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THE RECENT SLOWDOWN OF
PRODUCTIVITY GROWTH

by

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The slowdown of productivity growth in the developed countries during the seventies will in this paper be viewed as a combined effect of three closely interacting forces: (I) a long-term deterioration in the efficiency and flexibility of some basic mechanisms of the economic and political systems of these countries; (II) the fading away of a number of uniquely favourable circumstances for productivity growth during the fifties and sixties; and (III) the exposure of these economies to unusually severe macroeconomic disturbances in the seventies.

Careful inspection of time series, with attempted modifications for cyclical factors, suggests that there was hardly any general slowdown of productivity growth among developed countries before approximately 1972-74.¹ As we know, the situation is

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1) For year-by-year data, see Maddison (1979); the US Bureau of Labor Statistics; Christensen, Cummings and Jorgenson (1980); and Åberg (1982). See also Chart 1.

radically different since then. Labour productivity growth per year for the entire national economy (GDP per man-hour) seems to have fallen between the periods 1960-73 and 1973-79 by about 1.2 percentage points in the US (45 percent), by about 2.4 percentage points in Western Europe¹ (45 percent), and by about 5.9 percentage points in Japan (60 percent); Table 1, see also Chart 1. The slowdown was of about the same size in the business and manufacturing sectors; see Table 1. To calculate the extent of the slowdown of total factor productivity growth is, of course, a much more hazardous matter to which I will return later.

If just the various system changes, and the fading away of the uniquely favourable factors, had been the dominating forces behind the productivity growth slowdown, we would expect the slowdown to have been gradual rather than abrupt, as it turned out to be. This abruptness, as well as its timing, makes the dramatic macroeconomic disturbances around 1972-74 a prime suspect when looking for the villain behind the productivity growth slowdown. Indeed, it is a basic hypothesis of the paper that these macroeconomic disturbances were not only by themselves strongly unfavourable for productivity growth, but that they also revealed and accentuated the gradual deterioration of the functioning of our economic and political systems, and brought, prematurely, some of the uniquely favourable conditions for productivity growth to an end.

1) Averages for countries will in this paper always refer to unweighted averages.

1.0
everingham
diagram
2.2
everingham
diagram
5.8

Chart 1 Labour productivity growth for the national economies (GDP per man-hour). Average rates, percent per year.

Sources: Basic data from Angus Maddison, (1979) and (1981).

¹Unweighted averages of 12 and 9 countries, respectively.

I. System Changes

(1) The first trendwise change in the basic mechanisms of the Western economic and political systems to be considered is the apparently permanent and since the mid-sixties rising inflation trend - a trend which most likely was further aggravated by the productivity growth slowdown itself in the seventies.

Admittedly, we have rather limited understanding of the consequences for productivity growth of this inflationary bias. There seems, however, to be more or less general agreement about at least three channels through which negative effects on productivity

Table 1 Productivity growth in the OECD area

	Maddison estim. National economy ¹ 60-73 73-79 Change	A.L. estim. Non- Farm Business Sector ² 60-73 73-78 Change	Kendrick estim. Business Sector ² 60-73 73-79 Change	Åberg estim.* Manufacturing ² 60-73 73-80 Change
<u>Western Europe³</u>				
Lab. prod.	5.2	3.0	5.9	5.8
Contr. K/L subst.	-2.4	-2.3	3.2	3.4
Tot. fact. prod.		2.0 1.8	2.1 1.8	2.7 1.5
Denison-type resid. ⁴		3.3 1.2	3.8 1.4	3.1 1.9
			2.6 1.4	-1.2
<u>Japan</u>				
Lab. prod.	9.8	3.3	9.9	9.9
Contr. K/L subst.	-5.9	-5.2	3.8	4.6
Tot. fact. prod.		4.0 2.7	2.0	5.7
Denison-type resid. ⁴		4.5 0.6	1.8	2.7
			3.9 2.1	4.2 1.9
			-1.8	-2.3
<u>US</u>				
Lab. prod.	2.6	0.9	3.1	3.8
Contr. K/L subst.	-1.2	-1.6	1.1	2.1
Tot. fact. prod.		0.7 0.5	-2.0	2.7
Denison-type resid. ⁴		1.8 0.6	0.5	1.0
			-1.3	-1.7
			1.2 0.5	1.2 0.0
<u>All countries³</u>				
Lab. prod.	5.0	2.6	5.8	5.9
Contr. K/L subst.	-2.3	-2.6	2.8	3.3
Tot. fact. prod.		1.9 1.7	1.6	3.0
Denison-type resid. ⁴		3.2 0.9	1.2	1.5
			2.5 1.3	2.9 1.8
			-1.2	-1.1

*In Åberg's figures (1982) the input of capital is measured as "capital services", reflecting both short-term and long-term changes in capacity utilization and changes in the "quality" of capital inputs. Åberg's estimates of "capital services" are based on profit statistics, calculated at constant absolute and relative prices.

¹GDP per man-hour.

²Real value added per man-hour.

³Arithmetic average. For information about included countries, see Statistical Appendix, Table A:1 and Chart A:1.

⁴Defined as labour productivity growth minus the contribution of capital-labour substitution, changes in the composition of the labor force, reallocation of labour, dynamic returns to scale and government regulations - as estimated by Kendrick (1981).

Sources: Maddison (1981), Åberg (1982); and OECD documents CPE/WP2(79)8, CPE/WP2(80)3, OECD Memorandum, March 4, 1982. See also Statistical Appendix for figures for individual countries.

growth are likely to arise: (i) via large fluctuations in the rates of change of absolute and relative prices including real interest rates, and therewith connected price uncertainties and the costs of dealing with these; (ii) via distortions of relative prices and of the tax system; and (iii) via the induced attempts by the authorities to fight the inflation trend by way of price and wage controls and/or restrictive demand management policies - resulting in capacity slack, slow output growth, squeezed profits and increased uncertainties both about the level of aggregate demand and about policy interventions. The rate of capital accumulation as well as efficiency in the allocation of resources are likely to suffer.

(2) The fall in the profitability of firms in the seventies should be similarly seen not only as a historically unique, temporary disturbance, but as a long-term trend as well.¹ Economists relying heavily on production function analysis are likely to argue that the falling rate of profit for the developed world as a whole is a result of several decades of heavy capital-labour substitution which has not been fully compensated by labour-saving biased technological progress. However, I would also like to emphasize the apparent increase in international competition due to the reconstruction of earlier damaged national economies in developed countries, trade liberalization, international technological transfers and the emergence of the Newly Industrialized Countries, following Japan, as competitors on world markets for manufacturing goods. In individual countries, other factors too have, of course, contributed to the trendwise fall in

1) OECD Secretariat document CPE/WP2(80)3. Chart 2, panel 1, below shows the time path of the profit share in the business sector.

profitability, such as stronger and/or more aggressive labour unions, labour shortages in the sixties and price controls and restrictive economic policies in the seventies, as well as an appreciation trend of some national currencies that has been leading domestic factor price formation.

harlan?

It is natural to expect this development in profitability to result in slower output growth, as part of previously produced output will become unprofitable. To the extent that the trendwise fall in profitability is not compensated by a trendwise fall in the required rate of return, we would also expect slower investment growth, as will be discussed below. However, it is a delicate matter to judge to what extent the various factors behind the falling profitability trend should be regarded as evidence of a "deterioration" in the functioning of our economies.

(3) A third apparent recent change in many Western economies is a deterioration in the functioning of markets and in the efficiency of economic incentives, in particular perhaps in factor markets - often as unintended side effects of social reforms and other policy interventions; see Lindbeck (1981).

For instance, it would seem that the functioning of the credit market, or more specifically the efficiency of competition in that market, has been seriously undermined by the combined effects of high marginal tax rates for people who are strongly active in that market; high inflation in the context of a basically nominalistic tax system; and considerable asymmetries and non-neutralities in the tax treatment of different types of assets, including the taxation of production firms. As a result financial funds have tended, in many countries, to be siphoned away to investment in durable consumer goods, including

houses, and to various types of collectors' items - at the expense of investment in assets that yield income in money terms including shares, which are often important sources of finance for physical investment in the production system. Predictable effects are, again, a slowdown of investment growth in the business sector and distortions of the allocation of resources - effects which have often been accentuated by government regulation and (when looking at the efficiency of the allocation of investment) also by selective subsidies.

Distortions of the labour market are also easy to identify. For instance, as new legislation on firing and on seniority rights makes labour more of a fixed cost than earlier, labour mobility tends to fall, and firms tend to be financially drained during prolonged recessions, with detrimental effects on the solvency of firms and hence also on investment growth. Moreover, it is unavoidable that high marginal tax rates create substitution effects against work effort; the ambition to strive for promotion; the willingness to shift from one job to another; and, if the tax system is progressive, against the ambition to invest in human capital where the return is obtained in money terms rather than "in kind", such as congenial work; see Lindbeck (1981). It should be emphasized, however, that some of the reforms that have been financed by these taxes may have been favourable to productivity growth - in particular perhaps public spending to stimulate investment in human capital in a wide sense of the term.

(4) A fourth and more profound long-term change in the economic systems of the developed countries is that there seem to have been changes in the behaviour patterns of private agents, in the sense that they react to given information and given economic incentives in a different way than before. A particularly

interesting aspect of such changes is that private agents adjust their behaviour patterns to past and expected government policies - a point that has been emphasized, though often in a rather one-sided way, by the "rational expectations" school.¹ In some cases this type of behaviour may be highly favourable for output and productivity growth, as when firms dare invest because of strong confidence in a high level of capacity utilization and rapid growth of aggregate demand. However, if unions and firms start to raise wages and prices more aggressively than before because of a belief that the government, in order to guarantee full employment, will accommodate any cost increases by demand expansion, possibly combined with a depreciating currency, the ensuing accentuation of the inflation trend may later on force the government itself to destroy this confidence in a high level of capacity utilization and brisk expansion of demand with restrictive demand management policies and/or price controls. In this sense full employment policies may in a long-run perspective carry the seeds of its own destruction.

Another example is the possibility that employees start to resist shifting to other jobs and geographical regions not only because of legislation on job security, high marginal tax rates and high social security benefits, but also because employees believe that the government will bail them, and "their" firms, out by trade restrictions, or more often perhaps selective subsidies. Moreover, in such a society, the returns to bargaining with governments ("rent seeking") will often be high as compared with ordinary production and marketing activities - with negative consequences not only for the allocation of resources but also for the efficiency of work effort of managers.

1) This literature was largely initiated by a seminal paper by Robert Lucas (1972).

When all these various system changes, in the form of market distortions, disincentives, inflexibilities and uncertainties, are considered, it is tempting to speak of an emerging "arterio-sclerosis" of the Western economic systems, accentuated by the resistance to change and the fights about income shares - by organized interest groups; Lindbeck (1982).

II. Fading Away of Favourable Circumstances

The long-term system changes discussed above, including the breakdown of the confidence in high capacity utilization, are not the only example of historically uniquely favourable circumstances for productivity growth that have tended to disappear. We can also notice the fading away of some more specific favourable factors.

One example is the gradual disappearance during the seventies of the particularly favourable opportunities for "easy" reallocation gains by tapping the pool of labour in low-productivity agriculture as well as by the restoration of free international trade after two decades of autarchic tendencies. The expansion of world trade also contributed to the increased availability of large quantities of energy at gradually lower real prices. Among the specific favourable factors that were bound to disappear were, of course, also the possibilities of countries other than the US to catch up with the most advanced existing technology.

In fact, most of these specific factors may be regarded as largely once-and-for-all possibilities of productivity increases, inherited from the past because of the retardation of resource reallocation, international trade and international technology transfer during the immediately preceding decades,

largely because of the Great Depression and the Second World War. The importance of the subsidence of these specific factors for productivity growth during the seventies will be considered subsequently, in the context of an analysis of the so-called "proximate sources" of productivity growth.

III. Macroeconomic Disturbances

The dramatic macroeconomic disturbances around 1972-74 (in fact repeated in 1979-81) took the form of both drastic reductions of aggregate demand and large increases of some relative prices of inputs of major macroeconomic importance.

The gradually steeper inflation trend during the sixties and early seventies would probably sooner or later have induced restrictive policies anyway. However, the abrupt reduction in aggregate demand and capacity utilization around 1974 was, of course, a direct consequence of the unwillingness of governments to compensate fully, by way of demand expansion in money terms, for the cost increases and the "income drain" that was implied by the dramatic price increases of oil and raw materials on world markets around 1972-74 after a period of rapidly rising inflation.

However, these were not the only macroeconomic relative price disturbances. There were also two periods of pronounced "overshooting" of the product wage rate¹ relative to labour productivity - around 1970-71 and around 1974-75, the latter one immediately after the price explosion for oil and raw materials;

1) Defined here as employee compensation per hour paid by firms (W), divided by the value added price (P).

see Chart 3. For instance, there was during the entire period 1967-76 an accumulated "overshooting" of product wage rates relative to labour productivity in manufacturing in the OECD countries by an average of about 11 percent; in 1979, 8 percentage points of this overshooting still remained. As the other side of the coin, while the capital income share in manufacturing in the OECD countries had fallen gradually from about 29 to 25 percent on average during the ten-year period 1960-70, it dropped further to about 19 percent in 1975, and has recovered only slightly since then.¹ (In the period 1980-82, we may speak about an "overshooting" of real interest rates as well, which accentuated the fall in profitability, in particular for additions to the capital stock.)

The slowdown of investment growth

The slowdown of investment growth during the seventies should be seen in the perspective of the changes in aggregate demand and macroeconomic relative prices discussed above, and therewith connected slowdown of output growth; Charts 2 and 3. It is suggestive that the rate of change of the investment share of value added has tended to follow the rate of change of the capital income share quite closely with a one-year lag (Chart 2, panels 4 and 5) - perhaps as closely in fact as investment growth has followed value added growth (panels 2 and 3). It would therefore be of interest to know how much

1) For the statistical sources see Chart 3. The development was similar for the entire business sector; see Chart 2.

Real wage rates for employees show a rather similar time profile as does the product wage rate, though the downward adjustment after the oil and raw material oil shocks seems to have occurred somewhat more promptly for the former; see Chart 3.

of the fall in investment growth after 1973 should be regarded as a result of the profit squeeze and how much as a result of the fall in output (or value added) growth.

One approach to this difficult issue is to make a cross-country regression of average investment growth on both average profits and the average growth of output (value added) during the entire 1960-73 period, whereby cyclical factors are largely removed. If we apply the estimated elasticities with respect to the profitability variable to the actual profit drop in the seventies, it seems that we can explain 0.6 to 1.3 percentage points of the slowdown of investment growth - or about fifteen to thirty percent on average for OECD countries.¹ Time-series regressions of investment functions may be an alternative approach. Such estimates by the OECD secretariat for individual countries, if applied to recent experience, suggest that the profit variable has had an influence on the magnitude of the figure in the upper end of the interval just mentioned.²

According to both the cross-country and the time-series estimates, the output growth variable would explain a considerably larger fraction of the slowdown of investment growth than does the profitability variable - in fact two or three times as much. Thus, according to these estimates, the fall in profitability and output growth after 1973 would, taken together, explain at least three quarters of the slowdown of investment growth in Western Europe; and about one half in the US and Japan.

It should be emphasized that the results of these regressions, as of all other regressions in the paper, are presented as rough

1) Thus, it is assumed that cross-country elasticities that are estimated for the 1960-73 period can be applied to analyze the effects of the profit squeeze in the seventies.

See Appendix TA:1 for the regressions, and Statistical Appendix for the calculated effects on investment growth.

2) Statistical Appendix Table A:2, and OECD document DES WP1/EM(81)4. I then assume constant real capital costs.

Chart 2

Investments, profits and output (real value added) in the business sector of the OECD area, unweighted averages of eleven countries.¹

Sources: OECD; annex to CPE/WP2(80)1, annex to CPE/WP2(80)3 and National Accounts.

Note: I = gross private non-residential investment (for Norway and UK excluding the petroleum and gas sectors)

R = gross operating surplus adjusted by OECD to account for labour income share for the self-employed

V = real value added

¹Canada, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Sweden, United Kingdom and United States.

Chart 3 Annual percentage change in real value added ($\hat{V}$), labor productivity ($\hat{V}/\hat{L}$), product wage rate ($\hat{W}/\hat{P}$) and real wage rate ($\hat{W}_h/\hat{P}_c$), unweighted averages for manufacturing in ten OECD countries.¹

Sources: US Bureau of Labor Statistics, OECD and UN statistics.

Note: W = employee compensation per hour paid by firms; W_h = earnings per hour obtained by employees; P = value added prices; and P_c = consumer goods prices.

¹Belgium, Canada, Denmark, France, Germany, Italy, Japan, Sweden, United Kingdom and United States.

IV. Proximate Sources

The next step in the analysis is to look more explicitly at the various channels through which the "background forces" discussed above are transmitted to productivity growth. Or, in terms of growth accounting, what are the "proximate sources" of productivity growth, through which the background forces exert their influence?

The analytical structure that is required for this discussion is, of course, a postulated aggregate production function for gross output - the independent variables being not only inputs of capital and labour, disaggregated by sectors and adjusted for quality changes and for variations in capacity utilization, but also inputs of energy and raw materials. Though ideally we would like to be able to analyze all these proximate sources simultaneously, in practice we have to settle for separate analyses of different "pieces" of the postulated aggregate production function, with informal attempts only to take account of the various inter-dependencies. Five such "proximate sources" will be considered in some detail.

(1) Capital-labour substitution (capital deepening)

On the basis of official statistics for capital and labour inputs (collected by OECD), and approximating the elasticity of real value added with respect to capital inputs (both calculated per unit of labour input) with the capital income share, we may calculate that the retardation in the rate

other variables that stimulate productivity growth. Such an estimate, for the period 1960-73, gives elasticities that are more than twice as high as the figures for the capital income shares, or more specifically 0.7-0.9 rather than 0.3-0.4.¹

A basic assumption behind using these cross-country elasticity estimates (from the 1960-73 period) to explain the effects of capital accumulation after 1973 is, of course, that the elasticity has not changed (much).² Then we obtain calculated contributions of capital-labour substitution to the slowdown of labour productivity growth in the range of 0.5-1.0 percentage points - as an average for OECD countries.³

Moreover, quality reductions of the capital stock due to obsolescence, caused by the dramatic changes in comparative advantages and relative prices, in the seventies are not recorded in official statistics on capital stocks. To the extent that

1) Time series regressions for individual countries, with adjustments for variations in capacity utilization, and with a separate time-trend variable, often give elasticities in the range of 0.4-0.6; Nelson (1964), Clarc (1978), and Åberg (1982). Of course regressing one endogenous variable on another, whether on cross section or time series data, is subject to a great number of well-known problems.

2) In contrast, elasticities estimated for the period 1973-79 on the basis of the same type of data vary from 0.53 to 0.63; see Appendix TA:2. However, the quality of these regressions is considerably poorer including the t-values. My interpretation is that the implicit ceteris paribus assumptions of the regression are more unrealistic for the second period than for the first.

3) For figures for individual countries, see Statistical Appendix.

labour inputs have not been reduced in proportion to the fall in the "effective" capital stock, this obsolescence is another reason to assume that the conventional calculations presented above underestimate the importance for the productivity growth slowdown of the retardations of capital-labour substitution.¹

(For instance, government subsidies have in several countries kept otherwise obsolete capital in operation, for instance in steel and shipbuilding.)

The most obvious conclusion of this discussion is that empirical calculations of the effects on labour productivity growth of capital-labour substitution are extremely unreliable. However, on the basis of the discussion above, realistically calculated figures may very well be of the magnitude of $\frac{1}{2}$ to $\frac{3}{4}$ of a percentage point per year, i.e. 20-30 percent of the slowdown of labour productivity growth - including the effects of both the fall in embodied technological advance and increased obsolescence of the earlier existing capital stock. Figures much higher than this (1.4 percentage points) have in fact been estimated by Yngve Åberg (1982) when measuring capital inputs by "capital services", rather than by officially recorded capital stocks; Table 1.

1) Martin Baily Jr (1981) argues that adjustments of the official statistics of capital stocks for such obsolescence would require a doubling of the official figures for the slowdown of the rate of capital accumulation in the US. If this calculation is taken seriously, and using 0.3 as the elasticity of output with respect to capital inputs, another 0.2-0.4 percentage points of the slowdown of labour productivity growth would be caused by slower capital accumulation in that country. See Technical Appendix TA:3.

(2) Substitution away from energy and raw materials

Two types of effects of the dramatic relative price increases of energy and raw materials have already been considered in connection with the discussion of the macroeconomic disturbances: (1) the "direct drain" on real income that is available for absorption (without reduced net wealth), due to the terms of trade loss; and (2) the induced fall in capacity utilization and profitability - due both to the reduction in aggregate demand and to the inability of product wage rates to adjust rapidly downward.

What remains to be discussed is (3) the effect of substitutions away from energy and raw materials in the production

process in response to the higher relative prices of these. Only this effect will be classified here as a "proximate source" of productivity growth, as this is the only one with a "direct" influence on gross output and real value added in the context of the production function; see Appendix TA:4. Using rather realistic assumptions about quantitative relations we may calculate that while the terms of trade loss of the energy prices increase in 1973-74 "typically" was about 2.5 percent of GDP in developed countries, about 0.4-0.8 percentage points may have been recouped in a five to ten year perspective by the substitutions away from energy; see Appendix TA:4. (The oil price disturbance was of about the same size relative to GDP in 1979-80.)

Moreover, based on Michael Bruno's statistics for relative prices of raw materials (Bruno 1981), we can estimate a (temporary) terms-of-trade loss of about 2.8 percent of GDP due to the relative price increase for this type of input in 1972-73, mitigated by the effect of a substitution away from raw materials that may have recouped about 0.1-0.2 percentage points; see Appendix TA:4.

As the substitution away from energy and raw materials to the "composite" of labour and capital mitigates the terms of trade loss, why do economists engaged in growth accounting say that these substitutions have contributed to the slowdown of productivity growth? The explanation must be that they try to answer the question: What are the effects on the growth rate of real value added of the substitution away from energy and raw materials, evaluated at the initial relative prices of these? It is easy to show that this "loss" is of approximately the same magnitude as the earlier mentioned "gain" due to substitutions when the calculations are made at the new relative prices; Appendix TA:4.¹ By such a definition of the "loss" of productivity due to substitutions away from energy and raw materials, the conclusion is that the annual rate of productivity growth during the period 1973-79 may have been reduced by about 0.1 percentage point for the national economy and about 0.2 percentage points for manufacturing - measured at

1) If the calculations are based on an average of initial and final prices, the effect tends to vanish.

initial relative prices.¹

Of course, this is not the whole story. As energy seems to be a much closer substitute to labour than to capital, the capital-labour ratio within the capital-labour "combine" would fall - an effect that is accentuated if energy and capital are in fact gross complements. However, this substitution effect has already been considered in the previous discussion of the retardation in the rate of capital-labour substitution.

All this indicates that the main effects on productivity growth of the relative price increases for oil and raw materials must be by way of the earlier discussed "indirect effects",

via the various macroeconomic variables, i.e., via capacity slack, slower growth of output, capital accumulation, etc., rather than by way of the "direct effects" on production via substitutions away from energy and raw materials.

1) Calculated as the annual rates of change that result from a change of 0.4-0.8 percent over six years for energy and 0.1-0.2 percent for raw materials for the national economy (0.3-0.6 for manufacturing).

Michael Bruno (1981) reports considerably higher figures for the sum of the effects of the oil and the raw material price increases. However, in his theoretical analysis Bruno uses a formula for the loss in gross output rather than value added, expressed as the fall in the energy bill, evaluated at the initial price of energy. Obviously, this is not the relevant concept if we want to analyze the slowdown of productivity growth. In the empirical regression analysis Bruno catches, in principle, various indirect effects of the price increases as well - and in fact also various other factors that are correlated with the price increases.

(3) "Direct" importance of capacity slack and output growth

It is empirically quite well established by now that measured labour productivity growth shows a pronounced procyclical pattern, because labour is not laid off in proportion to the reduction in the input of labour (and capital) services in the production of current output during business downswings. Schematic calculations based on behaviour patterns from "ordinary" business cycles suggest a rather important role for the increased capacity slack between 1973 and 1979 in explaining the slowdown of labour productivity growth. As an average for OECD countries a slowdown of labour productivity growth of approximately half a percentage point would be consistent with reasonable empirical assumptions based on previous experience; see Appendix TA:5.

However, such calculations would probably give upward biased estimates, as the capacity slack in the seventies has been of much longer duration than during normal cyclical recessions, which means that firms have had more time than usual to reduce the labour force to what is required for current output.¹ This would then mean that for the seventies as a whole the indirect effects on productivity growth of increased slack via the macroeconomic system - i.e., via the slowdown of output growth, capital accumulation and the process of reallocation of resources - most likely dominate over the "direct" cyclical effect of increased capacity slack as calculated above.

1) Thus, even if a sustained increase in capacity slack has a pronounced negative effect on output growth, there is not necessarily an equally pronounced effect on labour productivity growth.

However, systematic medium and long-term relations between output growth and productivity growth may also exist. In particular, we may hypothesize about a distinction between two kinds of relations, each connected to a specific type of productivity growth. One type is characterized by productivity growth along an equilibrium path, with "normal" profitability, where a Verdoorn-type law is often asserted to operate with "dynamic returns to scale" in the sense that productivity growth is stimulated by output growth. For instance, this type of effect is assumed, and estimated, in Denison-type growth accounting. Along these lines, John Kendrick (1981) calculates that the retardation of output growth after 1973 contributed to a slowdown of 0.3 percentage point of annual productivity growth - measured as an (unweighted) average for developed countries.

The other type of productivity growth may rather be classified as growth along a disequilibrium path, where subnormal profits stimulate productivity increases by way of rapid structural changes and a rapid removal of efficiency slack within firms and plants. This type of productivity growth, with a more or less "permanent" disequilibrium of product wage rates and profitability, has of course its limits. After a while the sector in question may become "too small" - in the sense that investment is badly hurt by low profitability and falling solvency (the equity/debt ratio); that balance-of-payments and unemployment problems occur; and that it becomes increasingly

difficult over time to remove efficiency slack.¹ Thus, in a long-term perspective, the first type of relation - the Verdoorn law - probably dominates the second type of "disequilibrium induced" relation.

(4) Allocation of resources

When discussing various "background forces" behind the productivity growth slowdown, resource allocation forces have at several occasions been emphasized. Four aspects may be of particular importance in this context.

Firstly, various empirical studies indicate that the retardation of the outflow of labour from agriculture to other sectors of the economy during the seventies has contributed by approximately 0.3 percentage points on average of the slowdown of productivity growth.² Secondly, some additional 0.2 percentage points of the slowdown of the productivity growth rate of the national economies - as an average for OECD countries - may be explained by the larger size of the service sector, relative to

1) Developments of this type constitute in fact a rather popular interpretation of the experience in several of the Scandinavian countries in the late sixties and during most of the seventies. See Erik Lundberg (1972); Hans Tson Söderström and Staffan Viotti (1979); Hans Tson Söderström (1982); and Pehr Wissén (1982).

2) OECD Study CPE/WP2(79)8; Maddison (1979); Kendrick (1981).

In fact, a recent study for Swedish manufacturing (SIND 1981) for the period 1966-76, with disaggregation down to the plant level, concludes that reallocations of labour accounts for 0.7 percentage points, or 14 percent, of labour productivity growth in that sector.¹ And a study by the Industrial Institute for Economic and Social Research in Stockholm concludes that at least twentyfive percent of labour productivity growth in the sixties were the result of reallocations of resources, labour plus capital, between various branches of manufacturing (Carlson 1979).² The study also suggests, on the basis of various case studies, that reallocations within subbranches, and within firms, account for a similar fraction of productivity growth of the total manufacturing sector. It is important to emphasize, however, that many of these reallocations within the manufacturing sector have been induced by technological change and made possible by new investment, training and education, which illustrates the arbitrariness of making separate calculations of the contributions to productivity growth of these various factors.

Now it is reasonable to assume that the process of reallocation of resources has slowed down during the seventies because of both the macroeconomic development and the earlier discussed deterioration of the flexibility of the mechanisms of the allocation of

1) This should be compared with about 0.3 percentage point for the entire non-agricultural business sector according to the earlier mentioned OECD study (CPE/WP2(79)8) without any disaggregation within manufacturing.

2) A similar conclusion was reached for the manufacturing sector in the US for the period 1949-56 by Massel (1961).

resources. It is therefore rather likely that reallocation factors have contributed considerably to the slowdown of productivity growth - in addition to the earlier mentioned special reallocation factors.

Attempts to quantify the sum of these reallocation effects have to await future research efforts. However, already on the basis of the information presented above, it is reasonable to argue that considerably more than 0.5-0.7 percentage point, perhaps even as much as 3/4 to 1 percentage point, or 30-40 percent of the labour productivity slowdown - as an average for the OECD countries - may be due to various types of allocation factors, i.e. slightly more than was regarded as a likely contribution of a slower rate of capital-labour substitution.

(5) Technological progress and catch-up

There is no reliable method to judge if slower technological progress has contributed to the productivity growth slowdown - except that the rate of introduction of embodied technology must have gone down because of the fall in investment growth. However, it is difficult to find convincing evidence for the often heard assertion that the advance of technological knowledge has slowed down.¹ Moreover, to identify technological advance by "residuals" in production function and growth accounting analysis, after taking care of other "proximate sources", is clearly a hazardous method.

1) The decline in civilian R and D spending in some countries during the seventies cannot possibly have had much effects already in that decade.

Changes in the rate of technological "catch-up" of countries other than the US is perhaps equally difficult to pin down. One conceivable way of quantifying the importance of slower catch-up in the seventies may be to interpret the changes in the difference between "Denison-type" residuals between the US and other countries as a measure of the change over time in such catch-up.¹ By that assumption, the fall in the speed of catch-up would, using Kendrick's estimates of Denison-type residuals, have resulted in a productivity growth slowdown by half a percentage point per year for Western Europe and by about one percentage point for Japan.

An alternative approach is to make explicit cross-country regressions of the relation between labour productivity growth on the one hand, and the total factor productivity gap of various countries vis-à-vis the US and the rate of capital accumulation on the other hand; see Appendix TA:6. Such estimates would then be used to estimate the importance for the productivity growth rate of the reduction over time in the gap, assuming that cross-country differences of productivity gaps can be applied to the change over time of the productivity gap of individual countries. By this technique the fall in the rate of technological catch-up would account for a "predicted" productivity growth slowdown by about half a percentage point in Western Europe, and one percentage point per year in Japan - i.e., about the same figures as obtained by comparing changes

1) Assuming, bravely, that the "misinterpretation" of residuals as reflecting technological progress is a less severe problem when looking at the differences between countries than when looking at the time path of residuals of individual countries.

over time of Denison-type residuals.¹

V. Final Remarks

I have tried to show in this paper how macroeconomic disturbances and policies during the seventies, partly induced by the dramatic price increases of oil and raw materials, helped to bring about an abrupt slowdown of productivity growth - via increased capacity slack, slower growth of aggregate demand, lower profits and higher relative prices of various inputs of major macroeconomic importance. These macroeconomic developments also revealed and strengthened the negative consequences for productivity growth of various trendwise changes in the basic mechanisms of our economic and political systems. I have also tried to demonstrate how these disturbances and policies speeded up the fading away of some historically uniquely favourable conditions for productivity growth.

Attempts have also been made to quantify the importance of various "proximate sources" through which these "background forces" have exerted their influence on the slowdown of productivity growth - not in the belief that very precise estimates

1) The coefficients are estimated for the period 1960-73, and applied to the change in the gap between 1960-1973. See Statistical Appendix, where calculated figures for individual countries are presented. The estimated elasticity of labour productivity with respect to the capital-labour ratio now has to be reduced from the range of 0.7-0.9 to the range of 0.4-0.7, hence lowering the contribution to the retardation of productivity growth of slower capital-labour substitution ("excluding" technological catch-up) to about 0.3-0.5, i.e. only slightly more than when the elasticity of labour productivity with respect to the capital-labour ratio is approximated by the capital income share.

are reliable, but in order to discriminate between factors of major and minor importance. Subject to reservations about the inaccuracies of the attempted quantification, the general conclusion is that two proximate sources seem to have been particularly important: the slowdown of capital accumulation (per unit of labour) and the reallocation of resources. These two factors seem to have been responsible for perhaps about 20-30 and 30-40 percent, respectively, of the slowdown. If this is true, at least half, perhaps even as much as two thirds, of the productivity growth slowdown may very well be closely related to these two sources.

In other words, this paper may be regarded as an attempted

"rehabilitation" of two classical "proximate sources" of productivity growth, the importance of which has been minimized in much of the scholarly literature during recent decades.¹

It should be noted, however, that an attempt has been made to incorporate the importance of embodied technological improvements in the term for capital accumulation, which is particularly important for countries other than the US because of technological catch-up via capital formation; in fact, the paper asserts that the retardation of the process of technological catch-up (embodied as well as disembodied) explains some 20-25 percent of the productivity growth slowdown for countries other than the US. Another characteristic feature of the paper is that the asserted reason for the fall in capital

1) Examples of economists who are not guilty of playing down the importance of capital formation are Dale Jorgenson (for instance in Christensen-Cummings-Jorgenson, 1980); Angus Maddison (1981); Peter Clark (1978); and Yngve Åberg (1982).

accumulation is a deterioration in investment incentives rather than a fall in saving propensities (as is usually assumed in theoretical growth models).

Of course, complementarities between various sources of productivity growth make attempts to separate the effects of each source dubious.¹ For instance, capital formation is bound to give quite different contributions to productivity growth depending on how it is allocated and how efficiently new technology is introduced in connection with investment activities and improvements of the stock of human capital.² The existence of such complementarities is also a warning against the belief in some mechanical effects of capital accumulation on output growth. Poorly allocated and managed capital may give no growth at all. For instance, one explanation why the statistical association between capital accumulation and labour productivity growth is weaker in the seventies than earlier is perhaps that investment in the later period has been less efficiently allocated - for instance because of increased uncertainties and more government subsidies and regulations. It is also conceivable, as earlier mentioned, that the marginal productivity of capital has fallen after several decades of rapid capital accumulation.

A number of other proximate sources of the productivity growth slowdown have also been identified, such as increased capacity slack; reductions in "dynamic returns to scale" because of the fall in output growth; and reductions in the

1) Such complementarities have been emphasized in particular by Richard Nelson (1981).

2) However, available studies suggest that changes in the composition of the labour force with respect to age, education and sex do not on balance explain much of the productivity slowdown after 1973; OECD document CPE/WP2(79)8.

if somewhat higher after-tax returns on production and productive investments can be restored; if governments are willing to remove some of the disincentives and inflexibilities that they have themselves introduced in various markets; if confidence in the stability and growth of markets and in the rules of the game can be restored; and, perhaps most important, if our economies will not be exposed to macroeconomic shocks of the same magnitude as they faced in the seventies - or alternatively if we learn to deal with such shocks in a more rational manner and hence avoid sluggish demand and large capacity slack.

TECHNICAL APPENDIX TO

THE RECENT SLOWDOWN OF PRODUCTIVITY GROWTH

Technical Appendix

TA:1 Cross-country regressions of gross investment growth (IG)
on profit rate (PR) and/or value added growth (VG) in
business sector 1960-73

$$(1) \quad IG = -0.17 + 0.23PR + 0.59VG$$

(5.22)* (4.47)*

$$\bar{R}^2 = 0.99 \quad DW = 2.46$$

$$F = 263.94^*$$

$$(2) \quad IG = 0.8 + 0.41PR$$

(11.04)*

$$\bar{R}^2 = 0.95 \quad DW = 1.63$$

$$F = 121.96^*$$

The bar above R^2 denotes adjustment for degrees of freedom.

Data: OECD document CPE/WP2(80)3; CPE/WP2(79)8.

For calculations based on these estimates for individual countries of the effects on investment growth of changes in profitability and value added growth 1973-79 as compared to 1960-73, see Statistical Appendix.

TA:2 Cross-country regressions of labor productivity growth
($\hat{V}/\hat{L}$) on the rate of change of the capital-labor ratio ($\hat{K}/\hat{L}$)
1960-73

Data from Christensen, Cummings and Jorgenson (1980) for the national economy:

$$(3) \quad (\hat{V}/\hat{L}) = 0.52 + 0.80(\hat{K}/\hat{L})$$

(16.8)*

$$\bar{R}^2 = 0.98 \quad F = 282.7^* \quad DW = 2.52$$

Data from Yngve Åberg (1982) for ($\hat{V}/\hat{L}$), and from OECD (CPE/WP2(79)8) for ($\hat{K}/\hat{L}$), ^{a)} for manufacturing:

$$(4) \quad (\hat{V}/\hat{L}) = 2.25 + 0.71 (\hat{K}/\hat{L})$$

(3.82)**

$$\bar{R}^2 = 0.69 \quad F = 14.61^{**} \quad DW = 2.75$$

Regression by John Kendrick (1981) for the business sector:

$$(5) \quad (\hat{V}/\hat{L}) = 0.84 + 0.88 (\hat{K}/\hat{L})$$

(5.7)*

$$\bar{R}^2 = 0.83$$

a) Data for this variable refers to non-farm business sector.

*) Significant at a 1 % level.

**) Significant at a 5 % level.

***) Significant at a 10 % level.

****) Significant at a 15 % level.

For the period 1973-80 and 1973-79, respectively, regressions (4) and (5) become

$$(4a) \quad (\hat{V}/L) = 0.99 + 0.53 (\hat{K}/L) \quad \bar{R}^2 = 0.43 \quad DW = 1.54 \\ (2.49)** \quad F = 6.21**$$

$$(5a) \quad (\hat{V}/L) = 0.08 + 0.63 (\hat{K}/L) \quad \bar{R}^2 = 0.51 \\ (3.1)**$$

TA:3 Modifications by Martin Baily Jr of figures for rates of capital accumulation in the US

Baily's calculations (1981) are based on the assumption that the fall in Tobin's "q" (by some 30 percent) in the US in the seventies reflects the fact that the statistically recorded capital stock nowadays overestimates the economically useful one, in contrast to the situation in earlier periods. Baily concludes that the slowdown in the rate of increase in the capital stock between the periods 1948-73 and 1973-79 was 2.3 percentage points larger than according to official statistics. (Information about preliminary results in a personal letter to the author from Baily.) That would mean an additional contribution to the productivity growth slowdown of 0.7 percentage points, using 0.3 as the elasticity of output with respect to capital inputs.

TA:4 Terms-of-trade effects and substitution effects of price increase for intermediary inputs¹

Let us assume a demand (marginal product) curve for an intermediate input (N) with respect to its relative price (π) in terms of gross output; see Chart 4.

A rise in the relative price of N from π_1 to π_2 causes a terms of trade loss $(\pi_2 - \pi_1)N_1$, depicted in the chart by the rectangle ADCB (evaluated at the initial demand for N). However, the loss in real income is mitigated by the substitution away

1) This section has profited greatly from my discussions with Avinash Dixit.

from N , from N_1 to N_2 , as then output falls less (the area GCN_1N_2) than the fall in expenditures on N (the area GDN_1N_2). Thus, in terms of the chart, real income is recovered by the amount of the unfilled triangle (GDC), or approximately $\frac{1}{2}(\pi_2 - \pi_1)(N_1 - N_2)$. As a consequence, the total loss in real income available for domestic absorption is AGCB.

Chart 4

If instead we are interested in the substitution effects on real value added evaluated at the initial relative price, there is a negative effect of substitution, approximated by the shaded triangle, which is (approximately) the same size as the (unfilled) triangle GDC. In other words, while the mitigation of the initial loss in real income, i.e. the triangle GDC, measures the (positive) change in value added at current prices (Paasche index) due to substitution, the triangle GCF measures the (negative) change in value added at base prices (Laspeyres index) due to the substitution.

The quantitative calculations in the text of the effects on real value added are based on the following (approximate) formula for finite changes:

Denote the "arc" elasticity

$$\frac{(N_1 - N_2)/N_1}{(\pi_2 - \pi_1)/\pi_1} \approx \frac{\sigma}{1-\theta}$$

$$\text{Then } \frac{V_2 - V_1}{V_1} = \hat{V} = \frac{(\pi_2 - \pi_1) N_1}{F_1 - \pi_1 N_1} \left[1 - \frac{1}{2} \frac{\sigma}{1-\theta} \cdot \frac{\pi_2 - \pi_1}{\pi_1} \right] =$$

$$= \hat{\pi} \cdot \frac{\theta}{1-\theta} \left[1 - \frac{1}{2} \frac{\sigma \hat{\pi}}{1-\theta} \right], \text{ where } \hat{\pi} \approx \frac{\pi_2 - \pi_1}{\pi_1}.$$

TA:5 Direct contribution to productivity slowdown of capacity slack

Various studies for the fifties and sixties suggest a short-term coefficient for the rate of labour productivity growth with respect to the unemployment rate, $\alpha = (\frac{\Delta V}{V} - \frac{\Delta L}{L})/\Delta u$ of about -1.5; see Okun (1970), Brinner (1977) and Drèze-Modigliani (1981).

Let this coefficient be applied to the change in the unemployment rate (Δu) between 1973 and 1979, where Δu is modified to include also "extraordinary removals" of labour from the labour force, by for instance public retraining programs, early retirement for labour market reasons and remigration of foreign labour. A hypothetical recalculation of "constant unemployment labour productivity" in 1979 would then imply an upward revision of the figures for labour productivity growth between 1973 and 1979 by 0.6 percentage points per year for the national economy, as an unweighted average for all OECD countries; (various sources of OECD statistics have been used for these calculations).

Kendrick (1981) reaches the figure 0.4 by not revising the official figures for Δu due to the earlier mentioned "extraordinary" withdrawals from the labour force in this period.

Michael Bruno (1981) reaches the following figures for the contribution of capacity slack to the slowdown of labour productivity

growth; the US 0.4, the UK 0.4, Germany 0.2 and Japan 0.0 percentage points.

For detailed estimates for individual countries, see Statistical Appendix.

TA:6 Cross-country regressions of total factor productivity growth (or advances in knowledge) on the "technological gap"

Let the independent variable be the ratio of total factor productivity of each country relative to the US, called "the gap". The figures for the gap are taken from Christensen, Cummings and Jorgenson (1980). The figures for total productivity growth (TFPG) are taken from the same source in equation (7); and from Åberg (1980) in equation (8). In equation (9) where the dependent variable is defined as "~~advances in knowledge~~" (AIK), the statistics for the dependent variable are taken from Kendrick (1981). The regression refers to the growth rates in the period 1960-73.

$$(7) \quad \text{TFPG} = 2.61 + 3.81 \text{ Gap}_{60} \quad \bar{R}^2 = 0.82 \quad F = 32.97^* \quad DW = 2.38 \\ (5.74)^*$$

$$(8) \quad \text{TFPG} = -2.3 + 3.64 \text{ Gap}_{60} \quad \bar{R}^2 = 0.60 \quad F = 11.54^{**} \quad DW = 2.26 \\ (3.40)^{**}$$

$$(9) \quad \text{AIK} = -1.76 + 3.01 \text{ Gap}_{60} \quad \bar{R}^2 = 0.51 \quad F = 7.19^{**} \quad DW = 1.95 \\ (2.68)^{**}$$

For the application of the estimated coefficients to the reduction of the productivity gap between 1960 and 1973, in order to estimate the contribution to the slowdown of productivity growth between the periods 1960-73 and 1973-79, see Statistical Appendix.

Multiple regressions of labour productivity growth on the capital labour ratio and the gap variable give smaller coefficients and lower t-values for both variables than the earlier reported coefficients from one-variable regressions, suggesting that it is difficult to discriminate between the effects of the two explanatory variables. We then obtain:

Data from Christensen, Cummings and Jorgenson (1980):

$$(7a) \quad (\hat{V}/L) = -0.91 + 0.68(\hat{K}/L) + 1.5 \text{ Gap}_{60} \quad \bar{R}^2 = 0.98 \quad DW = 2.37$$

(9.08)* (1.96)*** F = 209.9*

Data for $(\hat{V}/L)$ from Åberg (1982); for $(\hat{K}/L)$ from OECD (CPE/WP2(79)8); for "gap" from the source above:

$$(8a) \quad (\hat{V}/L) = -0.68 + 0.47(\hat{K}/L) + 2.89 \text{ Gap}_{60} \quad \bar{R}^2 = 0.68 \quad DW = 2.76$$

(1.45) (0.90) F = 7.45

Data from Kendrick (1981):

$$(9a) \quad (\hat{V}/L) = 1.18 + 0.37(\hat{K}/L) + 1.28 \text{ Gap}_{60} \quad \bar{R}^2 = 0.84 \quad DW = 1.94$$

(1.05) (1.65)**** F = 19.29*

The arbitrariness of distinguishing between the effects of capital accumulation and technological catch-up is reflected in the fact that the significance for the two variables becomes dubious in the multiregression estimates, in contrast to one-variable regressions.

Regressions of labour productivity growth on the per-capita income gap vis-à-vis the US and variables like the investment-output ratio, and occasionally also the rate of change of exports are broadly consistent with the figures presented here. See Cornwall (1976); Parikh (1978); Gomulka (1971); and Singer and Reynolds (1975).

STATISTICAL APPENDIX TO
THE RECENT SLOWDOWN OF PRODUCTIVITY GROWTH

Table A:1 Productivity growth rates, average annual, percent

	Maddison estim. National economy 60-73 73-79 Change			A.L. estim. Non- Farm Business Sector ¹ 60-73 73-78 Change			Kendrick estim. Business Sector 60-73 73-79 Change			Åberg estim. Manufacturing ² 60-73 73-80 Change		
<u>Belgium</u>	Lab. prod.	5.4	4.2	-1.2	5.7	5.0	-0.7	6.1	4.4	-1.7		
	Contr. K/L subst.				2.2	2.4	0.1	1.9	1.8	-0.1		
	Tot. fact. prod.				3.5	2.6	-0.8	4.2	2.6	-1.6		
	Denison-type resid.*											
<u>Canada</u>	Lab. prod.	3.0	1.0	-2.0	3.5	1.3	-2.2	4.2	1.0	-3.2	4.3	2.4
	Contr. K/L subst.				1.1	1.1	0.1	1.3	1.1	-0.2	2.7	1.2
	Tot. fact. prod.				2.4	0.2	-2.3	2.9	-0.1	-3.0	1.6	1.2
	Denison-type resid.											-1.9
<u>Denmark</u>	Lab. prod.	5.3	1.6	-3.7							6.8	4.1
	Contr. K/L subst.										3.1	1.9
	Tot. fact. prod.										3.7	2.2
	Denison-type resid.											-2.7
<u>France</u>	Lab. prod.	5.6	3.5	-2.1	5.2	3.7	-1.5	5.9	4.2	-1.7	5.3	4.1
	Contr. K/L subst.				1.4	1.8	0.4	2.0	2.0	0.0	2.4	1.5
	Tot. fact. prod.				3.8	1.9	-1.9	3.8	2.1	-1.7	2.9	2.6
	Denison-type resid.							2.8	2.1	-0.7		-1.2
<u>Germany</u>	Lab. prod.	5.4	4.2	-1.2	5.3	4.1	-1.2	5.8	4.3	-1.5	5.0	4.4
	Contr. K/L subst.				2.6	2.4	-0.2	2.6	2.2	-0.4	2.1	1.6
	Tot. fact. prod.				2.7	1.7	-1.0	3.2	2.1	-1.1	2.9	2.7
	Denison-type resid.							2.4	2.1	-0.3		-0.6
<u>Italy</u>	Lab. prod.	6.9	2.5	-4.4	6.8	1.7	-5.1	7.8	1.6	-6.2	6.2	3.0
	Contr. K/L subst.				2.5	1.3	-1.2	2.0	0.8	-1.2	2.6	1.8
	Tot. fact. prod.				4.3	0.4	-3.9	5.8	0.8	-5.0	3.5	1.2
	Denison-type resid.							3.4	0.1	-3.3		-2.3

(Table A:1 continued)

	Maddison estim. National economy			A.L. estim. Non- Farm Business Sector			Kendrick estim. Business Sector			Åberg estim. Manufacturing		
	60-73	73-79	Change	60-73	73-78	Change	60-73	73-79	Change	60-73	73-80	Change
<u>Japan</u>												
Lab. prod.	9.8	3.9	-6.9	8.5	3.3	-5.2	9.9	3.8	-6.1	9.9	4.6	-5.3
Contr. K/L subst.				4.0	2.7	-1.3	3.3	2.0	-1.3	5.7	2.7	-3.0
Tot. fact. prod.				4.5	0.6	-3.9	6.6	1.8	-4.8	4.2	1.9	-2.3
Dennison-type resid.							3.9	2.1	-1.8			
<u>Netherl.</u>												
Lab. prod.	5.3	3.3	-2.0							7.3	5.3	-2.0
Contr. K/L subst.										3.6	3.5	-0.1
Tot. fact. prod.										3.7	1.8	-1.9
Dennison-type resid.												
<u>Sweden</u> ³												
Lab. prod.	4.7	1.9	-2.8	4.8	1.8	-3.0	5.8	2.5	-3.3	6.2	1.9	-4.3
Contr. K/L subst.				1.7	1.9	0.2	2.2	2.2	0.0	3.0	0.3	-2.7
Tot. fact. prod.				3.1	-0.1	-3.2	3.6	0.3	-3.3	3.2	1.6	-1.6
Dennison-type resid.							2.8	0.6	-2.2			
<u>UK</u>												
Lab. prod.	3.8	2.1	-1.7	4.1	1.9	-2.2	3.8	1.9	-1.9	4.0	1.4	-2.6
Contr. K/L subst.				1.3	1.2	-0.1	1.6	1.6	0.0	1.9	-0.1	-2.0
Tot. fact. prod.				2.8	0.7	-2.1	2.2	0.3	-1.9	2.1	1.5	-0.6
Dennison-type resid.							1.3	0.5	-0.8			
<u>US</u>												
Lab. prod.	2.6	1.4	-1.2	2.5	0.9	-1.6	3.1	1.1	-2.0	3.8	2.1	-1.7
Contr. K/L subst.				0.7	0.5	-0.2	1.2	0.5	-0.7	2.7	1.0	-1.7
Tot. fact. prod.				1.8	0.6	-1.2	1.9	0.6	-1.3	1.2	1.2	0.0
Dennison-type resid.							1.2	0.5	-0.7			

*See Table 2.

*See Table 2.

¹Gross capital income shares in the industrial sector (France: + transp. and comm.) are used as capital weights to minimize confusion from income among the self-employed. The weights are averages of the period 1960-78 though for some countries a shorter period.

period 1960-78, though for some countries a shorter period.² Capital inputs measured as capital services, including effects of changes in capacity utilization.

³A.L. estimates for the periods 1960-74 and 1974-78.

Sources: Maddison (1981), Kendrick (1981), Åberg (1982), A.L. estimates based on OECD

(April 22, 1930); (April 25, 1980); (March 4, 1982).

Table A:2

Effects on investment growth of changes in profitability and as compared to 1960-73. Change, percentage points.

output (value added) growth 1973-79

	Effects of change in profitability		Effects of change in output growth		Actual change in investment growth
	Based on cross country regressions by AL*	Based on OECD time series regressions**	Based on cross country regressions by AL*	Based on OECD time series regressions**	
(1)	(2)				
Belgium			-2.1		-5.5
Canada	+0.1	+0.2	+0.2	-1.5	-3.7
Finland	-0.2	-0.4		-3.5	
France	-0.7	-1.3	-0.6	-1.8	-6.6
Germany	-0.6	-1.1	-0.7	-1.7	-2.9
Italy	-0.8 ¹	-4.4 ¹		-4.0 ¹	-4.4
Japan	-1.0	-1.7	-1.8	-4.5	-10.8
Sweden	-0.6	-1.1	-1.6	-2.5	-4.8
UK	-0.8	-1.4	-3.8	-1.7	-1.7
US	-0.5	-0.9	-0.3	-1.0	-4.1
Average	-0.6	-1.3	-1.2	-2.5	-4.9
Average Europe	-0.7	-1.6	-1.7	-2.6	-4.3

*Cross-country regression of gross investment growth (IG) regressed on profit rate (PR) and/or output growth (QG) in business sector:

Data from OECD: (April 25, 1980); (April 22, 1980)

(1) $IG = -0.17 + 0.23PR + 0.59 QG$
(5.22) (4.47)

$R^2 = 0.99$
F-statistic 263.94
All significant
at 1 % level
DW = 2.46

(2) $IG = 0.8 + 0.41PR$
(11.04)
 $R^2 = 0.95$
F-statistic 121.96
All significant
at 1 % level
DW = 1.63

**Time series regressions by OECD secretariat of investment growth on rate of return and output growth 1974-79.

OECD (February 20, 1981)

¹Cross-country regression on profit share used as data on profit rate is not available for Italy.

Table A:3

Contributions to productivity slowdown of retardation of technological "catch-up"

	Difference vis-à-vis the US of "Denison-type" residual ¹			Difference vis-à-vis the US of time-trend in Åberg ²			Catch-up according to regression analysis					
							Total factor prod. growth regressed on tot. factor prod. gap ³			Advancement in knowledge regressed on total factor prod. gap ³		
	60-73	73-79	Δ	60-73	73-79	Δ	60-73	73-79	Δ	60-73	73-79	Δ
Belgium ⁴	1.9	2.6	+0.7				2.5	1.9	-0.6			
Canada	0.8	-0.3	-1.1	0.4	0.0	-0.4	4.3	4.0	-0.3	3.6	3.3	-0.3
Denmark ⁴				2.5	1.0	-1.5	3.1	2.3	-0.8			
France	1.6	1.6	0.0	1.7	1.4	-0.3	5.7	4.5	-1.2	4.7	3.7	-1.0
Germany	1.2	1.6	+0.4	1.7	1.5	-0.2	4.9	4.0	-0.9	4.1	3.3	-0.8
Italy	2.2	-0.4	-2.6	2.4	0.1	-2.3	5.1	4.3	-0.8	4.2	3.6	-0.6
Japan	2.7	1.6	-1.1	3.0	0.7	-2.3	6.6	4.7	-1.9	5.5	3.9	-1.6
Netherlands				2.6	0.6	-2.0	5.1	4.2	-0.9	4.2	3.5	-0.7
Sweden	1.6	0.1	-1.5	2.0	0.5	-1.5	2.3	1.8	-0.5			
UK	0.1	0.0	-0.1	1.0	0.3	-0.7	5.2	4.7	-0.5	4.3	3.9	-0.4
Arithm. aver.												
All countries ⁵	1.5	0.9	-0.7	1.9	0.6	-1.3	5.3	4.3	-1.0	4.4	3.6	-0.8
Western Europe ⁵	1.4	0.9	-0.5	2.0	0.8	-1.2	5.2	4.3	-0.9	4.3	3.6	-0.7

¹The business sector; basic data from Kendrick (1981).).²The manufacturing sector; data from Åberg (1982).³See Appendix TA:6 in the paper.⁴Total factor productivity and gap according to Maddison (1979).⁵Excluding Belgium, Denmark and Sweden.

Table A:4

Schematic calculations of direct importance of increased capacity slack for labor productivity growth (per man-hour)

	Total economy		Manufac- turing ⁶
	A.L. calc. ¹	Kendrick calc. ²	Åberg calc. ³
Australia	-1.0		
Austria	-0.3		
Belgium	-1.4	-1.1	
Canada	-0.5	-0.7	-1.2
Denmark	-1.2		
Finland	-1.0		
France	-0.8	-0.4	-1.4
Germany	-0.9	-0.1	-0.1
Italy	-0.3	-0.2	
Japan (?)	-0.2	-0.3	-0.7
Netherlands	-0.5		
Norway	-0.1		
Sweden	0.0	+0.1	-2.6
Switzerland	-0.8		
UK	-0.7	-0.7	-1.8
US	-0.2	-0.3	-1.1
Arithmetic average:			
"All" countries	-0.6	-0.4	-1.3 ⁴
Western Europe	-0.7	-0.4	-1.5 ⁵

Estimates based on the assumption about a systematic short-term cyclical statistical relationship between changes in the unemployment rate and labor productivity (Q/L). Based on various studies such as Okun (1970), Brinner (1977), Drèze-Modigliani (1981), it is ensured that the coefficient $(\frac{\Delta Q}{Q} - \frac{\Delta L}{L})/\Delta u = -1.5$. It is consistent with the following coefficients that also seem to be of broadly the right magnitude: $\frac{\Delta L}{L}/\Delta u = -1.5$ (reflecting then some of the employees that are laid off in a recession temporarily leave the labor force), and the elasticity of output $\frac{\Delta Q}{Q}/\frac{\Delta L}{L} = 2$, which gives $\frac{\Delta Q}{Q}/\Delta u = -3$ ("Okun's law"). In countries where labor hoarding has been strongly stimulated recently by new labor market legislation and subsidies to such hoarding, as in Sweden, the last mentioned elasticity may today be considerably higher.

¹Calculated as compounded rates of change 1973-79, see Table A:5, column 3.

²Kendrick [1981]. Even though Kendrick's figures are presented as referring to the business sector, they seem in fact to be calculated for the national economy.

³Åberg [1982]. Includes factors other than variations in cyclical slack as well. See footnote p. 00.

⁴Seven countries only.

⁵Four countries only.

⁶Michael Bruno (1981) reports the following contributions to the productivity slowdown of "cyclical factors" for manufacturing: the US 0.4 percentage point, the UK 0.4, Germany 0.2 and Japan 0.0.

Table A:5 Rough calculations of "cyclical" reduction in labor productivity due to increased unemployment.

	Change in official unemployment rate 1973-79 ¹⁾	Modified change ditto 1973-79	Shortfall of labor prod. 1979 due to higher un- employment ⁵⁾	Change in official unemploy- ment rate 1973-81 ¹⁾
Australia	3.9	3.9	5.9	3.4
Austria	1.0	1.2 ²⁾	1.8	1.3 ⁶⁾
Belgium	5.6	5.6	8.4	8.1
Canada	1.9	1.9	2.9	2.0
Denmark	4.9	4.9	7.4	7.8
Finland	3.7	4.0 ³⁾	6.0	2.8 ⁷⁾
France	3.3	3.3	5.0	5.0
Germany	2.3	3.6 ²⁾	5.4	3.7
Italy	1.3	1.3	2.0	2.1
Japan	0.8	0.8	1.2	0.9
Netherlands	1.9	1.9	2.9	5.1
Norway	0.5	0.5	0.8	0.5 ⁷⁾
Sweden	-0.4	0.0 ⁴⁾	0.0	0.0
Switzerland	0.0	3.2 ²⁾	5.0	..
UK	2.7	2.7	4.0	8.2
US	1.0	1.0	1.5	2.8
Unweighted average				
All countries	2.2	2.5	3.7	3.6
Western Europe	2.3	2.7	4.0	4.1

1) Standardized OECD statistics.

2) Adj. for change in stock of foreign workers (1974-79), neglecting the change 1973-74. Based on OECD statistics.

3) Adj. for public retraining. National sources.

4) Adj. for public retraining and labor-market induced early retirement. National sources.

5) Column 2 multiplied by 1.5; i.e. it is assumed that the "elasticity" $(\frac{\Delta Q}{Q} - \frac{\Delta L}{L})/\Delta u = 1.5$.

6) Based on seasonally adj. figures for two quarters.

7) Same as 6 but for 3 quarters.

Note: An alternative way of calculating "modified" changes in unemployment rates would be to compare the ratio between employment and the officially registered labor force with the ratio between employment and a hypothetical labor force figure that is calculated by extrapolating labor force growth in previous years, such as in the period 1969-73(?) By this technique, figures for unemployment of about the same magnitude as in column 2 are obtained, except mainly for Australia, Finland, Italy and UK. However, to calculate residuals like these from hypothetically calculated (extrapolated) trends is probably too hazardous to be taken very seriously.

Table A:6

Measures of the variation in the annual change series of manufacturing output.¹

1960-69

Belgium ²	6.3	2.9	8.3	46.8
Canada	6.5	2.6	6.7	39.9
Denmark	6.2	3.4	11.2	54.3
France	6.9	1.6	2.6	23.3
Germany	6.5	4.6	21.0	70.7
Italy	8.2	3.2	10.2	39.1
Japan	15.0	5.8	33.7	38.6
Sweden	6.2	1.9	3.7	31.1
UK	3.7	3.2	10.0	84.8
US	5.0	3.6	12.6	71.0
Average	7.0	3.3	12.0	50.0

1970-79

Belgium	4.2	4.9	23.6	115.6
Canada	3.8	4.4	19.3	115.1
Denmark	3.6	3.2	10.3	89.0
France	4.4	2.7	7.3	61.9
Germany	2.8	3.4	11.9	123.1
Italy	4.3	6.0	35.8	138.1
Japan	7.6	6.0	35.5	78.5
Sweden	1.6	3.8	14.5	236.5
UK	0.7	3.8	14.4	520.2
US	3.1	6.4	40.3	206.8
Average	3.6	4.5	21.3	168.5

Annual percent change in output and period averages. Average of 10 countries.

Note: Averages are calculated from columns above, not as variations in the 10-countries average series in the chart.

¹Value added, Bureau of Labour Statistics.

²1961-69.

Table A:7 Measures of the variation in the annual change series of manufacturing producer prices.¹

	Mean	St.dev.	Variance	Coeff. of variation
1960-69				
Belgium	1.7	1.3	1.6	75.6
Canada	1.9	1.0	1.0	53.9
Denmark	2.8	1.7	2.9	61.9
France	2.5	3.3	10.7	129.6
Germany	0.9	1.1	1.2	119.8
Italy	1.9	1.7	2.8	85.9
Japan	0.9	1.1	1.1	115.2
Sweden	2.3	1.4	1.9	58.2
UK	2.4	1.1	1.1	43.1
US	1.2	1.4	2.1	115.7
Average	1.8	1.5	2.6	85.9
1970-79				
Belgium	5.0	4.5	20.0	88.5
Canada	8.9	5.7	32.4	63.9
Denmark	8.4	5.7	32.3	67.7
France	8.3	8.8	77.1	105.6
Germany	4.7	3.3	10.7	69.3
Italy	14.1	10.5	111.2	74.7
Japan	5.9	8.1	65.4	136.4
Sweden	9.2	5.6	31.6	60.9
UK	14.2	6.0	36.1	42.5
US	8.3	4.8	22.7	57.4
Average	8.7	6.3	43.9	76.7

Note: Averages are calculated from columns above not as variations on the 10-countries average series in the chart.

¹Mostly general wholesale prices, OECD and IMF.

Chart A:1

Labor productivity growth (GDP per man-hour)
Average rates, percent per year.

Sources: Angus Maddison (1981), tableau C-10; and (1979), p. 43.

¹Unweighted averages excluding countries which lack information for one or more periods.

*Statistical lacking.

Chart A:2 Growth rates of output (real value added) and labor productivity (real value added per man-hour).
Non-farm business sector. Average annual percent.¹

Source: OECD, (April 22, 1980).

¹Finland: 60-70, productivity = value added per employed; not included in the averages.
Norway: productivity = value added per employed for all periods.

References

- Baily, M.N. (1981). "Productivity and the services of capital and labor." Brookings Papers on Economic Activity, No. 1, pp. 1-65.
- Berndt, E.R. (1980). "Energy price increases and the productivity slowdown in United States manufacturing." Resources Paper No. 51, University of British Columbia, Vancouver.
- Bruno, M. (1981). "Raw materials, profits, and the productivity slowdown." NBER Working Paper Series No. 660R, December, Cambridge, MA.
- Carlsson, B. (1979). "Den tekniska utvecklingens innehåll och betydelse för den ekonomiska tillväxten." In Företagen i marknadsekonomin. Stockholm: Industriens Utredningsinstitut.
- Christensen, L.R., Cummings, D. and Jorgenson, D.W. (1980). "Economic growth 1947-73; an international comparison." In Kendrick, J. and Vaccara, B. (eds), New Developments in Productivity Measurement and Analysis. Chicago: University of Chicago Press.
- (1981). "Relative productivity levels, 1947-1973. An international comparison." European Economic Review, vol. 16, pp. 61-94.
- Christiansen, G.B. (1981). "The contribution of environmental regulations to the slowdown in productivity growth." Journal of Environmental Economics and Management, vol. 8, December, pp. 381-90.

- Clark, P.K. (1978). "Capital formation and the recent productivity slowdown." The Journal of Finance, vol. 33, June, pp. 965-75.
- Denison, E.F. (1979). Accounting for Slower Economic Growth. The United States in the 1970s, Washington: The Brookings Institution.
- Feige, E.L. (1980). "A new perspective on macroeconomic phenomena," mimeo, August.
- Jorgenson, D.W. (1980). "Econometric and process analysis models for energy policy assessments." Discussion Paper Series, Harvard Institute of Economic Research, Cambridge, MA.
-
- and Fraumeni, B.M. (1979). "Substitution and technical change in production." Paper presented at the N&F Conference on Natural Resource Substitution, Key Biscayne, Florida, December 13-14, 1979.
- Kendrick, J.W. (1981). "International comparisons of recent productivity trends." In Fellner, W. (ed), Contemporary Economic Problems. Washington: American Enterprise Institute.
- Lindbeck, A. (1981). "Disincentive problems in developed countries." Lecture at conference on Growth and Entrepreneurship, International Chamber of Commerce, Manila. (Also as Reprint No. 171, Institute for International Economic Studies, University of Stockholm.)
- (1981a). "Work disincentives in the welfare state." Nationalökonomische Gesellschaft Lectures 79-80. Vienna: Manz. (Also as Reprint No. 176, Institute for International Economic Studies, University of Stockholm.)

—— (1982). "Emerging arteriosclerosis of the Western economies - Consequences for the Less Developed Countries", lecture at the International Center, New Delhi, January. (Also as Reprint No. 191, Institute for International Economic Studies University of Stockholm, forthcoming.)

Lucas, R.E. (1972). "Expectations and the neutrality of money." Journal of Economic Theory 4, pp. 103-24.

Lundberg, E. (1972). "Productivity and structural change - a policy issue in Sweden." The Economic Journal, vol. 82, March, pp. 465-85.

Maddison, A. (1979). "Long-run dynamics of productivity growth". Banca Nazionale del Lavoro Quarterly Review, March, pp. 3-43.

—— (1981). Les phases du développement capitaliste. Paris: Economica.

Massel, B.F. (1961). "A disaggregated view of technological change." Journal of Political Economy, December, pp. 547-57.

Nelson, R. (1981). "Research on productivity growth and productivity differences: Dead ends and new departures." Journal of Economic Literature, September, pp. 1029-64.

Nordhaus, W.D. (1980). "Oil and economic performance in industrial countries." Brookings Papers on Economic Activity, No. 2, pp. 341-99.

OECD (April 17, 1980). "Investment determinants and investment Incentives." Working Party No. 2 of the Economic Policy Committee, CPE/WP2(80)1, Annex, Paris.

———, (April 25, 1980). "Factor income shares and profit rates." Working Party No. 2 of Economic Policy Committee, CPE/WP2(80)3, Annex, Paris.

——— (April 22, 1980). "Productivity trends in the OECD Area." Working Party No. 2 of the Economic Policy Committee, CPE/WP2(79)8 (1st Revision), Paris.

——— (March 4, 1982). Memorandum; "Profits and rates of return." Paris.

——— (February 20, 1981). "Profits and investment demand." Working Party No. 1 of the Economic Policy Committee, Ad Hoc Group of Experts on Economic Modelling, Paris.

Parikh, A. (1978). "Differences in growth rates and Kaldor's laws." Economica, vol. 45, February.

Pindyck, R.S. (1979). The Structure of World Energy Demand. Cambridge, MA: MIT Press.

SIND (1981). Statens Industriverk. "Överflyttningssvinster i industrin." PM 1981:3, Stockholm.

Singer, H.W. and Reynolds, L. (1975). "Technological backwardness and productivity growth." The Economic Journal, vol. 85, pp. 873-6.

Solow, R. (1960), "Investment and technical progress." In Arrow, K.J., Karlin, S. and Suppes, P. (eds), Mathematical Methods in the Social Sciences. Stanford, CA: Stanford University Press.

Söderström, H. (1982). "Explaining sectoral productivity differentials in small open economies." Institute for International Economic Studies, University of Stockholm, mimeo.

——— and Viotti, S. (1979), "Money wage disturbances and the endogeneity of the public sector in an open economy." In Lindbeck, A. (ed), Inflation and Employment in Open Economies, North-Holland.

Wissén, P. (1982). "Wages and growth in an open economy." Ph.D. dissertation, Stockholm School of Economics.

Åberg, Y. (1982). "Produktivitetsutvecklingen i industrin i olika OECD-länder 1953-1980." (In Swedish), mimeo.

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