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PROFITABILITY AND GROWTH IN A SMALL OPEN ECONOMY

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Introduction

Contemporary macroeconomic models of the open economy by and large neglect considerations of economic growth. The popular model of the small open economy developed in a series of papers by Corden (1960), Dornbusch (1974), Meade (1956), Salter (1959), and Swan (1960, 1963) for example takes the stock of capital as given. In that model an "overvalued" exchange rate presents a macroeconomic problem because it makes it impossible to attain full employment with external balance except after a prolonged unemployment induced deflation of wages and prices; whilst an "undervalued" exchange rate prevents a macroeconomic problem because it entails a conflict between price stability and external balance.

The purpose of this paper is to investigate another aspect of the problem of an overvalued or undervalued exchange rate, namely the effect of such relative price distortion on investment and growth. The analysis of this problem is simplified by assumptions which eliminate a number of important considerations which have been exhaustively discussed in the literature. Thus, the analysis is not concerned with the 'balance of

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payments problem' as such. It also puts monetary policy to the background by assuming that the required rate of return to capital is determined in the international capital market. The problem addressed in the paper is whether, given the required rate of return to capital, the actual rate of return to investment is such as to induce firms to invest at a rate which keeps the economy growing neither too fast nor too slowly.

A simple model of the growth process is developed in the next section. The subsequent two sections discuss the adjustment processes and point out the insights gained from the analysis for understanding the macroeconomic problems of 'high profitability' and 'low profitability' countries. A brief discussion of the implications of the analysis for the Scandinavian model of inflation follows. The paper concludes with some supporting evidence drawn from a discussion of the Finnish experience.

The Model

The analysis assumes the standard model of the small open economy. Thus the economy is assumed to produce two classes of commodities, internationally traded goods on the one hand and nontraded goods on the other. Each class is treated as a composite good with fixed relative prices within the class. The price of the composite tradable good in terms of the composite nontradable good is called the real exchange rate. To simplify the analysis it is assumed that the nontradable sector uses only labor. This makes it possible to identify the real exchange rate as the inverse of the real wage rate in the tradable sector and internal balance as the state of excess demand or supply in the labor market.

It is assumed that firms in the tradable sector are competitive and that they are never constrained by effective demand. They supply output

and employ labor up to a point of equality between the real wage rate and the marginal product of labor. Assuming a constant returns to scale neoclassical production function between output and inputs of labor and capital services, supply of output and demand for labor in the tradable sector can be written in the form:

$$(1) \qquad X_T^s = k(P_T/W)K_T \ , \quad L_T^d = l(P_T/W)K_T \ ,$$

where X_T^s = supply of the composite tradable good,

L_T^d = demand for labor in the tradable sector,

K_T = stock of capital in the tradable sector,

k = output-capital ratio,

l = labor-capital ratio,

P_T = domestic currency price of the composite tradable good,

W = wage rate.

Labor productivity is assumed to be constant. Demand for labor in the nontradable sector is determined by the demand for nontraded goods. All investment goods are assumed to be imported or produced in the tradable sector. Thus the demand for labor in the nontradable sector is given by:

$$(2) \qquad L_H^d = X_H^d = h(P_T/P_H)C$$

where L_H^d = demand for labor in the nontradable sector,

X_H^d = demand for the nontradable good,

C = consumption measured in terms of the nontradable good,

h = share of nontraded goods in consumption expenditure, and

$h'(P_T/P_H) < 0$.

Regarding consumption behavior it is assumed that all wage income is consumed and all profit income is saved. The motivation for this assumption is mainly to simplify the dynamic analysis. Otherwise there would be an additional dynamical equation, namely one describing the accumulation of wealth. Thus

$$C = X_H + L_T W/P_H \,, \tag{3}$$

where X_H = output of the nontradable good.

The price of the composite nontradable good is equal to the wage rate:[1]

$$P_H = W \,. \tag{4}$$

Setting X_H equal to X_H^d, a condition of equilibrium in the market for the nontradable good, the effective demand for labor in the nontradable sector can be written as a function of the real exchange rate and the stock of capital in the tradable sector:

$$L_H^d = \phi(P_T/W)K_T \,, \tag{5}$$

where $$\phi(P_T/W) = \frac{h(P_T/W)}{1 - h(P_T/W)}\ell(P_T/W) \,,$$

and $$\phi'(P_T/W) > 0 \,.$$

An increase in the real exchange rate (a reduction in the real wage rate) increases the effective demand for labor in the nontradable sector for two reasons: first, it increases employment in the tradable sector

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[1] Labor productivity is set equal to one.

and via the multiplier effect also in the nontradable sector; secondly, it induces a shift of demand from traded goods towards nontraded goods.

From equations (1) and (4) total effective demand for labor in the economy is given by:

$$(6) \qquad L^d = L_T^d + L_H^d = \psi(P_T/W_T) \cdot K_T \ ,$$

where $$\psi(P_T/W) = \frac{1}{1 - h(P_T/W)} \ell(P_T/W) \ ,$$

and $$\psi'(P_T/W) < 0 \ .$$

The supply of labor is assumed to be exogenous and to grow at a constant rate n :

$$(7) \qquad \dot{L}^s = nL^s \ .$$

From equations (6) and (7) the equilibrium real exchange rate, consistent with internal balance, is a decreasing function of the 'capital intensity' of the economy:[1]

$$(8) \qquad P_T/W = f(k_T) \ ,$$

where $$k_T = K_T/L^s \ .$$

This crucial relationship is illustrated by the LL schedule in Figure I. Points on the LL schedule imply internal balance or full

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[1] Since there is no capital in the nontradable sector the capital intensity of the economy is equal to the capital stock of the tradable sector divided by the total labor force.

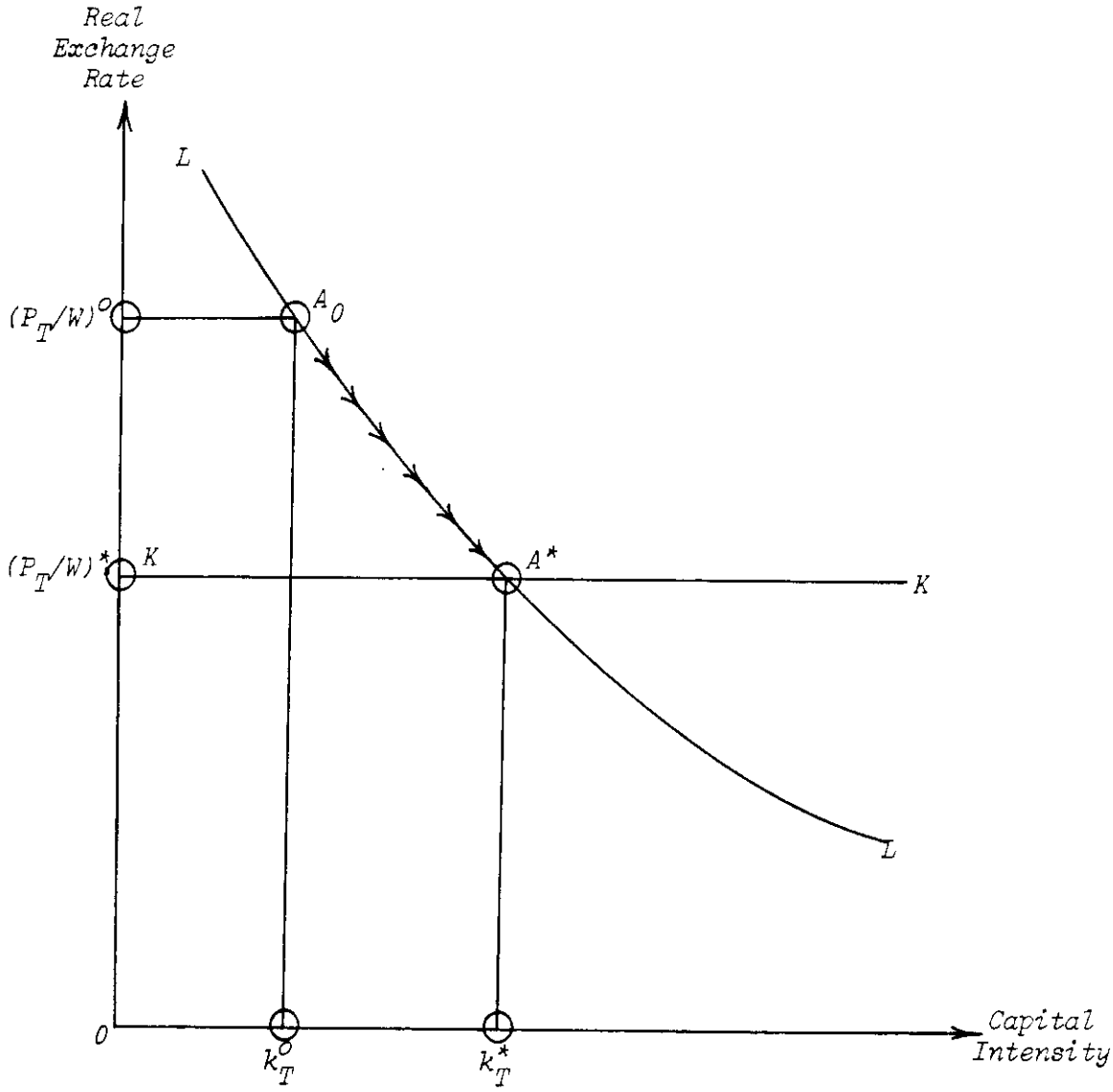
Real
Exchange
Rate
L
$(P_T/W)^o$
A_0
$(P_T/W)^*$
K
A^*
K
L
0
k_T^o
k_T^*
Capital
Intensity

FIGURE I

employment equilibrium in the labor market. Points above it imply excess demand for labor while points below it imply excess supply of labor.

The second crucial relationship relates the marginal rate of return to capital in the tradable sector to the real exchange rate:[1]

$$r_T = \pi(P_T/W) \tag{9}$$

where $\pi'(P_T/W) > 0$. This is simply the factor price frontier implied by the tradable sector's production function.

It is assumed that the 'required rate of return' to capital is given exogenously in the international capital market, and that net investment is an increasing function of the discrepancy between the actual rate of return to capital and the required rate of return:[2]

$$\dot{K}_T = I(r_T - r^*)K_T \ , \tag{10}$$

where r^* = required rate of return, $I(0) = 0$, and $I'(r_T - r^*) > 0$. It is implicitly assumed that expectations are stationary, an assumption that needs to be abandoned in a refinement of the analysis.

Making use of the factor price relationship specified by equation

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[1]Let $X_T = F(K_T, L_T)$ be the production function for the tradable sector. The marginal product of capital is equal to $F_K(K_T|L_{T1}|)$. Marginal product of labor is equal to $F(K_T|L_{T1}|) - F_K(K_T|L_{T1}|)(K_T/L_T) = W/P_T$ by profit maximization. Therefore the profit maximizing capital intensity, (K_T/L_T) , is a function of the real wage rate. Upon substitution the marginal product of capital becomes a function of the real wage rate (equation (9)).

[2]This investment function can be derived from a model of a profit maximizing firm by assuming that it is costly to adjust the stock of capital and that expectations are stationary. A similar investment function is used in Keynes-Wicksell type growth models. See, for example, J. Stein, *Money and Capacity Growth*, New York and London: Columbia University Press, 1971.

(9) and the fact that the labor force grows at a constant exponential rate (equation (7)) equation (9) can be written in the more convenient form:

$$\dot{k}_T = I(r_T - r^*) - n = g(P_T/W,\ r^*;\ n)\ , \tag{11}$$

where $k_T = K_T/L^S$ = capital intensity of the economy.

The long run equilibrium values of the rate of return to capital and the real exchange rate are then obtained by setting the two expressions on the right hand side of (11) equal to zero.

The long run equilibrium value of the real exchange rate is illustrated by the *KK* schedule in Figure I. From equation (11) it depends only on the 'elasticity' of investment with respect to the rate of return, the rate of growth of the labor force, and the factor price relationship implied by the production function of the tradable sector. It does not, in particular, depend on consumption preferences between traded and non-traded goods as in the static small open economy model.

The model is now complete in its outline. One further point needs to be mentioned however, namely regarding the behavior of the current account balance. The current account balance is simply equal to the difference between profit income and investment since domestic saving is by assumption equal to profit income. The real exchange rate has an ambiguous effect on the current account balance: a depreciation of the exchange rate for example increases profits and saving on the one hand and profitability and the rate of investment on the other. It is not possible to say *a priori* which of these two effects dominates. Thus the exchange rate cannot be viewed as an instrument for adjusting external balance. Rather, it is an instrument for adjusting internal balance and for keeping the economy on its full employment growth path.

Equilibrium Growth

In this part we investigate the dynamics of growth in a small open economy in the framework of the simple model outlined in the previous section. We start by assuming that the wage rate is flexible and equilibrates the demand for and the supply of labor at full employment.[1] By this assumption the economy is always on the LL schedule in Figure I. Thus if the initial capital intensity is equal to k_T^0 the wage rate adjusts so as to make the real exchange rate equal to $(P_T/W)^0$. At the initial point A_0 profitability in the tradable sector is high and the economy is growing fast. In the process of growth the capital intensity increases and the real wage rate also increases, implying an appreciation of the real exchange rate along the LL schedule. If the exchange rate is fixed the adjustment to the long run steady state equilibrium at A^* requires wage inflation and therefore also inflation of the prices of nontraded goods.

The prices of nontraded goods rise because there is no increase in labor productivity in the nontradable sector. Allowance for capital accumulation in that sector would obviously moderate the inflation of prices. On the other hand allowance for productivity increase for reasons other than capital accumulation accentuates the inflation bias of a growing economy given the empirical regularity of faster productivity increase in the sectors producing internationally traded goods.[2]

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[1] The price of traded goods is assumed to be constant.

[2] The difference in the rates of productivity increase between the 'open' sector and the 'sheltered' sector is a central feature of the Scandinavian model of inflation in a small open economy. That model does not, however, distinguish between increase in labor productivity due to capital accumulation and increase in labor productivity due to shifts in the production function.

Such inflation can be viewed as structural in nature since inflation is the way that the economy adjusts the structure of relative prices in the process of growth. An alternative mode of adjustment would be a secular appreciation of the exchange rate. The German economy provides an example of both types of adjustment. After the Second World War Germany was capital poor and much behind the United States in terms of technological sophistication. It took thirty years for German wages to catch up with American wages through capital accumulation and technological adaptation and innovation. The macroeconomic adjustment took the form of persistent 'imported inflation' on the one hand and periodic revaluations of the mark on the other.

Disequilibrium Growth

The process of growth is unlikely to be a sequence of full employment equilibria. In this section we analyze the growth process as a sequence of disequilibrium situations. The *LL* and the *KK* schedules, reproduced in Figure II, separate four regions of disequilibrium:

(I) a region of high profitability and excess supply of labor;

(II) a region of high profitability and excess demand for labor;

(III) a region of low profitability and excess demand of labor;

(IV) a region of low profitability and excess supply of labor.

To analyze the dynamics it is assumed that the price of traded goods is fixed and that the wage rate is governed by a Phillips curve relationship. Thus the wage rate increases (the real exchange rate depreciates) when the economy is below the *LL* schedule and decreases (the real exchange rate appreciates) when the economy is above the *LL* schedule. When there is excess demand for labor it is assumed that the tradable sector is never

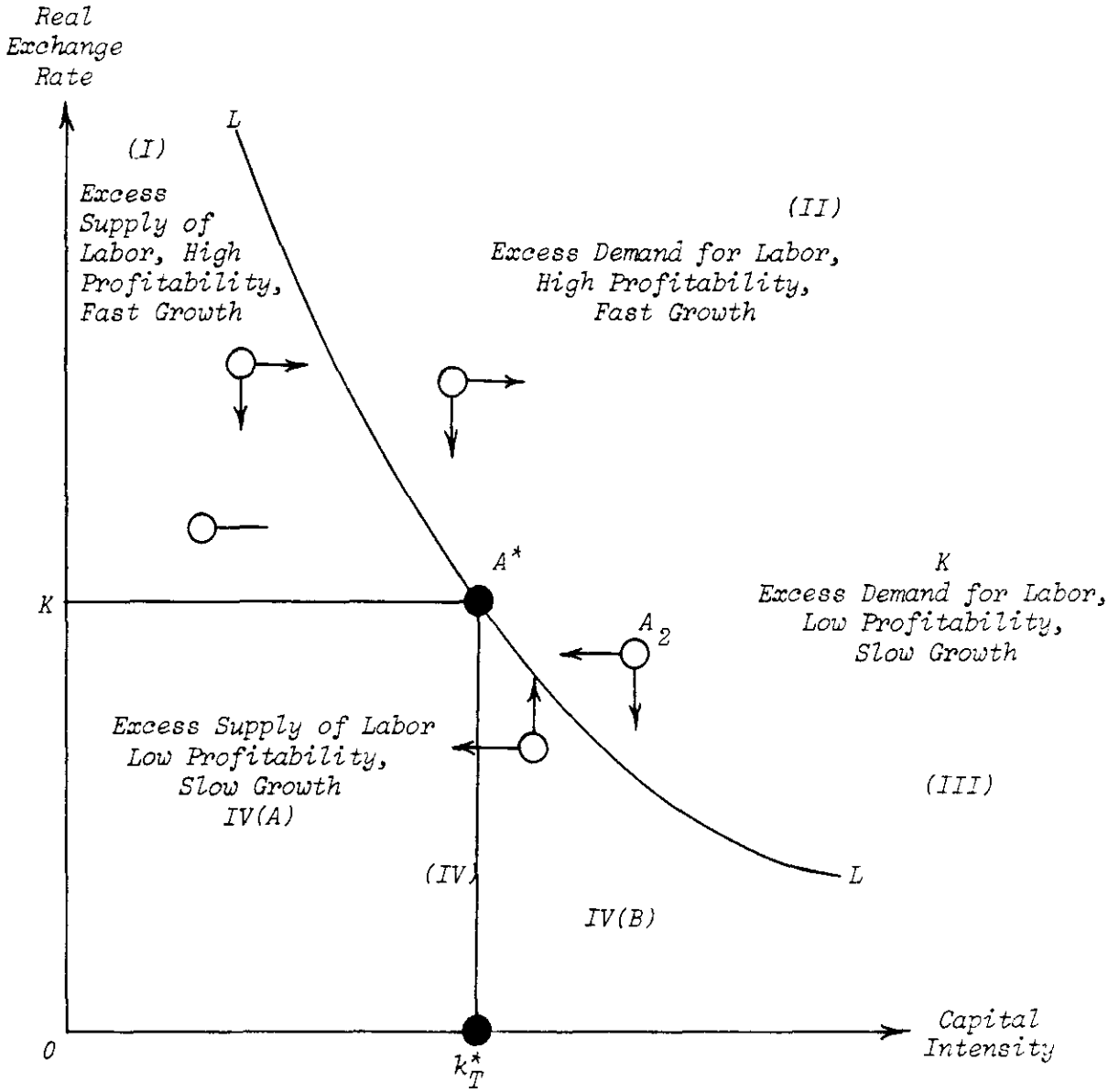
Real
Exchange
Rate
L
(I)
Excess
Supply of
Labor, High
Profitability,
Fast Growth
(II)
Excess Demand for Labor,
High Profitability,
Fast Growth
A*
K
K
Excess Demand for Labor,
Low Profitability,
Slow Growth
A2
Excess Supply of Labor
Low Profitability,
Slow Growth
IV(A)
(III)
(IV)
L
IV(B)
0
k*T
Capital
Intensity

FIGURE II

constrained, instead labor shortage is felt in the nontradable sector. As before the capital intensity of the economy increases above the *KK* line and decreases below it.

Consider now the various regions of disequilibrium, using Germany as a convenient example. After the war Germany was capital poor and had unemployment. But profitability was sufficiently high to enable the economy to grow fast enough to absorb the surplus labor. Thus Germany started in region *I* . Gradually excess demand began to develop in the labor market--the economy entered region *II* .

It continued to grow rapidly, adjusting to excess demand in the labor market through immigration of 'guest workers' and through inflation and exchange rate revaluations. The sharp appreciation of the mark starting in 1969 remitted in a sharp decline of the real exchange rate and in the 1970's the German economy entered a phase of low profitability, stagnation of investment activity and high unemployment. In terms of the simple paradigm of Figure II it moved from region *II* to region *III* and is now in region *IV* . An interesting question is whether it is now to the right or left of the vertical line $k_T^*A^*$. If it is to the right (in region *IV(B)*) it cannot but grow slowly in equilibrium because it has reached a level of affluence that cannot support a rapidly expanding tradable (manufacturing) sector. On the other hand if it is to the left of $k_T^*A^*$ (region *IV(A)*) it is still a 'capital poor economy.' In that case a larger reduction in the real wage rate is needed to induce a fast enough rate of capital accumulation.

Region *IV(A)* provides an image of capital poor countries that start with a high real wage rate and low profitability. If the real wage stays at the high level the economy grows too slowly to keep up with the

growth of the labor force. In such a case the economy is likely to experience emigration of labor, expansion of the nontradable sector and substitution of the tradable sector through various policies that are motivated by the goal of full employment. In the end region *IV(A)* leads to a 'crisis of capitalism' which has to be resolved either through restoration of profitability and investment incentives or through a complete reorganization of the system of production and capital accumulation.

An Interpretation of the Scandinavian Model

The analysis of the previous sections suggests an interpretation of the so-called Scandinavian model of inflation.[1] According to that model the rate of change of wages is equal to the sum of the rate of change of (value added) prices in the 'open' sector--assumed to be determined in the world market--and the rate of growth of labor productivity in that sector. The rate of change of prices in the sheltered sector is equal to the difference between the rate of wage inflation determined in the 'open' sector and the rate of productivity growth in the sheltered sector.

These two equations are best interpreted as requirements of macroeconomic equilibrium which ought to guide wage settlements and exchange rate policy. From the perspective of the analysis developed in this paper they are guidelines for keeping the economy on the equilibrium growth path

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[1]The Scandinavian model is known as the Aukrust model in Norway and as the EFO model in Sweden. See Odd Aukrust, "Inflation in the Open Economy: A Norwegian Model," in Lawrence B. Krause and Walter S. Salant, eds., *Worldwide Inflation*, Washington: The Brookings Institution, 1977; and G. Edgren, K. O. Faxen, and C.E. Ohner, *Lönebildning och samhällsekonomi*, 1970. See also W. Branson and J. Myhrman, "Inflation in Open Economies, Supply-Determined versus Demand-Determined Models," *European Economic Review* (January 1976); and J. Paunio and H. Halttunen, "The 'Nordic' Approach to Inflation: Interpretation and Comments," in Parkin and Zis, eds., *Inflation in the World Economy*, 1975.

(on the *LL* schedule in Figure II). If wage inflation fails to satisfy the Scandinavian equation either profitability is squeezed in which case the economy grows too slowly, or profitability is excessive in which case the economy grows too fast.

The latter development is likely in situations where there is unanticipated inflation of the prices of traded goods in the world market as in the early 1970's. As wages lag behind such nominal disturbance will have a real impact on the economy by increasing profitability and thus stimulating the rate of capital accumulation in the tradable sector.

The Devaluation Cycle

Finland provides a good example of the consequences of departures from the 'Scandinavian equation' of equilibrium growth. In the post war period the Finnish economy has goen through three 'devaluation cycles' marked by devaluations of the Markka in 1957 and 1967 and another 'devaluation situation' in 1977. The two devaluations took place against the background of high and rising unemployment, persistent deficits on the current account, extremely low profitability and stagnating investment in the tradable sector, and years of below-potential growth of the economy. The devaluations were designed not only to restore external balance with full employment but also to revive investment and to accelerate the rate of growth.

Charts I to III relate the stylized facts of the Finnish economy to the theoretical analysis of this paper. Chart I shows the behavior of "the real exchange rate" measured as the ratio of the price of value added in the tradable sector to unit labor cost in the same sector. The tradable sector is the manufacturing sector; more refined classification

would not change the picture very much. The solid line illustrates the behavior of the cyclically adjusted real exchange rate (computed using trend rather than actual labor productivity) and the broken line that of the actual real exchange rate. Except for the late 1950's, the two measures do not differ greatly. After the devaluation of 1957 both measures show sharp rise in the real exchange rate until 1960, followed by steady decline until the second devaluation in 1967. Since export and import prices increased at an annual rate of less than one percent during this period, the decline of the real exchange rate is attributable to increase in wage costs in excess of growth of labor productivity. The devaluation of 1967, with the successful incomes policy that followed it and the already accelerating inflation in world markets increased the real exchange rate dramatically from 1968 to 1970. Wages caught up in 1971 and completely eroded the relative price effect of the 1967 devaluation. The sharp rise of the real exchange rate from 1973 to 1974 reflects the sharp rise of export prices as well as of import prices in these years (despite the oil price increase Finland's terms of trade improved slightly in 1974). One can interpret the depreciation of the real exchange rate in these years as an "unintended devaluation." As is evident from the chart, the effect of that devaluation was not long lasting. It is interesting to note, however, that the cyclically adjusted real exchange rate declined much less sharply than the actual real exchange rate in 1975 and 1976. This reflects the fact that tradable goods prices continued to increase strongly during this period, despite the recession in the export sector: the decline in labor productivity reflects slow adjustment of employment to reduction of effective demand.

Chart II illustrates the behavior of profits and investment in the

tradable sector. The solid line measures gross profits in the tradable sector deflated by the price index of investment expenditure. It appears from the chart that the only way that real profits have increased in the tradable sector has been through devaluations and the associated stabilization policies. There was no growth in the level of real profits in the 1950's or in the 1960's except for the upward adjustment of the level in the two or three years following the devaluations. The same pattern is reflected in the level of gross fixed investment in the tradable sector with a time lag. A similar chart for the sheltered sector, not shown, would indicate much less variability in profits and in investment.

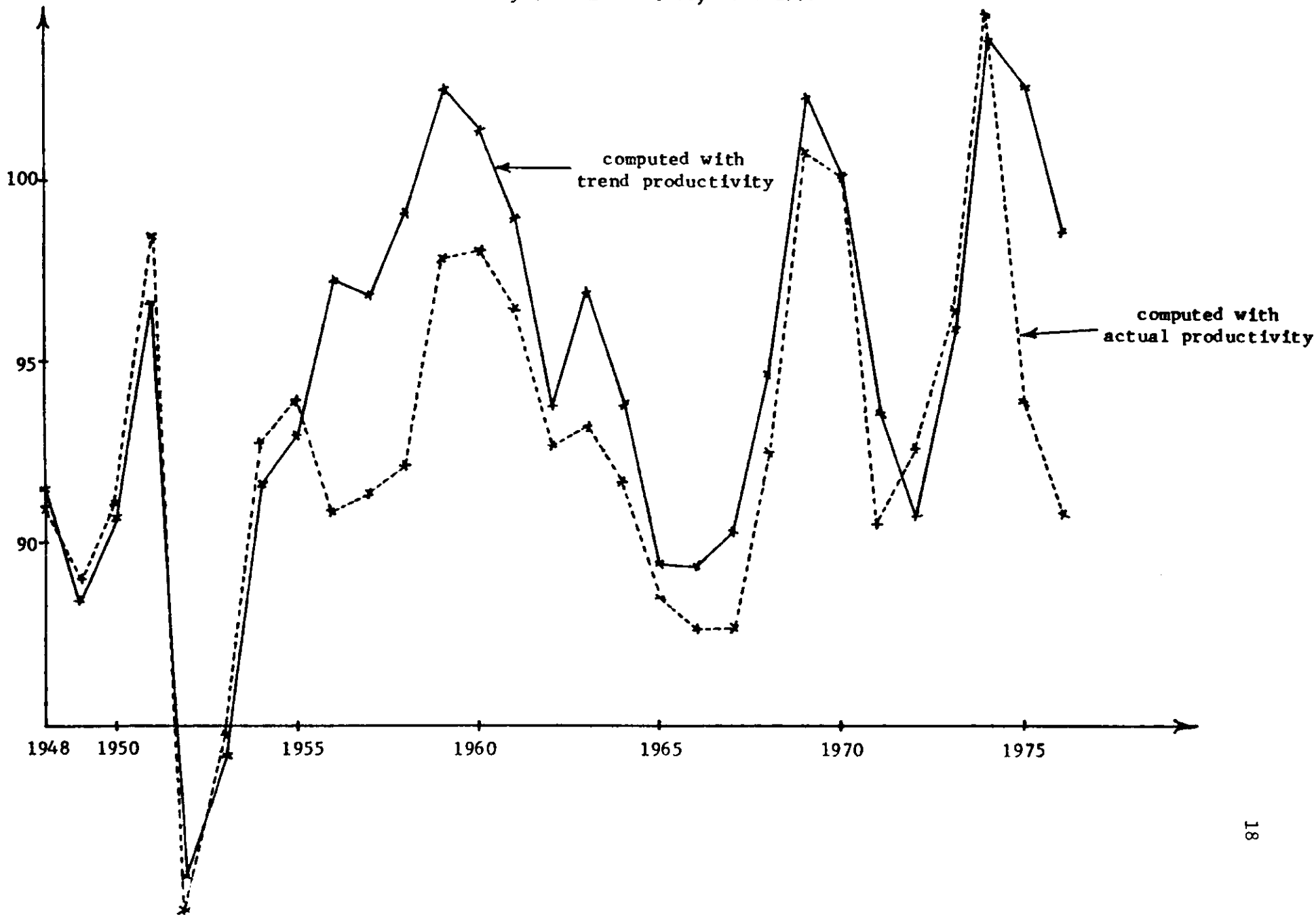
Chart III illustrates the growth of actual and potential GDP in the tradable sector in the post-war period. The potential GDP is constructed by the crude method of joining the peaks of output by exponential curves. With this method, the tradable sector has been on its growth path only in years 1951, 1955, 1961, 1970 and 1972 through 1974. There is a clear tendency of the GDP gap to increase prior to the 1957 and 1967 devaluations and subsequently to decrease as a result of a few years of rapid growth.

Whilst these charts are only included in the paper as an illustration of the empirical phenomena that was the motivation of the paper they do suggest the fruitfulness of exploring in more detail the dependence of the level and of the rate of growth of output of the tradable sector on the real exchange rate.

Concluding Remarks

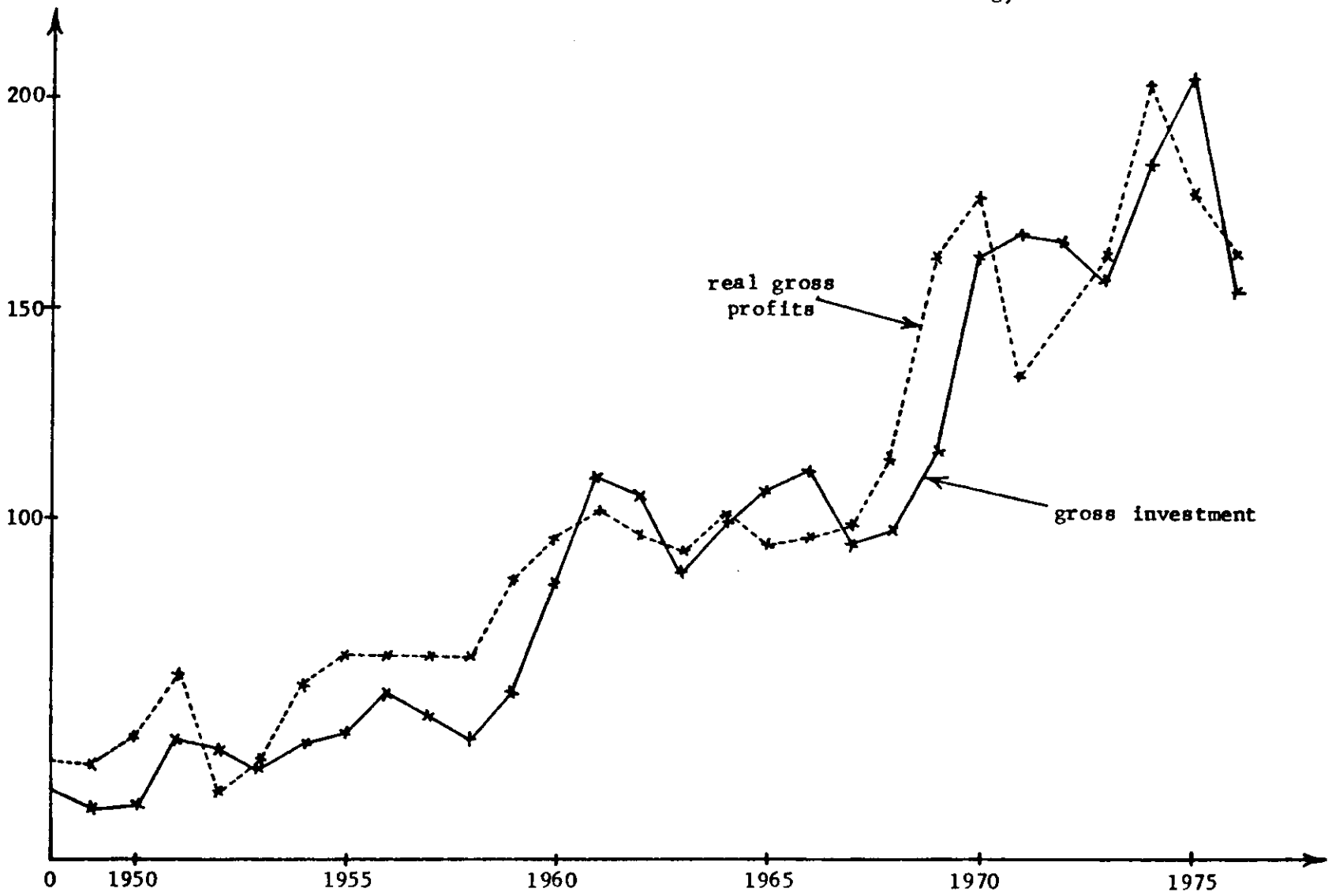
Macroeconomic theory of the open economy has paid little attention to the problems of growth in small open economies. The emphasis has been on the short run problems of internal and external balance. This paper has examined the two way interaction between short run macroeconomic disequilibrium and the process of growth in a greatly simplified model. Only one aspect of the problem has been explored, namely the link between overvaluation or undervaluation of the exchange rate and profitability on the one hand and the rate of investment and growth of output on the other.

CHART I. The Price of Value Added in the Tradable Sector Divided by Unit Labor Cost, 1948-1976



Source of data: National Accounts of Finland

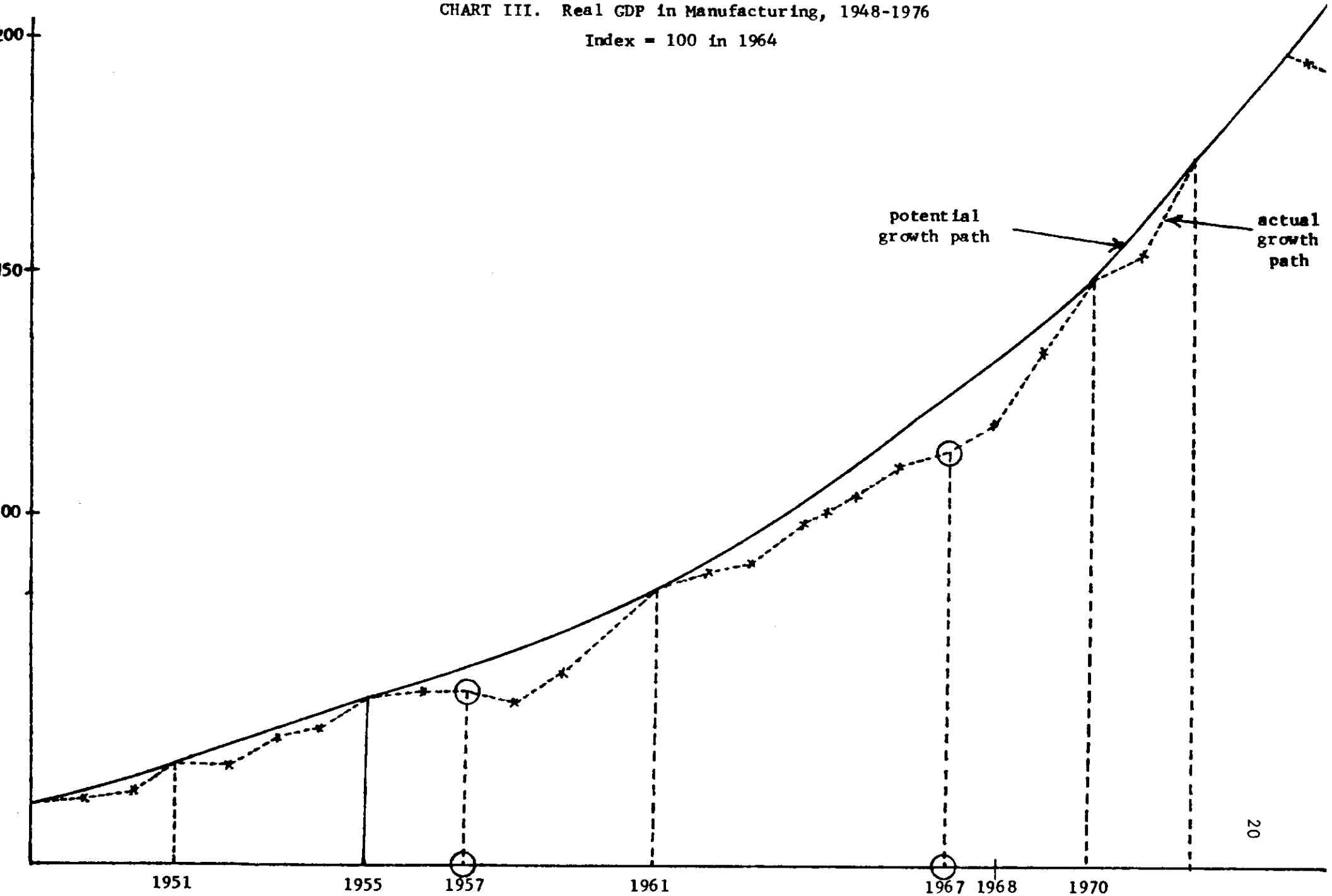
CHART II. Investment and Real Gross Profits in Manufacturing, 1948-1976



Source of data: National Accounts of Finland

CHART III. Real GDP in Manufacturing, 1948-1976

Index = 100 in 1964



Source of data: National Accounts of Finland

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