A MODEL OF MAXIMAL ECONOMIC GROWTH

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A MODEL OF MAXIMAL ECONOMIC GROWTH

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I. INTRODUCTION

The problem of the optimum rate of investment has usually been tackled along the following two lines: (1) either a social welfare function is defined and then social welfare is maximized or (2) the terminal stock of capital is postulated and consumption is maximized. Both approaches are operationally meaningless. Social welfare functions are arbitrary because utility cannot be measured. The estimation of the terminal stock of capital is both unnecessary and irrelevant. It is irrelevant because no real world planner has ever attempted to carry out a long-term plan. The sole purpose of a long-term plan is to provide the economic decision makers with a perspective and enable them to make efficient decisions *now*. With every new information the plan is revised and the horizon shifted further into the future. Why the knowledge of the terminal capital stock is not necessary will become clear as we proceed.

Thus, the usual approaches failed to be of any use to planners. It is also clear that no amount of sophistication and perfection can make them useful. Consequently, one had to look for an alternative approach. This approach consisted primarily in explorations of characteristics of the real world [2, 3, 4]. In the present paper I shall extend earlier results and explore some of the implications of the proposed solution.

II. THE MODEL

Consider the production function of the economy $\Delta P_t = f(I_t, E_t)$ with the following properties:

(1) t is a fixed period of time of unspecified length.

(2) I_t is optimally distributed investment within the fixed period of time chosen. 'Optimally' means that I_t generates the highest possible increment of production in period t.

(3) E_t stands for exogenously determined factors, labor included.

(4) Since in any finite interval of time the capacity of absorbing productive investment is absolutely limited in every economy [2], ΔP will be an increasing function of I only up to the point where the decreasing marginal efficiency of investment will reach the value zero, $mei = 0$. After that point ΔP becomes a decreasing function of I. It is important to realize that this is not an assumption but a description of a fundamental property of the world.

(5) Investment generates technological progress which, in turn, increases the absorptive capacity of the economy. But since there is an obvious limit to the productive rate of technical change *per unit of time*[1], we reach the same result as in (4).

(6) It follows from (5) that a limit exists not only for the expansion of investment at any one time, but also for the share of productive investment in social product. Empirical evidence suggests that the limit for investment in fixed capital lies around 40 percent. No independent economy of some size has ever succeeded in investing productively more than this percentage of social product.

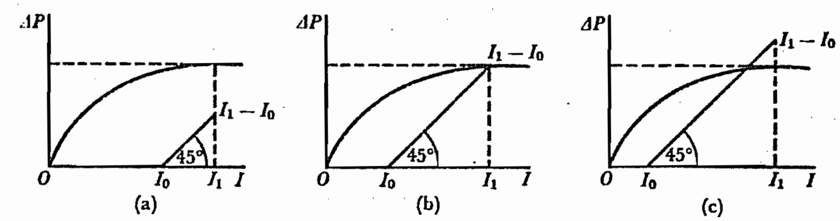
(7) The absorptive capacity (and so the increment of output) in any period depends on the volume of output of the preceding period. It looks reasonable to assume that, ceteris paribus, higher output now provides better chances for achieving higher output in the future. As a consequence, excessive investment will produce similar results as insufficient investment: lower rate of growth.

(8) The gestation period of investment is zero. This is the only unrealistic assumption. Its only role is to simplify analysis. It affects in no way the substance of the argument.

The production function with the enumerated properties are represented in *Figure 1*. The graphical presentation is in only one aspect more restricted than necessary. Since it is impossible to draw the production function in its 'general form', *i.e.*, without any specific form, I had to choose a possible form for the function in *Figure 1*. The choice implies the property $d^2P/dI^2 < 1$. Perhaps *S*-shaped curves would be more realistic. In any case the question of the exact shape of the production function is in no way relevant for the argument that follows. The only relevant property is the existence of the maximum.

1. This fact was also observed by N. Kaldor [5, p. 207].

Figure 1



Consider two periods or years, the base year (0) and the current year (1). The maximum output is obviously determined by $mei = 0$. Three possibilities exist: (a) the increment in investment in the current year, determined by $mei = 0$, may be smaller than the increment in output resulting from total investment in that year, $I_1 - I_0 < \Delta P_1$ ($\Delta P_1 = P_1 - P_0$); (b) it may just exhaust the total increment in output, $I_1 - I_0 = \Delta P_1$; or (c) it may even be greater than the latter. If our two years are typical years, then in (a) consumption is expanding all the time, in (b) consumption remains constant, and in (c) consumption is declining. Which of three cases is the relevant one cannot be decided on the basis of deductive reasoning. We have to turn to the empirical world. It may be shown that for observed highest growth rates of investment observed capital coefficients rule out cases (b) and (c) [4]. Thus, case (a) should be studied as a typical case.

Since we have imposed no restriction on the variability of the growth rates, capital coefficients, type of technology, etc., the result is rather general. Assuming that the economy has been fully adjusted to the maximum rate of growth (i.e., $s \approx 0.4$), it says that consumption will be maximized forever if investment is carried to the point where its marginal efficiency becomes zero. It does not pay to go beyond $mei = 0$, because total output will decrease. It does not pay to stop before $mei = 0$, because this would reduce the potential absorptive capacity of the economy and with it the possible rate of growth. And a smaller rate of output growth in a situation in which the share of investment in output is approximately constant means a decrease in consumption.

If the economy is not on a maximum growth path, the situation is slightly more complicated. The transition from a low rate of growth to a high rate of growth state requires an increase in investment that theoretically may be so high as to depress consumption and bring us back to traditional utility considerations. However, the characteristics of the real world are such that (1) for any longer period of time investment cannot expand by more than about 15 percent annually without bringing *mei* below zero; (2) this implies that the share of investment in outputs cannot increase by more than 1–1.5 percentage points per annum; (3) as a consequence in no economy growing at a rate higher than 1–1.5 percent per annum can the level of consumption be reduced if $mei=0$ policy is followed; (4) the level of consumption under $mei=0$ policy can lag behind the one under constant share of investment ($s=\text{const.}$) policy at most about one half of a year in the first several years, while the gain bought by this waiting is later expanding geometrically [2]; and (5) every generation maximizes consumption within its life-time [3]. In the light of these facts it is quite safe to expect that in any referendum in any country in which more consumption is considered desirable an overwhelming majority would vote in favour of the maximum growth policy. This means three things: (a) we have a testable hypothesis, (b) we are pretty sure what preference will be revealed and (c) the knowledge of the exact shape of a social welfare function is both unnecessary and irrelevant.

A growing economy displays certain important characteristics generally not well-known. In this context, I shall briefly explore a phenomenon which closely corresponds to the relativity phenomena in physics. I shall first consider a steady rate of growth (corresponding to inertial systems in physics) and then I shall examine accelerated growth.

III. STEADY RATE OF GROWTH

Growth implies means of production which, for short, I shall call capital. In the present context, the term primarily refers to fixed assets. The text which follows is an analysis of the economic properties of fixed assets in systems expanding at constant rates of growth. I propose to approximate the real world by the following set of assumptions:

(1) A fixed asset has a life span of n years.

(2) Throughout the life span of an asset its output capacity diminishes at a constant proportional rate ϱ. At time t productive capital in existence is equal to $K_t=K_0e^{-\varrho t}$. For $\varrho=0$ we get the frequently considered case of constant output capacity throughout the service life of the asset. For $\varrho=\infty$ fixed asset loses its time dimension and becomes economically equivalent to raw material completely used up in one single period of production.

(3) Output is proportional to capital, $P_t=pK_t$. Thus K represents not only gross capital but also output capacity. In the latter case it is implied that the units of measurement are changed by a constant factor p.

(4) One type of good is produced and it serves for both capital formation and consumption (this good may be thought of as exchanged for other consumer goods from abroad).

(5) Changes in labour and other non-capital costs are either neglected or expressed in terms of changes in output capacity—whichever of the two alternatives may be preferred.

(6) The scrap value of a machine is zero.

(7) The investment gestation period is zero.

(8) Capital goods are perfectly divisible.

(9) There is no technological progress.

Assumptions 3 and 9 will be relaxed at a later stage. Assumption 4 is simplifying but inessential. It is frequently used. Its sole purpose is to avoid the purist's discussion of the role of prices and of index number problems, which are problems completely irrelevant to our task. Assumption 2, though not perfectly general, is sufficiently general (ϱ can vary between zero and infinity) to make all results generally valid. The remaining assumptions are either realistic or merely simplify algebra at no cost for the substance of the problem discussed.

We also need two definitions:

(1) The steady growth system is the one that expands at a constant rate of growth which is less than infinite ($r=\text{const.}$).

(2) Real capital cost represents investment necessary to maintain output capacity intact within the accounting period. The accounting period may be specified arbitrarily.

Since a machine lasts only n years, it suffices to consider investment (reduced by wear and tear) within the period of the last n years. We assume that at $t=0$ unit investment was made and that since then (gross) investment has expanded at a constant rate r. Thus by the time t gross capital stock will amount to

$$K_t = \int_0^n e^{r(\tau+t-n)}\, e^{-\varrho(n-\tau)} d\tau = \frac{e^{r(t-n)-\varrho n}}{r+\varrho}\left(e^{(r+\varrho)n}-1\right) \qquad (1)$$

Maintenance is equal to wear and tear at any time t which means that it represents a fixed proportion of capital in existence at that time.

$$M_t = \varrho K_t \qquad (2)$$

Replacement is equal to (gross) investment made n years earlier reduced for the wear and tear in the intervening n years

$$R_t = e^{r(t-n)-\varrho n} = e^{-\varrho n} G_{t-n} \qquad (3)$$

Total capital cost per unit of output consists of maintenance and replacement

$$k^* = \frac{M_t + R_t}{K_t} = \varrho + k \qquad (4)$$

Since unit maintenance cost is clearly invariant, we can focus attention on k.

Unit replacement cost is given by

$$k = \frac{R_t}{K_t} = \frac{r+\varrho}{e^{(r+\varrho)n}-1} \qquad (5)$$

In a stationary situation, i.e., for $r=0$, unit replacement cost reduces to

$$k^0 = \frac{\varrho}{e^{\varrho n}-1} \qquad (6)$$

The transformation factor α, by which stationary capital cost is reduced to unit capital cost in a growing economy, appears to be

$$\alpha = \frac{k}{k^0} = \frac{(r+\varrho)\left(e^{\varrho n}-1\right)}{\varrho\left(e^{(r+\varrho)n}-1\right)} \qquad (7)$$

The transformation factor α has the following properties:

$$\alpha(r=0) = 1 \qquad (8)$$

$$\lim_{r\to\infty} \alpha = 0$$

$$\frac{d\alpha}{dr} < 0$$

It follows that capital cost per unit of output is smaller the higher the rate of growth. Essentially the same phenomenon has already been noted, though not analyzed, by MARX [6, pp. 353–55] and, in Soviet literature, by NOTKIN [7, pp. 104–5]. They observed that in a growing economy only a fraction of depreciation allowances, as usually determined, is used for replacement, the remaining part being available for accumulation. This is, of course, well-known to professional planners. But the use of depreciation obscured the problem, because it was thought that the effect depends on the procedure used to compute depreciation and that it therefore was not a real but merely an accounting effect which may also be annihilated [1].

It is of some interest to note an intriguing similarity between $1/\alpha$ and the LORENTZ's transformation factor β used in the special theory of relativity. The similarity goes as far as to result not only in a contraction of cost but also in a dilatation of time in the economic time-space of the steadily growing system.

IV. ACCELERATED GROWTH

If a higher rate of growth reduces capital cost, why not accelerate growth in order to reduce it even more?

It was noted in *section 2* that in a specified period of time an economy is capable of absorbing only a limited amount of change. Change is induced by investment and so limited absorptive capacity puts definite limits on the amount of investment that can be productively absorbed. When investment is expanded, diminishing returns set in and very soon the rate of growth cannot be increased any more.

Our model becomes now more general because assumptions 3 (proportionality of output to capital) and 9 (no technological progress) can be discarded. We need an additional assumption about technological progress which will be explained in connection with the respective algebraic relation. We shall also postulate that, whatever the amount of investment, it is always optimally distributed in time and space so as to generate the highest possible increment in output.

If average efficiency (productivity) of capital is $p = \text{const.}$, the available amount of gross fixed capital K will generate output pK per unit of time

$$P = pK \tag{9}$$

A similar relation holds between investment and the rate of increase of output

$$\frac{dP}{dt} = p\frac{dK}{dt} = pI \tag{10}$$

Dividing both sides by P we get the usual HARROD-DOMAR model in which, however, I is new investment $[I = G - (M + R)]$ and P is gross social product

$$r = p\frac{I}{P} = ps^* \tag{11}$$

Since I is defined as net of replacement, the important effect of diminishing replacement per unit of output is assumed away. In order to take care of this effect as well, we shall define s as a share of *gross* investment in gross social product. Thus we now have

$$s^* = \frac{I}{P} = \frac{G-(M+R)}{P} = \frac{G}{P}\left(1 - \frac{M+R}{G}\right) = s[1-g(r)] \tag{12}$$

where $g(r) = (R+M)/G$ is a declining function of the rate of growth. For finite values of r the function $g(r)$ remains above zero. Using (12) in (11), we get the following expression for the rate of growth of product[2]

$$r = ps[1-g(r)], \quad 0 < g(r) \leqq 1 \tag{13}$$

It is now clear that by increasing s we achieve not only a proportionate rise of r, but more than that because of a decrease in g due to the rise in r. In other words, each increase of the rate of investment in terms of real resources has an additional effect identical to an additional increase in investment which, however, is absolutely costless (i.e., larger output at same capital cost). Speeding up growth produces investment from nowhere and at no cost.

So far our model has remained within the framework of a steady growth system. Now we shall generalize it by taking care of two crucial phenomena which have been neglected: one concerning technological progress, and the other concerning limited absorptive capacity of the economy. The two phenomena are closely connected and their effects partly offset each other.

The limited absorptive capacity implies, as has already been noted, sufficiently diminishing marginal efficiency of investment (after a point). In the absence of technological progress, capital efficiency will decrease because of substitution effects (substituting capital for labour and for nonreproducible resources) and because of capital saturation (which, however, does not bother us because one good produced is freely exported in our model and exchanged without restrictions for consumer goods from abroad). The process of diminishing p^* is speeded up if the rate of growth increases. This is so not only because of the reasons just quoted, but also because of adjustment difficulties, because of 'the resistance to change'. Since the rate of growth depends on the relative rate of investment, capital efficiency may be made a function of the share of investment and time, $p^* = p^*(s, t)$.

Assuming that no restriction is imposed on the availability of cooperating factors, technological progress will clearly increase the

2. This extension of the model has already been undertaken by E. DOMAR for the case of constant output capacity [1].

average output-capital ratio at any one time since *TP* means more output per unit of capital or less capital per unit of output. This need not only be a result of the improvement of the quality of fixed capital. In fact, simultaneously the quality of other cooperating factors improves as well, economies of scale make themselves felt, the general organizational efficiency of the economy increases. A part of technological progress may be just a function of time. But, it is clear that if we wish to speed up technological progress, we must invest. And so the rate of *TP* per unit of time becomes a function of the relative rate of investment, $h = h(s)$.

If, for simplicity, we assume that the combined production coefficient (p) is independent of the volume of capital in existence, its two components are: pure production coefficient (p^*) and technological progress correction factor (h), $p(s) = p^*(s)\, h(s)$. The pure production coefficient appears to be a decreasing function of s, $dp^*/ds < 0$, technological progress an increasing function of s, $dh/ds > 0$. Their elasticities have not the same absolute value. That is why $p(s)$ will change.

By taking into account all that has been said, the rate of growth of output may be expressed as follows

$$r = h(s)\, p^*(s)\, s\,[1 - g(r)] \qquad (14)$$

If now the rate of growth is accelerated, some interesting things happen.

$$\frac{dr}{dt} = hp^* \frac{ds}{dt} (1 - g) \frac{\eta_{hs} + \eta_{p^*s} + 1}{1 + hp^*s\,(\partial g/\partial r)} \qquad (15)$$

Relation (15) could have been derived by differentiating (13) directly—relation (13), it will be recalled, belongs to the world of 'inertial systems'—except for an additional factor which I shall call γ, and which requires closer scrutiny

$$\gamma = \frac{\eta_{hs} + \eta_{p^*s} + 1}{1 + hp^*s\,(\partial g/\partial r)} \qquad (16)$$

The factor γ has the following three properties

$$\begin{aligned} &\gamma\,(r = 0) = 1 \\ &\gamma\,(r = \bar{r}) = 0 \\ &\frac{d\gamma}{dr} < 0 \quad \text{for } r > \varepsilon\,(s) \end{aligned} \qquad (17)$$

Let us discuss them in turn. In a stationary situation ($r = 0$), h, p^* and g remain unchanged and so $\eta_{hs} = \eta_{p^*s} = \partial g/\partial r = 0$. For non-stationary values of s, the rate of growth will be positive, $r > 0$. For the rate of growth to assume the maximum possible value $r = \bar{r}$, the factor γ must be reduced to zero as it follows from (15), since the denominator of γ is always larger than zero and approaches one when the rate of growth increases (because of $hp^*s > 0$, $\partial g/dr < 0$, and, as it can be easily proved, $|hp^*s\, \partial g/\partial r| < 1$), the behavior of γ will depend on what happens in the numerator. Here, as the rate of growth approaches its maximum value, $r \to \bar{r}$, the elasticity of the production coefficient with respect to the share of investment assumes increasingly negative values and eventually we get

$$-\eta_{p^*s} = 1 + \eta_{hs}, \quad \text{for } r = \bar{r} \qquad (18)$$

as a condition for maximum growth.

In the early stages of the acceleration of growth it may happen that the two elasticities compensate each other, or even leave a positive surplus, $\eta_{hs} \geqq -\eta_{p^*s} - 1$, (because unused resources, unexploited research opportunities, and strong economies of scale may outweigh resistance-to-change effects) which will increase γ, since the denominator decreases as the rate of growth increases (due to the contraction of the capital cost effect). But after a while increasingly negative returns must set in and the derivative of γ assumes negative values.

V. CONCLUSION

Even with unchanged technology and under ceteris paribus conditions, fixed capital cost per unit of output will not remain constant. Production becomes less and less costly as the rate of growth increases. This means that for a given output and in order to keep the output capacity unimpaired in a specified period of time a smaller amount of real resources has to be spent in an economy growing more rapidly. The marginal efficiency of gross investment increases. It is further increased by technological progress, which may be taken as an increasing function of gross investment.

Due to the limited absorptive capacity of any economy (and quite apart from the capital saturation phenomenon, which in a relatively small open economy may be neglected) diminishing returns set in, they eventually outweigh increasing returns mentioned above and for a sufficiently high rate of growth the economy reaches the point where $mei = 0$. This is the point of the maximum rate of productive investment.

This is also most likely the point of the optimum rate of investment, because consumption effects are such that we may reasonably expect the population to accept this policy as the most desirable. The cost of such a policy is comparable to one mild recession which, as we can observe in actual life, causes no appreciable concern either among the public or among economists or politicians. The benefit of such a policy during one generation's life-time consists in achieving a multiple of per capita consumption, as compared with an alternative policy of a constant rate of growth. (Gains in later years outweigh the losses in first few years by many tens of times.) And this, for all we know, matters a lot to every consumer.

It follows that the economist can give unambiguous advice to the planner concerning the rate of investment. The advice reads: invest until you reach the path of maximum growth. I may add, however, that the problem of how to maximize the rate of growth is a different and immensely more difficult problem.

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REFERENCES

[1] E. DOMAR, 'Depreciation, Replacement and Growth', *Economic Journal*, 1953, pp. 1–32.

[2] B. HORVAT, 'The Optimum Rate of Investment', *Economic Journal*, 1958, pp. 747–67.

[3] B. HORVAT, 'The Optimum Rate of Investment Reconsidered', *Economic Journal*, 1965, pp. 572–6.

[4] B. HORVAT, 'The Rule of Accumulation in a Planned Economy', *Kyklos*, 1968, pp. 239–60.

[5] N. KALDOR, 'Capital Accumulation and Economic Growth', in F. A. LUTZ and D. C. HAGUE (Eds.), *The Theory of Capital*, St. Martin's Press, New York, 1961.

[6] K. MARX, *Theories of Surplus Value*, Lawrence and Wishart, London, 1951.

[7] A. J. NOTKIN, *Očerki teorii socialističeskogo vosproizvodstva*, Ogiz-Gospolitizdat, Moskva, 1948.

SUMMARY

Even with unchanged technology and under ceteris paribus conditions, fixed capital cost per unit of output will not remain constant. Production becomes less and less costly as the rate of growth increases. This means that for a given output and in order to keep the output capacity unimpaired in a specified period of time a smaller amount of real resources has to be spent in an economy growing more rapidly. The marginal efficiency of gross investment increases. It is further increased by technological progress, which may be taken as an increasing function of gross investment.

Due to the limited absorptive capacity of any economy (and quite apart from the capital saturation phenomenon, which in a relatively small open economy may be neglected) diminishing returns set in, they eventually outweigh increasing returns mentioned above and for a sufficiently high rate of growth the economy reaches the point where $mei = 0$. This is the point of the maximum rate of productive investment.

This is also most likely the point of the optimum rate of investment, because consumption effects are such that we may reasonably expect the population to accept this policy as the most desirable.

ZUSAMMENFASSUNG

Selbst bei unveränderter Technologie und unter ceteris paribus Bedingungen bleiben die fixen Kapitalkosten pro Outputeinheit nicht konstant: die Produktionskosten sinken mit steigender Wachstumsrate. Dies bedeutet, dass in einer schneller wachsenden Wirtschaft, zur Erreichung eines bestimmten Outputs und zur Aufrechterhaltung einer bestimmten Ausstosskapazität innerhalb eines gewissen Zeitabschnitts, weniger reale Ressourcen aufgewendet werden müssen. Die marginale Effizienz der Bruttoinvestitionen wächst und wird zudem erhöht durch den technischen Fortschritt, der als steigende Funktion der Bruttoinvestitionen angesehen werden kann.

Infolge der begrenzten Absorptionskapazität einer Volkswirtschaft (und ganz abgesehen vom Phänomen der Kapitalsättigung, das in einer relativ kleinen, offenen Wirtschaft vernachlässigt werden kann) setzen abnehmende Erträge ein

und überwiegen eventuell die oben erwähnten Skalenerträge, so dass bei einer genügend hohen Wachstumsrate die Volkswirtschaft den Punkt erreicht, an dem *mei* = 0 ist. Dies ist der Punkt der maximalen Quote produktiver Investitionen.

Es ist ebenfalls höchst wahrscheinlich der Punkt der optimalen Investitionsquote, da die Konsumeffekte so sind, dass man von der Bevölkerung eine Annahme dieser Politik als der wünschbaren erwarten kann.

RÉSUMÉ

Dans l'hypothèse même d'une technologie constante et de conditions ceteris paribus, les coûts fixes en capital par unité d'out-put ne restent pas constants: les coûts de production diminuent au fur et à mesure que le taux de croissance augmente. Cela signifie que, dans une économie qui connaît une forte croissance, on utilise moins de ressources réelles pour atteindre un volume donné d'out-put et pour maintenir un niveau donné de capacité productive pendant une certaine période. L'efficience marginale des investissements bruts augmente. Elle croît davantage encore grâce au progrès technique qui apparaît comme une fonction croissante des investissements bruts.

Par suite de la capacité d'absorption limitée d'une économie (indépendamment du phénomène de saturation en capital qui peut être négligé dans une économie relativement restreinte et ouverte) des rendements décroissants apparaissent et pèsent éventuellement plus que les rendements croissants cités précédemment de telle façon que, dans l'hypothèse d'un taux de croissance suffisamment élevé, l'économie atteint le point où *mei* = 0. Ce point est celui du taux maximum des investissements productifs.

Il est également fortement probable que ce soit le point du taux d'investissement optimum, car les effets de consommation sont tels que l'on puisse attendre de la part de la population une acceptation de cette politique comme étant la plus désirable.

RANIJE OBJAVLJENI SEPARATI:

141. S. Popov, "Osnovni faktori kretanja cena proizvodjača industrijskih proizvoda u periodu 1962—1970", *Ekonomist*, br. 2/1972., 297—318.

142. O. Kovač, "Platnobilansna politika Jugoslavije", *Medjunarodni problemi*, br. 1/1972., 9—33.

143. M. Kovačević, "Naučnoistraživački rad kao faktor konkurentnosti jugoslovenskog izvoza", *Ekonomska misao*, br. 2/1972., 7—25.

144. S. Popov, "Intersectorial Relations of Personal Incomes", *Yugoslav Survey*, No. 2/1972., 63—80.

145. B. Horvat, "Hospodářské cykly v Jugoslávii", *Statistika a demografie* (Praha), IX/1972., 21—42.

146. Ž. Mrkušić, "La Yougoslavie et la réforme du système monétaire international", *Predavanje na XIV zasedanju Medjunarodnog univerzitetskog centra za društvene nauke*, 11.IX 1972.

147. D. Bejaković, "Značenje koncentracije prometa za ekonomično korištenje prometnih kapaciteta", *Zbornik JAZU "Naučno savjetovanje: Prometna valorizacija Hrvatske"*, Zagreb, 1971., 257—265.

148. B. Horvat, "Analysis of the Economic Situation and Proposal for a Program of Action", *Praxis* (medjunar. izdanje), br.3—4/1971., 533—562.

149. B. Horvat, "Nationalism and Nationality", *International Journal of Politics*, No. 1/1972., 19—46.

150. D. Bejaković, "Poslijediplomska nastava iz ekonomike saobraćaja", Zbornik *Kongres o saobraćaju i vezama Jugoslavije, Knjiga 9*, Beograd, 1972., 69—73.

151. B. Horvat, "Development Fund as an Institution for Conducting Fiscal Policy", *Ekonomska analiza*, br. 3—4/1972., 247—254.

152. M. Bazler–Madžar, "Ekonometrijska analiza proizvodnih funkcija", *Ekonomska analiza*, br. 3–4/1972., 270–287.

153. B. Horvat, "Critical Notes on the Theory of the Labour–Managed Firm and Some Macroeconomic Implications", *Ekonomska analiza*, br. 3–4/1972., 288–293.

154. M. Radović, "Odredjivanje stepena korišćenja kapaciteta radne snage i mašina i analiza faktora koji na njih deluju", *Ekonomska analiza*, br. 3–4/1972., 301–309.

155. R. Knežević, "Mesto interne banke u organizacionom sistemu velikog preduzeća", *Ekonomska analiza*, br. 3–4/1972., 310–329.

156. B. Horvat, "Institucionalni model samoupravne socijalističke privrede", *Ekonomist*, br. 3–4/1971., 501–517.

157. B. Horvat, "Dva pojednostavljena matematska modela jugoslavenske privrede", *Ekonomist*, br. 3–4/1971., 519–532.

Napomena: Spisak svih dosad objavljenih separata vidi u katalogu Instituta ekonomskih nauka.

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