RESTRICTURING AND ECONOMIC GROWTH
IN OECD COUNTRIES:
1964-1992

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INTRODUCTION

The empirical literature has long recognized the contribution of restructuring to economic growth, as illustrated by Clark (1940). The shift in economic activity from primary industries to manufacturing has been seen as an integral part of the growth process that shifts resources towards higher productivity activities with greater potential for technological advance. But the more recent restructuring from goods-producing to service-producing activity has not enjoyed the same broad recognition as a contributor to economic growth.

Some analysts and policy makers argue that the faster growth of the service sector relative to the goods sector threatens the longer-run capacity of the economy to sustain recent rates of productivity and real income growth. Their arguments follow from the "unbalanced growth" explanations of structural change like those offered by Baumol (1967) and Baumol et al. (1965), and the concept of "negative de-industrialization" suggested by Rowthorn and Wells (1987). Others, for example Bailly et al. (1997), Grewel and Wardley (1990), Curtis and Murthy (1991), Felli and Trin (1995) and Lipsey (1995; 1996) view service sector growth as potentially productivity- and growth-enhancing. They argue that the restructuring that accompanies service sector growth is based on increased sectoral specialization and inter-sectoral trade, which has at least the same potential to contribute to the dynamics of real income growth as the earlier primary industry to manufacturing restructuring and the specialization that accompanies growth in international trade.

The differences between these views rest essentially on different perceptions of the efficiency gains and externalities that induce and accompany structural change. Those who are pessimistic about the growth implications of restructuring toward services tend to emphasize the lower levels of productivity and slower rates of productivity growth observed in some parts of the service sector. A shift in economic activity and resources to this sector would appear to reduce overall productivity and the potential for growth. Those who are positive about the growth implications of service
Restructuring and Economic Growth in OECD Countries

This study examines empirical evidence on the restructuring of production and the service sector's contribution to aggregate economic growth of OECD countries. Using modified and extended versions of the two-sector economic growth model suggested by Feder (1983) and later used by Ram (1986; 1989), the growth implications of goods-sector/service-sector structural change are tested empirically. The results suggest that the growth of the service sector has made a significant positive contribution to aggregate economic growth in OECD countries from 1964–1982. However, this contribution amounts to more than the potential efficiency gains derived from the reallocation of resources between sectors. Evidence presented here suggests that it arises from the strong externality effects of service sector growth on goods sector production. These results contribute to the broader discussion of the role of economic re-structuring, and particularly the importance of the expansion of the service sector, in economic growth and national welfare.

The next section of the paper sets out two-sector growth models used for this analysis. We then discuss the data, definitions of sectors and the time periods used to examine the growth contribution of the service sector in a sample of industrialized OECD countries. We follow with a discussion of main findings of this exercise and concluding remarks.

The Models

Our primary interest is to evaluate the contribution of economic restructurings to growth in real Gross Domestic Product. From an examination of the data, the major and most striking aspect of this restructurings is the shift in the distribution of output and employment from the goods-producing to the service-producing sectors of the economy. We examine this restructuring first within a framework suggested by Feder (1983) in his study of the role of the export sector in growth. This approach was designed, and has been widely used, to examine the impact of growth of one sector, to overall economic growth. A modified version of this model was used by Ram (1986; 1989), with respect to the contribution to growth by the government sector. Because this model gives explicit recognition to the resource allocation efficiencies and the externalities that may accompany the restructuring of economic activity as one sector grows relative to other sectors, it is well-suited here as well.

However, the basic Feder model of growth has been criticized for including a major component of GDP as a determinant of GDP growth. Sheehy (1990; 1993) argues that the results of such models may be biased and suggests testing for bias by reversing the roles given to the sectors in the growth process. In terms of the initial growth model used here, this means reversing the roles of the goods and service sectors in the specification of the model and then testing to see if goods sector growth has a positive impact on GDP growth rates through efficiencies and externalities. Clearly, it is possible for both sectors to contribute to growth directly and through externalities, but both cannot provide efficiency gains as a result of restructuring.

We follow this suggestion, although this pattern of restructuring is clearly contrary to observations. Furthermore, explaining how goods sector growth might gen-
erate growth externalities, as the service sector does, is also more challenging. Regardless, that is not our objective: we are simply interested in testing the model for bias.

The results suggest that modifications to the Feder model are appropriate for our purpose. Accordingly, we extend the model to examine simultaneously the roles of the two broad sectors, and restructing between them, in the growth of real GDP. The remainder of this section of the paper sets out these steps in the derivation of the models, and modifications to these models that yield the set of equations on which our final estimates are based.

Consider first an economy composed of two sectors, one producing goods \( G \), and the other producing services \( S \). Real GDP \( Y \) is then:

\[
Y = G + S, \quad \text{where}
\]

\[
Q = G(K_{Q}, L_{Q})
\]

\[
S = S(K_{S}, L_{S})
\]

\[
K = K_{Q} + K_{S}
\]

\[
L = L_{Q} + L_{S}
\]

\( K \) and \( L \) are capital stock and labor inputs respectively.

Including \( S \) as an input to goods sector production captures the externality effect of increased service sector production on the goods sector and thus on GDP. A positive externality might be attributable to improvements in the availability, quality, and cost of service sector inputs to goods sector production when these inputs are obtained from specialized producers. More generally, as outlined above, increased information flows from improved communications facilities, increased financial service capacity, improved transportation facilities, and increases in general social overhead provision may impact positively on goods sector production.

Defining two sectors within the growth model also permits total output growth based on improvements in resource allocations between sectors. There are various ways to exploit this potential. For example, following Feder [1983], suppose the ratio of marginal factor productivities differs between sectors by \( b \), then

\[
S_{Q}/G_{Q} = S_{S}/G_{S} = 1 + b
\]

The sign of \( b \) indicates which of the two sectors has higher marginal productivity, and thus the direction of factor reallocation that would increase \( Y \) through improved efficiency, in the absence of externalities.

The production functions (2) and (3) along with (4) and (5), using the assumption that the marginal productivity of labor in goods production \( G_{L} = \beta Y/L \), can be manipulated to derive the following approximation for the growth of real GDP:

\[
Y = \alpha (Y/L) + \beta L + [b/(1 + b) + G_{L}] (S/L)
\]

In this equation \( \alpha \) is the marginal product of capital in the goods sector \( G_{K} \), and \( \beta \) is the impact of employment growth on GDP growth. More importantly, the parameter \([b/(1 + b) + G_{L}] \) gives the total effect of service sector size and growth on the growth of \( Y \).

With this specification, the service sector clearly has two effects on the growth of \( Y \): a "resource allocation" effect \( b/(1 + b) \), and an externality effect \( G_{L} \). They cannot, however, be identified separately. Nonetheless, estimating this equation yields a measure of the total effect of service sector size and growth.

Equation (6) also provides a base from which different and interesting variants of this model can be derived in order to examine the different aspects of the relationship between growth, structure and restructuring.

If, for example, there are no resource misallocations, \( b = 0 \), and no externalities, \( G_{L} = 0 \), then (6) becomes:

\[
\dot{Y} = \alpha (Y/L) + \beta L
\]

the familiar neoclassical sources of growth equation.

However, our main interest is in separating, if possible, the allocative efficiency and externality effects of the restructuring observed as growth in the service sector, both absolutely and relative to the goods sector. To this end we first follow Sheehey's [1996] suggestion to test the model for bias. This involves changing the initial specification of the model to yield the following approximation for GDP growth:

\[
\dot{Y} = \alpha (Y/L) + \beta L + [b/(1 + b) + S_{L}]/G_{L} Y
\]

which simply reverses the roles of the sectors in the growth process. It is clearly a different perspective on the basic argument we make about the nature of the contribution of restructuring to the growth process. Examples of the contribution of increased goods sector output to service sector output, beyond the contribution of capital goods, are more difficult to illustrate. Intermediate goods appear to play a much smaller role in service production than do intermediate services in goods production. Prepared meals entered for the food services industry might be one example of intermediate goods inputs to services, as might modular replacement components for use in the computer and electronics service and repair sector. But these inputs are clearly not as widely important to service sector output as communications, transportation, financial, maintenance, custodial, design, and other services are as inputs to goods sector output. Nevertheless, estimation results for equation (6a), reported below, do not rule out the possibility of bias in the parameters estimated on the basis of equation (6).

Indeed they raise a further interesting possibility. As Sheehey [1996, 158] recognizes, a significant positive contribution of the goods sector to GDP growth based on
equation (6a), in addition to that from services based on equation (6), may indicate the presence of externalities from both sectors, cross-externalities, in the growth process.

To explore this possibility we extended the specification of the service sector production function (3) to allow for the presence of externalities from goods production in equation (3a). As before, let real GDP \( Y \) include output from two sectors namely goods \( G \) and services \( S \) as in equation (1) above. Then

\[
(1) \quad Y = G + S_w
\]

\[
(2) \quad G = \Omega(K_m, L, S), \text{ and new}
\]

\[
(3a) \quad S = S(K_m, L, \Omega)
\]

Then using assumption (5) yields:

\[
(6b) \quad Y = \alpha(Y) + bL + [\beta(1 + \delta) + G]S + G \theta \frac{S}{Y} + S
\]

which nests equations (6) and (6a) to allow growth in both sectors to contribute to real GDP growth through cross-externalities, in addition to the direct effects of increases in capital stock and employment. It also provides for efficiency gains or losses from the restructuring of the economy between goods and services sectors, but those gains or losses are concealed in the overall effects of restructuring on growth.

We isolate each by using two alternatives to Fedor's (1965) assumptions about the relationships between factor marginal productivities by sector. First consider the case in which the marginal productivity of capital is the same in both goods production and service production:

\[
(8) \quad G_k = S_k
\]

while marginal productivities of labor differ by \( \epsilon \), such that:

\[
(9) \quad S_l/G_k = 1 + \epsilon
\]

and the marginal productivity of labor in goods production is related to average labor productivity in the economy, as before, \( \Omega = \beta(Y) \).

Particularly when the sample to be considered consists of industrialised economies with well-developed capital markets, it seems appropriate to assume that the marginal productivity of capital will be equal across sectors. Furthermore, the concern about goods-sector service-sector restructuring is usually expressed in terms of sectoral labor productivity differentials and the major shift in the sectoral distribution of employment produced by such restructuring. These assumptions focus on that aspect of the process and also correspond to the assumptions used by Dowrick (1989) in his study of growth and structural change.

Using assumptions (8) and (9) yields an equation that separates the resource efficiency and externalities. When the production functions (2) and (3a) are combined with assumptions (8) and (9) we get the following approximation for the growth of real GDP:

\[
(10) \quad \dot{Y} = \alpha(Y) + [\beta L + \delta L] + G \theta S(Y) + S + \dot{G} (YG)
\]

The composite parameter \( \alpha \) provides a measure of the efficiency gains or losses resulting from the reallocation of labor from goods to service sectors, based on differences in the marginal productivities of labor between sectors. \( G \) and \( S \) measure the externality effects of service sector growth on goods sector output, and goods sector growth on service sector output, respectively.

Second, consider the case in which sector marginal productivities of labor are linearly related to sector average labor productivity. For example, assume that:

\[
(11) \quad G_l = \mu(G) \Omega, \quad S_l = \lambda(S) \Omega
\]

which is consistent with a quasi-Cobb-Douglas production function. Then using assumption (8) that sectoral marginal productivities of capital are equal, and (11) rather than (9) yields:

\[
(12) \quad \dot{Y} = \alpha(Y) + [\beta L] + \delta L + G \theta S (Y) + G \theta S (Y) + S + \dot{G} (YG)
\]

This specification separates the efficiency and externalities effects of restructuring as does equation (10), but in a different way. It also measures sectoral employment effects directly. The effects of changes in employment are separated by sector and weighted by sector size in terms of output shares, which permits inference about the efficiency effects of employment restructuring. The externality effects also remain separate, as in equation (10). Dowrick and Gemmell (1991) have used this approach to sectoral productivity differentials in their examination of restructuring between agricultural and industrial sectors in the process of aggregate growth.

It is important to point out two possible shortcomings of these models. First, gives an explicit rule to technology or technological change as a factor in the explanation of income growth. However, the restructuring process itself, the main object of the analysis, is a change in the technique, organization, and technology of production particularly from the perspective suggested by Lipsey (1989, 1996). The externalities associated with sector growth can be interpreted as reflecting this dimension of the growth process. Secondly, the models do not include the possibility of "catch-up" as a factor explaining differences in growth rates. Although some other studies, for example Dowrick and Gemmell (1991), have integrated the potential for catch-up into their models, they have not reported results that isolate the catch-up component. This is a dimension of the growth process we refer to future work.
The overall result is a set of five equations linking restructuring to economic growth. The first two equations (6) and (6a) represent the basic Feder model, and the consistency test of that model suggested by Shoekey, respectively. They provide the background to equation (6b), which is the first full specification of GDP growth based on growth in factor inputs, and the externality and efficiency gains from economic restructuring. The last two equations (10) and (12), provide alternatives to equation (6b) which have the potential to yield separate estimates of the efficiency and externality effects of restructuring, based on alternative assumptions about the patterns of productivity differentials between sectors. Parameter estimates for these equations measure the effects of observed shifts in employment and output, from the goods sector to the service sector, on the rate of GDP growth. These effects lie at the heart of the debate about the role of restructuring in economic growth.

THE DATA AND VARIABLES

Our focus is on growth and structural change in fourteen industrialized OECD countries from 1964–1992. In preliminary work we found that pushing the sample period back before 1964 sharply reduced the number of countries for which the required data were available. On the other hand, it would be possible to expand the number of countries in the sample in later years. We have not done this in order to avoid the problem that a changing sample would cause for the interpretation of our results. We have restricted our work in this paper to the fourteen industrialized countries for which data are available for the full sample period.

The definitions of goods-producing and service-producing sectors within economies follow the usual practice as illustrated, for example, by Blades [1987]. The International Standard Industrial Classification of economic activity adopted by the United Nations in 1968 is used by the OECD in reporting national accounts and employment data. Within this framework we define the goods-producing sector to include: primary production, manufacturing, utilities and construction. The service sector includes the remaining activities, namely, trade, transport and communications, finance, insurance, real estate and business services, community social and personal services, and government services. Annual data for aggregate real GDP (Y), sectoral real GDP (S and G), real gross fixed capital formation (I), total employment (L) and sectoral employments (L_s, L_g), by country are from OECD National Accounts: Volume II (OECD, 1983; 1990; 1994) and OECD Labour Force Statistics (OECD, 1975; 1990; 1994).

An examination of the data based on these definitions suggested the division of the sample period into four sub-periods. These sub-periods are distinct in terms of their profiles of structural change, and their observed rates of growth, as illustrated by Table 1. In part these differences are likely a result of OPEC oil price shocks and the resulting domestic policy responses, as well as other factors we cannot identify. For our purposes the observed growth rates in aggregate real GDP (Y) define the sub-periods 1964-75, 1975-81, 1982-87 and 1988-92, each of which runs approximately from cyclical peak to cyclical peak within the 1964-1992 sample period. Growth rates for each sub-period were calculated by ordinary least squares estimation, using a time variable.

We have used these sub-periods in two ways. First, they provide the basis for constructing four panels of data for each of the fourteen countries in the sample. Each data panel includes annual averages, for the sub-period, of the variables in the estimating equations. This procedure recognizes the longer-term aspects of the growth and restructuring we wish to examine. Pooling these data panels provides a sample of 55 observations for statistical tests of the models. Second, to control for the effects of different underlying conditions on aggregate GDP growth rates, we have introduced sub-period dummy variables to capture these differences, essentially through shifts in the intercepts of the estimated equations. The intent is to sharpen the estimates of the impacts of investment, employment growth and restructuring on real GDP growth.

The next section presents and discusses the contribution of service sector growth and economic restructuring to the growth of real GDP, based on estimations using the pooled data for the 1964-1992 period.

THE EMPirical RESULTS

Table 2 presents parameter estimates for the equations derived above. The presentation is organized, in the left-hand column, in terms of the parameters that measure investment, employment and sector output effects on GDP growth, plus the dummy variables used to allow for different underlying conditions in the sub-periods.
Equation (6) is the basic Fedor model, (6a) the consistency test of that model as suggested by Sheehy and (6b) the nested model which allows for the possibility of cross-sectoral externalities. Estimates from equations (10) and (12) provide alternative measures of the efficiency and externality effects of the restructuring of economic activity between the goods sector and the service sector. Overall the results provide strong support for the positive role of restructuring in economic growth based primarily on the externalities that we see as resulting from increased sectoral specialization and inter-sectoral complementarities in production.

The first evidence that restructuring contributes to growth is provided by equation (6). Estimates based on this specification suggest that growth in capital stock, employment and the service sector play a significant positive contribution to the growth rate of real GDP. Parameter estimates for the sub-period dummy variables confirm our expectation that different general economic conditions within the sample period also play a role in the explanation of variations in growth rates. Service sector growth contributes to GDP growth through a combination of efficiency effects and externalities, but these effects are not identified or estimated separately in this specification. Furthermore, the results ignore the role of goods sector growth as a determinant of GDP growth, except as it is captured directly by employment and capital stock growth. They may simply reflect the positive correlation between GDP growth and service sector growth when the latter is a major component of GDP, the argument for the test suggested by Sheehy (1993).

The estimates based on equation (6a) are a response to this suggestion. They show that goods sector output growth also has a positive impact on GDP growth above and beyond the effects of growth in employment and capital stock. In this case, however, the total effect of growth in sector size and share is much smaller than in the case of service sector growth, as anticipated by our initial specification. But the results still raise the question of how restructuring contributes to economic growth.

Clearly, there cannot be efficiency gains from both the patterns of restructuring reported in equations (6a and 6b). If one sector has higher marginal factor productivity, the other by definition must have lower marginal factor productivity. Reallocation resources between sectors can only have a positive effect on growth in one direction, or no effect if marginal productivities do not differ between sectors. We cannot reconcile positive growth effects from both sectors based on efficiency gains. However, growth in either sector can have a positive externality effect on the other sector. The implication is that restructuring in either direction can contribute to higher economic growth even if marginal productivities differ between sectors as long as the externality effects of output growth in the sector of lower marginal factor productivity are large enough to overshadow any efficiency losses. Alternatively, and more simply, there may be no differences in marginal productivities between sectors and no efficiency effects, just externalities arising from the restructuring of output. Estimation results for equation (6b) provide the initial evidence.

The parameter estimates for this equation are consistent with the presence of cross-externalities. Growth in either goods sector size and share has a significant positive effect on the GDP growth rate. As in the earlier separate estimates, the effect of restructuring from goods to services is much larger.
than restructuring in the opposite direction. However, by this specification service sector growth involves both externality effects and efficiency effects without identifying them separately. We cannot tell what combination of efficiency gains or losses and positive or negative externalities may be present.

Equations (10) and (12) offer alternative estimates of the efficiency gains and externalities that restructuring contributes to the growth of real GDP. The parameter estimates on service sector employment growth in (10) is positive but not significant, suggesting that service sector growth does not contribute to overall economic growth through efficiencies from the reallocation of employment. This result is not surprising in developed economies with extensive labor markets, and is consistent with Dowrick’s (1989) results. It is the restructuring of output that makes a strong positive contribution to growth through externalities, primarily the gains from increased sectoral specialization and the accompanying reorganization of production, perhaps along the lines suggested by Lipsey (1965).

Equation (12) offers a somewhat different perspective and one perhaps more in line with the balance of popular opinion on the differences between goods and service sectors. The effect of service sector employment growth is again insignificant, but the effect of goods sector employment growth is positive and significant. Labor inputs appear to have a higher marginal productivity in goods production than in service production. Restructuring employment from goods to services, which is the pattern of employment restructuring observed in this sample of countries in this period, might cause efficiency losses in circumstances where the technology of production was constant. However, the externally effects of restructuring output are strongly positive. Service sector output growth results in growth in total output that clearly exceeds its own expansion. Recognizing the possible efficiency losses of employment restructuring, the implication would seem to be that service sector output growth based just on internal productivity increases and technological advance has the potential to be a strong engine of GDP expansion, through its impacts on the structure and organization of goods sector production.

In summary, the estimation results on equations (6b), (10), and (12) provide some interesting insights into the way goods-sector to service-sector restructuring impacts on GDP growth rates. Based on equation (6b), we find that restructuring output through service sector growth that is higher than goods sector growth has a significant total effect on real GDP growth rates, but we cannot identify the efficiency and externality sources of that effect. From equation (10) we find that employment restructuring toward services does not have a significant positive impact on GDP growth, indicating that the marginal productivity of labor in service production is not higher than in goods production. This result is not surprising. It is the externality effect of service sector output growth that is strong and positive. It must be the primary source of the positive overall effect found in (6b). The estimation results for (12) lend support to this interpretation, and strengthen the role of externalities arising from differentials in the rates of growth of sectoral output. But just restructuring employment from goods to services would appear to reduce GDP growth rates.

## SUMMARY AND CONCLUSIONS

The experience of a sample of OECD countries, over the 1964 to 1992 time period, shows that growth in real GDP was enhanced by the restructuring of output and employment that accompanied growth in the service-producing sectors of these economies. In broad terms our results indicate that investment and restructuring were the keys to real GDP growth. The redistribution of employment between sectors had ambiguous effects on growth, and at best only contributed relatively small efficiency gains to the growth process. Restructuring output, on the other hand, in terms of the growth in the size and share of the service producing sector of the economy, generated strong positive externalities that increased real GDP growth rates. These results are consistent with the views that restructuring yields positive growth rate effects by enhancing output and productivity in the “declining” sector through the provision of improved intermediate inputs to production, increased sector specialization, broader and deeper markets and increased inter-sector trade. On a wider scale, the restructuring that supports the growth in the service sector reflects the improvements in organization and technology in all sectors of the economy made possible by new and improved service sector outputs. Based on this recent experience, ongoing technological advances in business and financial services, in transportation and communications, and in information technology should provide continuing opportunities for a growing service sector to make strong contributions to real GDP growth rates.

## NOTES

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1. All regressions are based on the following 14 industrialized countries: Canada, United States, Japan, Austria, Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Norway, Sweden, and the United Kingdom. The choice of countries was dictated by the availability of sector-specific time series data over the 1964-1992 period.

2. Industry-specific GDP data for the United States are not available beyond 1987 and it has been excluded from the 1988-92 data. Hence we only have 13 observations for the last period, giving a total of 76 observations for the entire sample period.
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The Outlook for EMU

Introduction

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On January 1 of this year, the Euro was launched. Although actual notes and coins denominated in Euro will not begin circulating until January 1, 2002, the exchange rates between the currencies of the eleven participating countries (Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain) and the Euro have been irrevocably fixed, so that their currencies for practical purposes stand in a relation much like nickels, dimes, and quarters

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