AN ECONOMETRIC TESTING OF SOME THEORETICAL PROPOSITIONS REGARDING LABOUR-MANAGED ECONOMY[1])

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1. INTRODUCTION

This paper presents some of the results of a broader study about the operation of the Yugoslav economy.[2]) The results presented here are of interest for assessing the relevance of theories of socialist market economies as applied to the Yugoslav case. They were confirmed by a variety of simulation experiments which are not reported here. The following paragraph briefly describes the model which provided the framework within which the analyzed relationships were estimated.

The quarterly macroeconometric model explains short-term fluctuations and medium-term growth of the economy. Its specification follows the general post-Keynesian theories of aggregate demand and supply, although the structure of this model varies significantly from the structure of the models for developed capitalist market economies. The difference is twofold. First, the Yugoslav economy is a developing economy, and secondly, it is a socialist economy. The model differs to an even greater extent from the models of centrally-planned economies. The reasons seem clear. In a centrally-planned economy, central authorities make allocational and usage decisions on the preponderant share of national resources. In a market economy, on the other hand, the rights to decide are diffused and the government is restricted to influencing the use of these rights. In the context of economic modelling, this means that most behavioural coefficients in a model of a centrally-planned economy are or should be subject to direct control. Accordingly, while in a market economy, equations explain the behavior of a particular group of decision-making units, in a centrally-planned economy they should explain the »planner's« behaviour. A highly simplified flow diagram summarizes the main linkages of the model. The relations considered in this paper are depicted by thick lines. They relate to price and wage determination, investments in fixed assets and inven-

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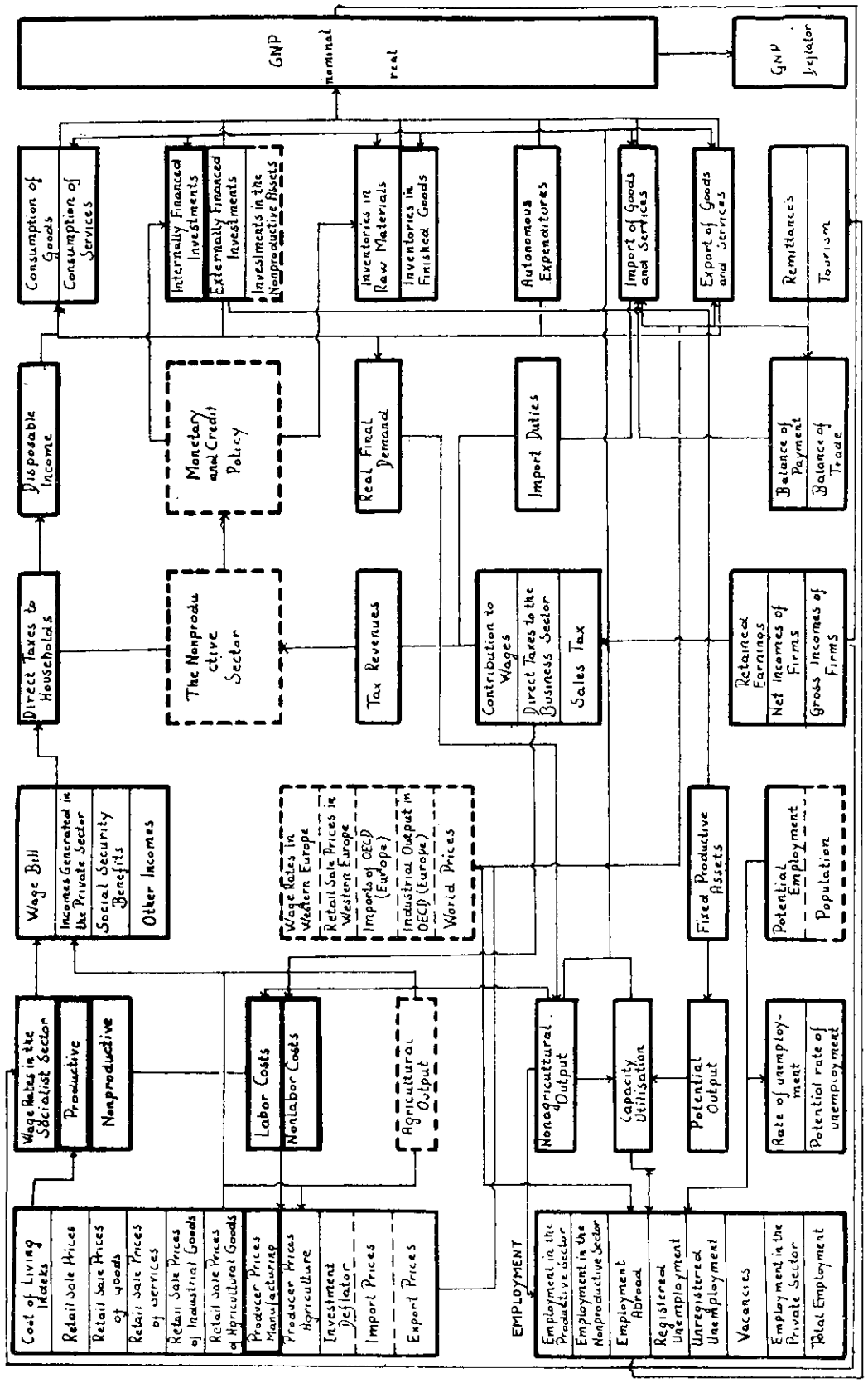
[1]) Revised version of a paper presented to the Second International Conference on Self-Management, June 6—8, 1975, Cornell University, Ithaca, USA.

[2]) Ph. D. dissertation: »A Quarterly Macroeconometric Model of the Yugoslav Economy«, University of Pennsylvania, Philadelphia, USA. Short, revised and reestimated versions of the model were published by Ekonomski institut Pravne fakultete: »Kvartalni ekonometrični model jugoslovanskega gospodarstva«, Ljubljana 1975, and »Modelska ocena efekata ekonomske politike u jugoslovenskoj privredi«, Ljubljana 1976.

FLOW DIAGRAM OF THE YUGOSLAV MODEL



tory investments in finished goods. The reason we chose to present only these relations is that they differ from the relations observed elsewhere in light of specific Yugoslav institutional characteristics. The specificities related to Yugoslavia as a developing economy are not considered here.

2. PRICE AND WAGE DETERMINATION

2.1 Prices

In a capitalist market economy, the profit maximization rule is the first-degree approximation for deriving the decision rules governing output quantities, employment of productive factors, and pricing. No clear-cut maximand has been accepted for decision-making in a socialist market economy. Benjamin Ward was the first to answer the question of what the natural and the rational concern of all participants in a worker-managed enterprise should be. He argued that workers faced with the responsibility of managing the firm and motivated by material selfinterest will attempt to maximize the average wage. This »natural and rational« rule was accepted by both Domar and Vanek.

A departure from the rule was suggested by Horvat, who argued that the observed behaviour of Yugoslav firms after 1960 does not correspond to the suggested income per unit of labour maximand. He proposed an objective function that does not differ mathematically from the neoclassical objective argueing that the contemporary Yugoslav firm distributes only part of its net income and that it accumulates the rest. His »realistic« hypothesis requires that the following function be maximized:

$$\pi = p^*Q - (d + \Delta d) * L + r^*K$$

π — profits

p — price of goods

d — wage rate

Δd — »target« wage rate increase

L — labour

r — price of nonlabour factors

K — nonlabour factors

Q — output

Except for Δd, this function is identical to the traditional theory of the firm maximand, so the decision rules should be similar to those in the capitalist market economy. The price equations can be derived as follows.

Assume that firms in a socialist market economy possess some degree of monopoly power. Hence, prices are fixed where marginal revenues equal marginal costs.

as

$$MC = MR$$

$$R = Q^*p(Q)$$

$$MR = p^*\left(1 - \frac{1}{e_{pQ}}\right) \tag{1}$$

Supprose further that costs are determined by only two factors, labour and capital

$$TC = (d + \Delta d)^*L + r^*K \tag{2}$$

$$MC = (d + \Delta d)^* \frac{dL}{dQ} + r^* \frac{dk}{dQ} \tag{3}$$

Since $MR = MC$ and $p = \dfrac{MR}{\left(1 - \dfrac{1}{e_{pQ}}\right)}$

$$p = \frac{(d+\Delta d)}{\left(1 - \dfrac{1}{e_{pQ}}\right)} * \frac{dL}{dQ} + \frac{r}{\left(1 - \dfrac{1}{e_{pQ}}\right)} * \frac{dK}{dQ} \tag{4}$$

Assuming a Cobb Douglas production function, one can replace $\dfrac{dQ}{dL}$ with (a^*Q/L) and $\dfrac{dQ}{dK}$ *with* (b^*Q/K). This gives

$$p = \frac{(d+\Delta d)}{\left(1 - \dfrac{1}{e_{pQ}}\right)} * \frac{L}{a^*Q} + \frac{r}{\left(1 - \dfrac{1}{e_{BQ}}\right)} * \frac{K}{b^*Q} \tag{5}$$

While not operational, equation (5) points out the elements that should be present in a linear approximation. These are the prices of productive services ($d + \Delta d$ and r), the shares of productive services determined by the production function (a and b), their average productivities (Q/L and Q/K), an price elasticity (e_{pQ}). While most factors can be introduced directly, elasticity can be replaced by a proxy variable such as excess demand.

The markup hypothesis is adopted as a starting point in the analysis of inflation, though the constancy of the markup is probably weakened in a labour-managed economy in which workers decide on income distribution. Specifically, the »realistic« version of the theory of the socialist labor-managed firm suggests that a firm plans a certain increase of the wage rate for each period in the future and that beyond that point it maximizes profits at that »target« wage rate. In boom times, the firm can easily reach the »target wage rate and the pressure to increase prices is weakened. When the economy is slack,

the pressure to increase prices is stengthened by the »target« wage. It is for this reason that the state of the economy seems to play a major role in the determination of prices. Equation (5) assumes: (1) that the firm posseses some degree of monopoly power and (2) that prices are in equilibrium. Actual pricing behaviour is a mixture of competitive, monopolistic princing, and is an adaptation procedure. The standard adaptation hypothesis is to assume that the actual change in price is proportional to the difference between the desired price and the last-period price. The realization that actual pricing is a mixture of competitive, monopolistic, and oligopolistic pricing allows for the replacement of the expected with the actual values. In price equations, only two cost factors usually appear; unit labour costs and import prices. Some authors, however, included taxes or cost of capital, either explicity or implicitly. We are able to include both the cost of capital and taxes.

There have been four statutory obligations paid by firms in Yugoslavia: (1) the interest on socially-owned capital assets, (2) the sales tax, (3) the tax on the income of firms, and (4) the tax on wages. The tax on wages constitutes part of the unit labour costs, while the remaining statutory obligations form the nonlabour costs. In pursuing the »target« wage, workers in a worker-managed firm protect the »target« wage from the changes in statutory obligations. The main part of their increases is likely to be readily passed on to consumers as higher prices. As there have been many institutional changes in the field of fiscal policy which have caused shifts in the tax bases, we were only able to construct a single variable embracing the interest paid on capital, the sales tax, and other direct taxes on the business sector. This variable is termed the index of nonlabour costs (NCOST) and it is defined as the sum of sales tax *(TS)* and direct taxes on the business sector (including interest on capital) *(TPD)* divided by the gross income of the business sector (*GIE*).

$$NCOST = 100. * \sum_{i=0}^{-3} \frac{TS + TPD}{GIE}$$

The rate of change of the index of producer prices *(rPPI)* is the function of the rate of change of unit labour costs *(rWCOST)* as defined elswhere, the index of nonlabour costs *(NCOST)* and the rate of change of import prices *(rPIM)*. Linear time *(TIME)* trend accounts for long-run shifts in the relationship. A dummy variable for the 1972 general price and wage freeze *(ICE)* is added to the relation.

The Index of Producers's Prices of Nonagricultural Goods

$$rPPI = \underset{(-7.30)}{-34.352} + \underset{(5.97)}{0.3297}\ rWCOST + \underset{(6.63)}{0.5787}\ NCOST$$

$$+ \underset{(3.71)}{0.1575}\ rPIM + \underset{(7.78)}{0.538} * TIME - \underset{(-2.64)}{3.089}\ ICE$$

$R^2 = 0.899 \qquad DW = 107 \qquad SE = 2.14$

Period of fit: 1961/I — 1972/IV

The results do not need specific explanations since they confirm our expectations. All variables introduced have the expected sings and values and are significant.[3])

2.2 Wages

The »realistic« version of the theory of the socialist labour-managed firm suggests that a firm plans a certain increase of the wage rate for each period in the future and beyond that it behaves like a capitalist firm maximizing its profits at the »target« wage rate. It does not answer the question of how the »target« wage rate is determied. Different alternatives are possible for its determination, i.e.: (a) by a fixed percentage change, (b) by expected net income per worker, or (c) by a productivity increase corrected for the expected inflation. The importance of the first alternative, which does not take into account the changing economic conditions, is confirmed by findings of great spontaneous wage increases. [Mencinger, 1971]. The second alterntive (expected net income per worker) is based on the hypothesis that workers determine the target nominal wages in advance by the expected performance of their own firm. The third alternative (the expected rise of productivity and inflation) expresses the »regenerative« property of inflation. The three decision rules are not contradictory and actual developments seem to give credence to their combined effects. Furthermore, the combined effects are suggested by the dual role of workers in a self-managed economy. They are at the same time sellers of labour services and entrepreneurs. As sellers of labour services the workers would take into account the general rise of productivity and expected inflation, while as entrepreneurs they would probably base their wage decisions on the net income per worker alternative.

In the theoretical context of the labour-managed economy, there is no reason for the relationshp between the increase in wages paid and the labour market conditions. Nevertheless, in the Yugoslav reality, the unemployment rate does indirectly influence the rate of wage increases, through social and political pressures rather than directly by the supply-demand mechanism. [Mencinger, 1971].

The »realistic« version of the theory of the socialist firm calls for an incorporation of the variables which are similar to those in the traditional wage determination theory. In the traditional theory, the relation of changes in wage rates to excess demand in the labour market, known as the Phillips curve, was refined by other factors thought to be important, such as the nonlinearity of the relation, the changes in prices, the lagged changes in wages, the productivity of labour, and profits.

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[3]) r denotes the overlapping rate of change of a variable. Thus, for example, $rPPI_t = 100\ (PPI_t - PPI_{t-4})/PPI$

One should note that the constant term is meaningless in a relationship in which both rates of change-type and level-type variables are present. Namely, both the long-run time trend and the average level of the variables are absorbed in the constant term.

These variables have been introduced because it had been assumed that wage rates are determined through negotiations between the unions and the employers with the introduction of strategic bargaining variables. While these variables were considered refinements of the basic relationship between the changes in wages and an excess supply of labour in a capitalist market economy, the reverse seems to be true in Yugoslavia. The relation between the excess supply of labour and changes in wage rates becomes the refinement.

Rate of wage change in the socialist productive sector *(rWP)* is a function of the lagged rate of change in the cost of living (rCL^{-1}), rate of change in productivity $(r\,Q/LP)$, rate of change in net income per worker $(r\frac{NIE}{LP})$, rate of excess labour supply *(U)* corrected for structural unemployment and a dummy variable *(ICE)* for the general price and wage freeze in 1972.

Wages in the Socialist Productive Sector

$$\underset{}{rwP} = \underset{(3.58)}{17.9951} + \underset{(782)}{0.7032}*\mathbf{rCL}^{-1} + \underset{(1.23)}{0.3143}*\mathbf{r}.\frac{Q}{LP} + \underset{(2.49).}{0.0867}*r\,\frac{NIE}{LP}$$

$$\underset{(-2.55)}{-1.7905}*\ (0.25 * \sum_{i=0}^{-3} (U - 3.2)) \underset{(-4.13)}{-4.539}*ICE$$

$R^2 = .8327 \qquad DW = 1.0331 \qquad SE = 4.7352$

Period of fit: 1962/I — 1972/IV

Regression coeficients agree with the expectations based on the theoretical reasoning concering factors influencing the wage rate. The significant and large constant allows for a high degree of spontaneous wage increase offset by only one variable having a negative sign. This is the rate of excess labour supply *(U)* corrected for the rate of structural unemployment.[4]) As expected, the elasticity of wage change to the expected cost of living is high, suggesting a quick adaptation. The elasticity of the wage rate to productivity is lower, and the elasticity with regard to the income of enterprises is lower still. These low elasticities suggest that wage determination is highly independent of actual performance. They indirectly contradict the validity of Ward's maximization principle in the Yugoslav economy.

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[4]) U is defined as $U = \frac{\text{registered unemployment} - \text{vacancies}}{\text{total employment} + \text{vacancies}}$

The lowest seasonally-adjusted rate of unemployment in the observed period (3.2) was taken to be the level of »structural unemployment«.

The influence of uneployment on wage increase is weak. *Ceteris paribus*, only a rate of unemployment of 13% would stabilize wages which would most likely be socially unacceptable. For further results see [Mencinger, 1971].

Note that the introduced moving average structure for the rate of unemployment is a simple adjustment of the level variables to the overlapping rate of change variables.

3. INVESTMENT IN FIXED ASSETS

The central issue dealt with in the Yugoslav literature on investment is normative in the sense that the discussions focus on how investment ought to take place rather than how it actually does. Macroeconomic implications of the positive theories on investment determinants are few. Vanek has been the only scholar offering an explicit investment function for a labour-managed economy. His investment function can be considered a version of the neoclassical investment theory [Vanek, 1970, Ch. 8]. Optimal capital accumulation of a labour-managed firm requires maximization of the present value of the sum of discounted future incomes per unit of employment. The basic assumption of the theory is the existence of a perfect capital market where individual firms can lend or borrow unlimited amounts of capital at the going rate of interest. With additional variables: interest for socially owned capital (charge per real worth of capital in a from of capital tax distinct from the current interest rate), general price level, and real national income (both stand for expectations), his investment function for the labour-managed economy is of the form:

$$I = f\ (i,\ P,\ Q,\ r)$$

where the hypothesized effects are:

$$\frac{d\ I}{d\ i} < 0,\quad \frac{d\ I}{d\ p} < 0,\quad \frac{d\ I}{d\ Q} > 0,\quad \frac{d\ I}{d\ r} \gtrless 0.$$

I — investment in fixed assets,

i — market interest rate,

p — general price level,

Q — real national income,

r — interest rate on socially-owned capital.

The existence of a perfectly competitive market is not merely a simplification of this basically neoclassical theory, but rather it is a condition for its validity. Since the capital market does not exist in Yugoslavia, the theory cannot explain the investment behaviour of firms in Yugoslavia. Furthermore, the assumption that a firm operates as a knowledgeable and efficient »future income per worker« maximizer, which is implicit in Vanek's theory, seems even more questionable than the corresponding assumption in the capitalist economy. While in most econometric studies on investment a negative relationship between the rate of interest and investment has been found, the interest rate can be ruled as a determinant of investment in Yugoslavia on *a priori* grounds. Socialized risk for erroneous decisions on investment and high rates of inflation have made the real interest rate negative. The Yugoslav reality, therefore, seems to place Vanek's investment theory within normative rather than positive economic thinking.

Ward does not give a specific investment function that could be tested empirically. The wage (income per worker) maximization rule, however, suggests that a firm distributes its entire net income as wages. Accordingly, the wage maximizing firm opts for zero new investments from its own sources, and deviation from such behaviour can occur only through direct government intervention. This implication contradicts observed behaviour.

There are few investment implications in the »realistic« version of the labour-managed economy. Horvat argues that:

> Since capital is socially-owned, risk and uncertainty are greatly reduced. As a consequence, the work collective, performing the role of an entrepreneur, shows a much higher propensity to invest and to increase employment — aiming at fast expansion of output — than is the case in the capitalist environment. Hence, a hight rate of investment, often not matched by adequate financing, and over-employment are to be expected [Horvat, 1972, p. 292].

Actually, the share of gross fixed investment in the Yugoslav GNP exceeds the share of gross fixed investment in the *GNP* of most market economies. Over-employment and inadequate investment financing are also well-known phenomena. Thus, these facts, speak in favour of his argument. On the other hand, the share of gross fixed investment in the *GNP* decreased rapidly during the periods in which firms' autonomy in income distribution increased.

An important implication can be derived from the Furubotn-Pejovich wealth maximization assumption.

> ... the employees of the Yugoslav firm face two fundamentally different wealth increasing alternatives: (i) the option to leave a a part of the residual with the firm for the purchase of additional capital goods, or (ii) the option to take the entire residual, out as wages and then to invest individually in savings accounts, jewelry, or in anything else the law allows ...
> Since the return from the joint investment in capital goods via retained earnings is received in the form of incremental wages and, for only as long as the emploee remains with the firm, the required internal rate of return on such investment must be substantially higher than the rate of return on fully-owned assets to make category (i) investment preferable to category (ii) [Ferubotn an Pejovich, 1972, p. 1156].

Accordingly, one could argue that a Yugoslav firm's propensity to invest would be lower than that of a capitalist firm. However, the lower propensity to invest due to the limited »property rights« can be matched to some extent by »socially-owned risks and uncertainty«.

The question of whether self-financing should be the primary or subsidiary source of investment financing has been raised by many Yugoslav economists. In general, it is viewed as natural for the Yugoslav firm to finance investment with internal funds. Actual development regarding self-financing does not support this view. Vanek, arguing for external financing as the only feasible means of investment financing in a labour-managed economy, fiercely opposes self-financing. This viewpoint clearly follows from his theory. Self-financing is ruled out in a perfect capital market where rational firms could have no preferences for using their own funds, because the opportunity costs are, by definition, equal to those of obtaining external funds.

The prevalent forms of investment financing — self-financing and investment credits — pose the question of whether the firms prefer their own funds rather than borrowed funds. It is a question of whether a marginal cost of funds curve exists similar to the one introduced by Duesenberry. Social ownership of the means of production and a negative real interest rate wolud imply preference for external funds. The Furubotn-Pejovich »property rights« theory would on this account imply that the greater the investment funds available to the firm in the form of external investment credits, the lesser the incentive of the firm to invest its own funds. Accually, the question is partly answered by regulations that tie investment credit to partial self-financing.

The distinction between the productive and the nonproductive sectors of the economy, along with frequently-changing investment financing, suggest that for the purposes of analysis it is necessary to distinguish between different categories of investments. This distinction is made on the basis of investment financing and on the basis of their addition to the productive capacity of the economy. The economic and/or political forces at work in these categories are quite distinct. We were able to differentiate the following categories of investments:

(1) investments in productive fixed assets financed by the internal sources of the enterprises (IER),

(2) investments in productive fixed assets financed by external sources (IER),

(3) investments in nonproductive fixed assets *(INR)*.

Explanation of the first of the components of investment, i.e. investment financed by the internal sources of the enterprises, is sought. In this category, economic factors prevail. The second component of investment cited above depends on complex social and political considerations. It is connected to investment decisions by firms and is endogenously estimated. Investment in nonproductive fixed assets by the socialist sector is treated as being entirely exogenously determined. This reflects the fact that public expenditure decisions, including investment

decisions, are made on complex social, political, and economic grounds and that economic considerations operate more by modifying other factors than by directly affecting the level of investment.

In specifying investment function in the absence of an explicit investment theory of the labour-managed economy, one is bound to consider, the relevance of traditional investment theories. Two groups of these theories can be distinguished: the neoclassical one arguing that profits are the most important determinant of investment and the acceleration principle.

Theoretical arguments that profits should be regarded as the most important or sole explanation of investment have two rationalizations: expected profits and source of funds. Profits (net incomes) can also be considered an important determinant of investment in Yugoslavia. The »source of funds« rather than the »expected profits« seems to be the more appropriate theoretical rationalization.

An acceleration theory based on changes in demand is an alternative to profits as the main determinant of investment. Its simplest form — the rigid accelerator — has been rejected by empirical studies. The flexible accelerator and, in particular, the stock adjustment model originated by Chenery and Koyck represent the basis for the specification of investment functions in most macroeconometric models. The basic theoretical assumption is that investment is proportional to the difference between the actual and the desired level of capital, and that investment adjusts to bring actual capacity into line with desired capacity. Until this is achieved, the difference influences the level of investment. Alternative specifications of the desired capital stock allow many different hypotheses to be formed in the framework of the accelerator which are essentially extensions of the accelerator. The diversity of possible hypotheses is important in the specification of the investment function for an economy in which maximization criteria are rather vague and where institutional changes play an important role in determining economic relationships.

Accelerator models, regardless of whether one has in mind the capital stock adjustment version, the capacity version, or the change in output version, relate to new investments. Without a complementary theory of replacement investment, they cannot provide adequate explanation of gross investment. While it is impossible to distinguish empirically between outlays for replacement and outlays for new investments, a theory can nevertheless be stated. Three different components of investments (replacement investments, adjustment investments, and expectational investments) can be distinguished (de Leeuw — 1962). The first concerns continual wearing out of the existing capital stock, the second relates to adjustment of capacity to its optimum relationship with current output, and the third to expected changes in output. The determinant of the expectational and the adjustment investments is output, and the determinant of replacement investment is the existing capital stock.

The stock adjustment version of the accelerator introduces the capital stock variable into the determination of new investments and requires a negative value for the coefficient for capital stock. On the other hand, investment for replacement requires a positive value for the coefficient for capital stock. The proper sign of the coefficient is thus unclear. In the change in output version of the accelerator, capital does not appear in the determination of new investments. For this reason, the change in the output version of the accelerator seems appropriate in determining gross investment. The rigid relationship between change in output and investment can be modified by incorporating capacity utilization, the adjustment process, and financial variables. A composite variable gross investment is thus the sum of new investment, being essentially a function of changes in output (modified for capacity utilization and liquidity) and replacement investment as determined by the existing capital stock.

In specifying the investment function, explicit recognition of time lags is necessary to account for actual lags between the time a firm faces the need for capital expenditures and the actual expenditures. Rather long lags can be expected in investment functions and additional long lags can be expected between the outlays for investment and the completion of a productive unit. The lags between the outlays and the completion of a productive unit are considered in the determination of the productive capacity of the economy. The average gestation period is estimated to be four-quarters. The lags between the recognized need for capital expenditures and actual expenditures are introduced into the specified investment function, though they are estimated empirically rather than determined on *a priori* grounds.

Two variables are added to the basic relation: a change in money in circulation *(M)* that reflects liquidity conditions, and a change in fixed investment credits *(KFA)* that reflects the institutional characteristics of investment financing. Liquidity conditions should not be overlooked since reduced availability of financial assets affects the accelerator. The accelerator may well provide an explanation of investment when liquidity is plentiful, but it will be inadequate as soon as liquidity becomes scarce.

The effects of investment credit on investment financed by internal sources are unclear. Institutional regulations bind credit to partial self-financing while the ready availability of investment credit stimulates firms to cover as much as possible of their investment outlays by credit and to reduce investment outlays from the internal sources. On this latter ground, one can expect a negative relationship between investment credit and internally-financed investment.

Internally-Financed Investments in Fixed Productive Assets[5])

$$IER = -702.24 + 10.05 * \Delta Q + .0238 * K_{-1} + .0207 * \Delta M$$
$$(-1.63) \quad (3.17) \quad (6.07) \quad (4.97)$$
$$-.0149 * \Delta KFA_{-2} - 88.15 * TIME + 207.27 * REF\ 65$$
$$(-2.04) \quad (-6.21) \quad (5.86)$$
$$R^2 = .6911 \quad DW = 1.27 \quad SE = 69.354$$

Period of fit: 1961/I — 1972/IV

The coefficients of the equation correspond to expectations and do not need additional explanation. The signs of two coefficients are nevertheless of interest here. These are the negative sign for the time trend *(TIME)* variable and the negative sign for the change in investment credits variable (ΔKFA). They are consistent with the Furubotn-Pejovich effect of the limited property right that suggest underinvestment tendencies in a socialist market economy.

Externally-financed investment in fixed productive assets, on the other hand, are related to internally-financed investment and change in investment credit. The signs of the coefficients are consistent with expectations but, as the equation is not of particular interest, it has not been presented here.

4. INVENTORY INVESTMENTS

There are at least two reasons which make the inventory investment mechanism in Yugoslavia important and interesting. First, investment in inventories represents a relatively important share of GNP. It exceeds the share in capitalist countries though it is smaller than the share in socialist planned economies. Secondly, the behaviour of this component of aggregate demand differs significantly from behaviour elsewhere. It is a stabilizing rather than a destabilizing component of aggregate demand [Horvat, 1969].

The distinction between the inventories of finished goods and the inventories of purchased materials and goods in process is essential in

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[5]) Note the meaning of the variables

ΔQ = $Q_t - Q_{t-4}$ — a four-quarter overlapping difference in output measured by indexes of nonagricultural production Ø 1967 = 100. As real investment in fixed assets is measured in 1967 dinars, the absolute value of the coefficient is meaningless.

K — productive capital stock determined by the model using the perpetual depreciation method, i.e.

$K_t = K_0(1-d(t))^t + I_i(1-d(t))^{t-i}$

where d(t) is the empirically determined rate of capital consumption.

ΔM — a four-quarter overlapping difference in currency and demand deposits (millions of dinars).

ΔKFA — a four-quarter overlapping difference in investment credits.

TIME— linear time trend.

REF 65 — a dummy variable for the 1965 economic reform.

developing a theoretical basis for inventory investment decisions. The basic difference between the established anticyclical movements of inventory investments in Yugoslavia and elsewhere stems from the stock building of finished goods (only inventories of finished goods are considered in this paper). They can be viewed as being, to a great extent, a phenomenon of passive investment. That means that inventories rise and fall as a consequence of decisions regarding purchasing, production, and employment rather than as consious decisions on inventory investments.

The assumption concerning the natural reluctance of worker-managed firms to dismiss fellow workers has important consequences for inventory investments. Workers are not dismissed; they produce even in periods when there is no market for their goods. Inventories of finished goods accumulate as production is continued. They are financed out of profits, credits, and price increases. Such accumulation is made possible by the specific type of financing working capital. Both the reluctance to discontinue production and the specific financial arrangements result in the observed accumulation of inventories in the recessions and their reduction in booms. While the role of the monetary sector is considered negligible in most econometric studies on inventory investments, the opposite view is accepted here. Monetary factors determine the enterprises' ability to purchase goods. The higher the liquidity (amount of money), the lower the inventories of finished goods should be. Hence, a negative relationship between the amount of money in circulation and investment in inventories of finished goods can be expected.

A flexible accelerator provides the basis for the inventory equation specification. It requires inclusion of the output variable and lagged inventories *(INVFG)* of finished goods in the equation. However, business conditions captured by the capacity utilization variable (CAPU) is the central variable determining inventory investments. While the accelerator retains its role in the long run, the difference between the sold and the produced output becomes the most important determinant of inventories of finished goods in the short run. Stock of inventories of raw materials *(INVRM)* appears along with other variables explaining inventory investments of finished goods. It reflects, the actual flow of goods in production and the predominantly residual nature of inventories in finished goods. The speculative motive of inventories of finished goods is related to what some claim to be a frequently-used practice by Yugoslav firms. Namely, to get permission to increase prices, they simulate the shortage of goods by stock-piling. The ratio of retail *(PCI)* to producers' prices (PPI) accounts for a speculative motive of this kind. The role of the monetary sector in determining inventory investments in finished goods is reflected by the quantity of the money variable *(M)*.

Inventory Investments in Finished Goods[6])

$$100.\ {}^{*}\Delta INVFG = \underset{(6.25)}{23251.6} + \underset{(4.73)}{.7853} * (.25 * \sum_{i=0}^{-3} Q_i) \underset{(-12.56)}{-.6807} * INVFG_{-4}$$

$$+ \underset{(3.38)}{.2486} * INVRM_{-2} \underset{(-7.02)}{-252.42} * (.25 * \sum_{i=0}^{-3} CAPU_i)$$

$$\underset{(-2.56)}{-.0786} * \Delta M \underset{(-2.46)}{-.0777} \Delta M_{-1} \underset{(-2.00)}{-45.29} * (25. * \sum_{i=0}^{-3} \frac{PCI}{PPI}$$

$R^2 = .9215 \qquad DW = .8811 \qquad SE = 242.65$

Period of fit: 1961/III — 1972/IV

All coefficients have theoretically correct signs; their absolute values are irrelevant. Only the coefficient for the capacity utilization index is of special interest here. Its highly significant negative value is consistent with Horvat's finding that inventory investments should be considered a strong countercyclical component of aggregate demand in the Yugoslav economy.

(Rad primljen avgusta 1976.)

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EKONOMETRIČNO TESTIRANJE NEKATERIH TEORETIČNIH PREDPOSTAVK SAMOUPRAVNEGA GOSPODARSTVA

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(P o v z e t e k)

Ekonomska teorija samoupravnega socialističnega gospodarstva šele nastaja. Posebno malo je empiričnih testiranj veljavnosti teoretičnih predpostavk ali njihovih implikacij. Članek je poskus v tej smeri; vse ugotovitve temelje na kvartalnem ekonometričnem modelu jugoslovanskega gospodarstva, oziroma so njegov stranski proizvod.

Tri področja so posebno zanimiva za presojo veljavnosti teoretičnih predpostavk in njihovih makroekonomskih implikacij.

[6]) Note again the meaning of the moving average structures, i.e. ΔINVFG — a four-quarter overlapping difference in stock of inventories, Σ Q — a four-quarter overlapping sum of production.

»Realistična« teorija samoupravnega socialističnega gospodarstva je osnova za izvedeno in ocenjeno funkcijo cen. Teorija vsebuje »zaželjeno« rast osebnih dohodkov, ne daje pa odgovora na vprašanje, kaj določa to rast. Empirično testiramo tri možne alternative, ki bi jih mogli imenovati spontana, dohodkovna in regenerativna. Testiranje kaže na sočasno veljavnost vseh treh, posredno pa zanika Wardov maksimizacijski princip.

Drugo področje proučevanja so investicijske funkcije. Jugoslovanska ekonomska misel na tem področju je predvsem normativna, saj bi med normativne morali uvrstiti tudi edino eksplicitno investicijsko funkcijo, Vanekovo neoklasično investicijsko teorijo. Tako ostajajo za testiranje Horvatove makroekonomske implikacije in Furubotn-Pejovichev efekt.

Investicije v zaloge dokončanih izdelkov so tretje področje proučevanja. Delež investicij v zaloge v družbenem produktu je zelo velik, obenem pa investicije v zaloge kažejo izredno značilne anticiklične tendence in jih zato moremo uvrstiti med najpomembnejše vgrajene stabilizatorje jugoslovenskega gospodarstva. Testiranje determinant investicij v zaloge dokončanih izdelkov v celosti potrjuje Horvatove makroekonomske implikacije.