Nor is the role of the government in the formation of human and non-human capital explicitly recognized in the projection model. Possible elaborations of the public sector and the role of the government appear therefore as interesting future avenues of research.

*This is done in the "dynamic" model presented in Bergman and Pór (forthcoming).

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