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9. ABSTRACT
 Section I of the paper first explores the determinants of the magnitude of the net transfer implicit in a nationalization policy; second, it attempts to derive some figures for such a transfer with orders of magnitude that appear plausible for some Latin American countries. Section III discusses the different channels by which such a transfer can be distributed to different sectors of the economy. Section III explores the probable net redistributive effect of using particular channels for distributing such a transfer. Section IV derives some conclusions and suggests additional lines of research.

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**POTENTIAL DISTRIBUTIVE EFFECTS OF
NATIONALIZATION POLICIES
THE ECONOMIC ASPECTS**

by

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March, 1974

This study is a revised version of an earlier paper prepared for the Research Workshop on Income Distribution in Less Developed Countries, Princeton University, November 13, 1973. We are indebted to several colleagues at the World Bank as well as Professor A.C. Harberger for comments on that earlier version.

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INTRODUCTION

1. Arguments for nationalization policies - here defined as the transfer of existing privately owned sectors of the economy into government ownership - have become increasingly popular in the literature concerning growth strategies in developing countries. These arguments run from pure political ones, i.e., an increase in political control particularly in cases of foreign-owned sectors of the economy, to purely economic arguments, i.e., the need to control monopoly power, nationalization as a means of raising aggregate investment, etc.

Arguments for nationalization policies as a means of redistributing income have also become important in the platform of several political movements in developing countries, especially in Latin America. The purpose of this paper is to explore that particular argument, inquiring specifically into the determinants of the potential redistributive effects of a nationalization policy. What we have in mind is the type of ex-ante exercise a Planning Office ought to carry out so as to identify the main parameters determining the distributive effects of such a policy.

Section I of the paper first explores the determinants of the magnitude of the net transfer implicit in a nationalization policy; second, it attempts to derive some figures for such a transfer with orders of magnitude that appear plausible for some Latin American countries. Section III discusses the different channels by

which such a transfer can be distributed to different sectors of the economy. Section III explores the probable net redistributive effect of using particular channels for distributing such a transfer. Section IV derives some conclusions and suggests additional lines of research.

2. In order to narrow down the scope of analysis we have focused on a particular scenario underlying a nationalization policy; it is characterized as follows:

- (a) We will analyze the effect of nationalizing a subset of the corporate sector of the economy owned by the nationals of the country in question. We will leave out foreign-owned enterprises as well as the banking sector, either owned by foreigners or nationals.
- (b) Nationalization will be defined as the purchase by the government of the privately-owned capital stock of the sector at a price representing a certain fraction of the market price of that capital.
- (c) After nationalization, the institutional setup will be characterized by state ownership of the nationalized industries.

I. FRAMEWORK

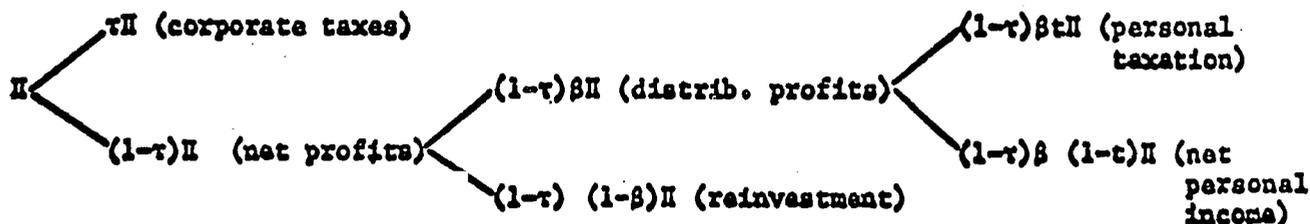
1. The potential behavior of the corporate sector. Potential present value of government revenues

Let us use the following notation characterizing the corporate sector in question:

- K = capital stock of the sector;
- ρ = net of depreciation rate of return to capital
- $\Pi = \rho \cdot K =$ profits (net-of-depreciation)
- τ = corporate income tax
- $(1-\tau)\Pi$ = net profits
- β = fraction of net profits being distributed as dividends
- $(1-\beta)$ = reinvestment rate
- $t = \sum t_i \left(\frac{D_i}{D}\right) =$ weighted personal income tax rate on dividends,

where t_i is the marginal personal income tax applicable to the i^{th} stockholder and $\left(\frac{D_i}{D}\right)$ is the share of total distributed dividends perceived by that stockholder.

The above parameters define the distribution of profits between reinvestment, taxation and net private personal income:



If the above parameters remain constant over time - and we assume all investment consists of reinvested profits - the profits at any year T will be:

$$(1) \quad \Pi = \Pi_0 e^{gT}$$

$$(2) \quad g = \frac{1}{\Pi} \frac{d\Pi}{dT} = \frac{1}{K} \frac{dK}{dT} = (1-\tau)(1-\beta)\rho$$

At any year T the revenue of the government - out of corporate and personal income taxation - becomes equal to:

$$(3) \quad \Pi_0 e^{gT} \left[\tau + (1-\tau)\beta t \right]$$

The present value of government revenues, expressed as a proportion of Π_0 , can be written as:

$$(4) \quad R = \frac{\tau + (1-\tau)\beta t}{r-g}$$

where r is the discount rate relevant to the government^{1/}. The condition for convergence is $r > g$ which implies $r > \rho(1-\tau)(1-\beta)$.

2. Potential value of government revenues after nationalization

(1) General relation

After nationalization the potential yearly profits (or now "surplus") out of the sector is equal to $1-k(1-\tau)(1-\beta)$.

$$1/ \int_0^{\infty} e^{(g-r)T} dT = \frac{1}{r-g}$$

$$g-r < 0$$

profits minus reinvestment, and where the reinvestment rate is defined as a proportion λ of the rate before nationalization.

The post nationalization growth rate of the surplus can now be written as $g_N = \lambda(1-\tau)(1-\beta)\rho_N$, where ρ_N is the post nationalization rate of return to capital; ρ_N can be different to ρ reflecting changes in efficiency as a result of the nationalization policy. The present value of such "surplus" is:

$$(5) \quad s = \frac{1-\lambda(1-\tau)(1-\beta)}{r-g_N} \frac{1}{r}$$

Assume the government decides to pay a compensation equal to a proportion k of the present value - as seen by the private sector - of the net personal income out of the ownership of the capital to be nationalized, V . The value of this compensation becomes therefore kV , where V can be defined as:

$$(6) \quad V = \frac{(1-\tau)\beta(1-t)}{i-g}$$

where i represents the discount rate as seen by the private

1/ This analysis assumes the same ex post market behavior concerning the "degree of use of monopoly power" on the part of the government; otherwise expression (5) must be corrected by a factor reflecting a change in the degree of competitive behavior of the enterprise. This correction factor is basically a function of the elasticities of supply and demand of the firm.

sector^{1/}.

The present value of the change in government revenues due to the nationalization policy, which we will define as N , is:

$$(7) \quad N = S - R - kV$$

$$(8) \quad N = \frac{1-l(1-\tau)(1-\beta)}{r-g_N} - \frac{\tau + (1-\tau)\beta t}{r-g} - \frac{k(1-\tau)\beta(1-t)}{i-g}$$

Assuming for simplicity that $\rho_N = \rho$, that is there is no change in productivity after nationalization we can write

$g_N = lg$ and we have:

$$(9) \quad N = \frac{1-l(1-\tau)(1-\beta)}{r-lg} - \frac{\tau + (1-\tau)\beta t}{r-g} - \frac{k(1-\tau)\beta(1-t)}{i-g}$$

Given the values of β , τ , t , ρ , r and i , N will be a function of l and k , the post nationalization reinvestment policy and the compensation policy. We can analyze two special cases: first, maintaining the reinvestment policy ($l = 1$) and second, a situation where reinvestment becomes zero after nationalization

^{1/} It is possible to identify some values of k corresponding to particular compensation criteria:

(a) The government decides to pay the present value of the base year net personal income out of the firm.

$$k' = \frac{(1-\tau)\beta(1-t)}{i} / v = \frac{i-g}{i}$$

(b) The government decides to pay the present value of the base year net personal income assuming all future net profits will be distributed. We can now define:

$$k'' = \frac{(1-\tau)(1-t)}{i} / v = \frac{i-g}{i\beta}$$

$(\lambda = 0)^{1/}$

(ii) Maintaining the reinvestment policy

In this case, with $\lambda = 1$, expression (9) becomes:

$$(10) \quad N_1 = \frac{1 - (1-\tau)(1-\beta)}{r-g} - \frac{\tau + (1-\tau)\beta t}{r-g} - \frac{k(1-\tau)\beta(1-t)}{i-g}$$

Defining as V_G the present value of the personal income as seen by the government (where r is now used in discounting the future flows) we have:

$$(11) \quad V_G = \frac{(1-\tau)\beta(1-t)}{r-g}$$

Defining $\sigma = \frac{i-g}{r-g}$ we can write:

$$(12) \quad V_G = \sigma V$$

Expression (10) can now be written as:

$$(13) \quad N_1 = (\sigma-k)V$$

The term $(\sigma-k)$ can be interpreted as the expropriation factor as seen by the government; if $i = r$, this factor becomes $(1-k)$ equal to the expropriation factor as seen by the private sector; if

^{1/} The choice of investment policy can be treated in more sophisticated terms assuming a choice through intertemporal optimization. Nevertheless this treatment would not add substantially to the problem addressed specifically in this paper, and would substantially complicate the treatment.

$r > 1$ ($\sigma < 1$), the expropriation factor, as seen by the government, is smaller than the one perceived by the private sector; the reverse is true when $\sigma > 1$.

The value of k that makes the potential transfer - as seen by the government - equal to zero is $k_1^* = \sigma$; if $\sigma = 1$ ($r = 1$) the value of k_1^* becomes one.

(iii) No reinvestment

Assuming the government does not undertake any (net) reinvestment after nationalization, $\lambda = 0$, expression (9) becomes:

$$(14) \quad N_2 = \frac{1}{r} - \frac{\tau + (1-\tau)\beta t}{r-g} - \frac{k(1-\tau)\beta(1-t)}{1-g}$$

After some manipulation we can write:

$$(15) \quad N_2 = (\sigma-k)V + \frac{(1-\tau)(1-\beta)}{r-g} \left(1 - \frac{\rho}{r}\right)$$

$$(16) \quad N_2 = N_1 + \frac{(1-\tau)(1-\beta)}{r-g} \left(1 - \frac{\rho}{r}\right)$$

From (16) it is clear that:

$$N_2 < N_1 \quad \text{if } \rho > r$$

$$N_2 = N_1 \quad \text{if } \rho = r$$

Expression (16) shows that N_2 can be written as N_1 plus a

correction factor whose sign depends on the sign of $\rho - r$. If $\rho > r$, the present value of one dollar invested is larger than one: in this case the transfer out of the nationalization is a positive function of the post reinvestment rate. If $\rho = r$ the present value of one dollar invested is equal to one dollar's worth of consumption: in this case the transfer is invariant to the reinvestment policy to be followed by the government after nationalization^{1/}.

The value of k that makes the transfer equal to zero (k_2^*) becomes now:

$$(17) \quad k_2^* = k_1^* + \frac{\sigma(1-\beta)}{\beta(1-t)} \left(1 - \frac{\rho}{r}\right)$$

Expression (17) is a direct reflection of the relationships between N_2 and N_1 (under different values of ρ/r) just discussed. If $\rho = r$, the compensation factor (k^*) that makes the transfer equal to zero is invariant to the reinvestment policy of the government. If $\rho > r$, the value of k^* becomes smaller ($k_2^* < k_1^*$) for the no reinvestment case.

3. Some extensions

(i) Side effects of the nationalization policy on the rest of the industrial sector

What are the effects of the nationalization policy on the

^{1/} The case of $\rho < r$ means that the productivity of the enterprise is lower than the government's discount rate. In this case reinvestment has a negative contribution to the present value of the transfer.

investment behavior and therefore on the growth of the rest of the industrial sector? How does this affect the present value of tax revenues out of the income of capital from this sector? This section attempts to explore such questions.

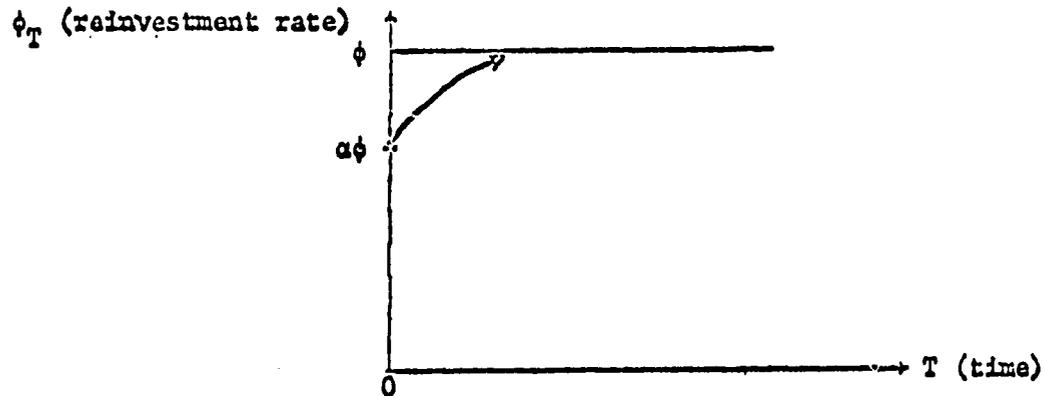
To the extent today's nationalization policies generate uncertainty about the possibility of future nationalization policies in other sectors the reinvestment policies of such sectors will be affected. It is hard to specify a functional form for such a change in investment behavior.

We can only speculate on the determinants of uncertainty induced by a given nationalization policy in the present. It will depend on the extent to which "rules of the game" concerning other sectors can be institutionalized; on the other hand, the "degree of uncertainty" will be itself a function of time, where such a "degree" is revised over time according to how consistently the government behaves concerning such rules of the game.

In order to derive some orders of magnitude we will simply assume that the reinvestment rate in other sectors changes forever by certain amount as a result of today's nationalization

policies in the corporate sector^{1/}.

1/ We could specify a more complex behavior of the reinvestment rate of the other sectors over time. Denoting the reinvestment rate as ϕ_T (where $\phi_T = 1 - \beta_{\phi T}$ and $\beta_{\phi T}$ is the fraction of profits not reinvested in such other sectors) we could assume a behavior similar to the one showed in the following figure.



Without nationalization policies the long run (no uncertainty) reinvestment rate is equal to ϕ ; the year of nationalization ($T=0$) that rate drops to a fraction α of the long run rate. However that rate can be "revised" over time according to the "consistency" of the government concerning "the rules of the game". That revision of ϕ_T can be proportional to the differences between the current value and the long run no-uncertainty value ϕ . We can therefore write:

$$\frac{d\phi_T}{dT} = \mu (\phi - \phi_T)$$

Solving the differential equation we obtain

$$\phi_T = \phi \left[1 - (1-\alpha)e^{-\mu T} \right]$$

At time T after the nationalization policy, the reinvestment rate will depend on: (a) the long run no-uncertainty rate ϕ ; (b) the short run drop in that rate due to the nationalization, $1-\alpha$; the value of μ , or the speed of "recovery".

The value of α probably depends on the "short run credibility gap" of the government as seen by the sectors not to be nationalized; the value of μ probably depends on "how consistent" is the future behavior of the government concerning such sectors.

The present value of tax revenues out of capital income in the industrial sector not to be nationalized - in terms of the base year profits of that sector - can be written as:

$$(18) \quad R_s = \frac{\tau_s + (1-\tau_s)\beta_s t_s}{r - \rho_s (1-\tau_s) (1-\beta_s)}$$

Expression (18) is equivalent to expression (4); we have simply added a subscript s to the parameters; these parameters are therefore specific to the other industrial sectors not to be nationalized. Although we are referring to the non-corporate sectors, we have left the parameter τ in the formula: it is simply a convenient way of taking into account other taxes on capital at the level of the firm or the fact that the government has decided to nationalize a subset of the corporate sector; in this case τ will reflect the corporate tax weighted by the fraction of corporate profits in the total profits of the sectors not to be nationalized.

The effect on such revenue of a once and for all change in β or the "non reinvestment" rate is:

$$(19) \quad dR_s = \frac{(1-\tau_s)}{(r-g_s)^2} \left\{ t_s \left[r - \rho_s (1-\tau_s) \right] - \rho_s \tau_s \right\} d\beta_s$$

Given the convergence condition $r > g$ and the fact that $\beta < 1$, it can be shown that the coefficient of $d\beta_s$ in (19) is negative. This means the present value of tax revenues on the capital income of the other sector declines when the reinvestment rate in these sectors, $(1-\beta_s)$,

goes down^{1/}.

After this extension we need to define a new concept of transfer, the one that takes into account this decline in tax revenues out of other sectors; we will define therefore

$$(20) \quad \Omega = N + \gamma dR_s$$

where Ω is the net transfer out of the nationalization policy and where γ is the ratio between the base-year profits of those other sectors over the profits of the corporate sector to be nationalized.

For the two alternative values of λ , $\lambda=0$ and $\lambda=1$, we can define:

$$(21) \quad \Omega_1 = N_1 + \gamma dR_s$$

$$(22) \quad \Omega_2 = N_2 + \gamma dR_s$$

(ii) Tax policy as a substitute

What is the magnitude of an additional tax on distributed dividends - over and above the existing personal income tax - yielding an increase in tax revenues equal to the net transfer out of nationalization?^{2/}

^{1/} The general value for dR_s , when β_s follows the behavior assumed in the previous footnote, has to be calculated as the present value of the differences in each moment of time of the value of R_s after and before the change in β_s .

^{2/} For simplicity we assume the value of β is invariant to this additional tax.

Differentiating expression (4) and solving for dt we get:

$$(23) \quad dt = \frac{(r-\beta)}{(1-\tau)\beta} \cdot dR$$

If the policy is to obtain a value of dR which will be a substitute of a nationalization policy aiming at a given net transfer $\hat{\Omega}$ we have:

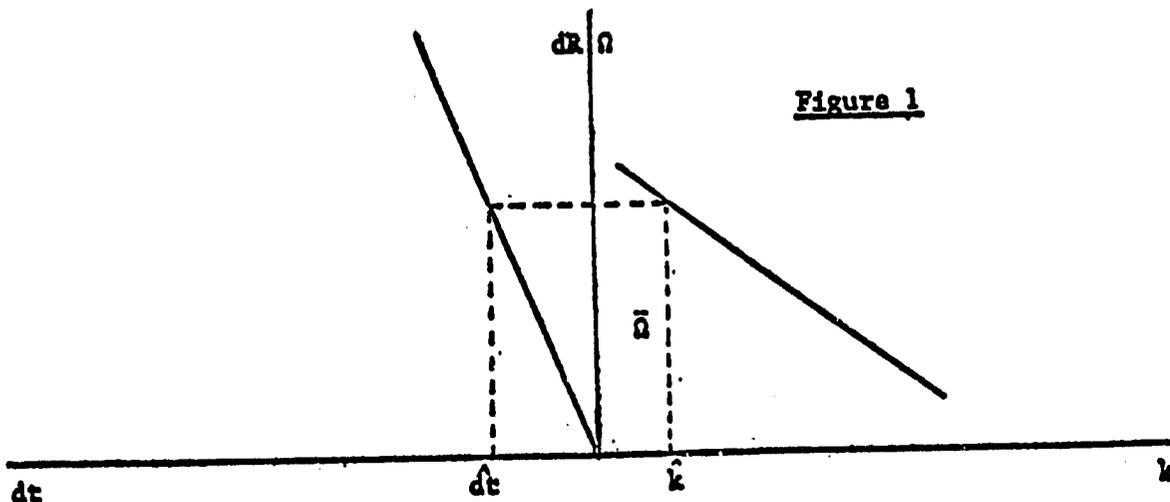
$$(24) \quad dR = \hat{\Omega} = \Omega(\hat{k})$$

Where \hat{k} is the implicit value of k that, given the values of all other parameters, determines a net transfer equal to $\hat{\Omega}$.

The tax change required to yield a value of $dR = \hat{\Omega}$ can also be expressed in terms of \hat{k} :

$$(25) \quad \hat{dt} = f(\hat{k})$$

The above relationships are shown graphically in Figure 1.



4. Some orders of magnitude

(1) We attempt here to evaluate some of the earlier equations so as to derive some orders of magnitude. The main expressions required for such an evaluation are:

- N = Present value of the transfer due to nationalization
- dR_s = Change in the present value of taxation from other sectors induced by the nationalization policy
- $\gamma = \frac{\pi_s}{\pi_0}$ = Initial profits in (other) sectors whose investment behavior is affected by the policy over the initial profits of the sector to be nationalized
- $\Omega = N + \gamma dR_s$ = Present value of the net transfer

Given that N is expressed in terms of the base year profits of the sector to be nationalized and dR_s is expressed in terms of the base year profits of the other (relevant) sectors we need γ to add up N and dR_s . This way Ω can also be expressed in terms of the initial profits of the sector to be nationalized (π_0).

For given values of the other parameters Ω can be written in terms of k , λ , and γ .

$$(26) \quad \Omega(k, \lambda, \gamma) = S(\lambda) - R - kV + \gamma dR_s$$

We will use the following values for those other parameters:

$$\begin{array}{ll}
 \tau = 0.20 & \tau_g = 0.10 \\
 t = 0.20 & t_g = 0.10 \\
 \beta = 0.50 & \beta_g = 0.50 \\
 \rho = 0.15 & \rho_g = 0.15 \\
 r = 0.10 & \\
 \sigma = 1.00^{1/} &
 \end{array}$$

By using the above figures expression (26) can be written as:

$$(27) \quad \Omega = \frac{1 - 0.42}{0.10 - 0.062} - 7 - 8.k + ydR_g$$

The first term on the right hand side is the present value of the "surplus" in the nationalized sector, a function of the new reinvestment policy λ ; the second term shows that the pre-

^{1/} A value of $\sigma=1$ implies $r=i$, the discount rate of the private sector to be equal to the discount rate relevant to the government. Notice however that we do allow for a difference between such discount rate and the marginal productivity of capital.

The assumption of $\sigma=1$ tends, if anything, to bias our results in favor of nationalization policies in the sense that the use of $\sigma < 1$ would reduce the value of the transfer as seen by the government.

It is likely that the typical rate of social yield on government investments would be higher than the after-tax (though not necessarily higher than the before-tax) rate of return on private investments. The theoretical basis for considering the social rate of discount - in a mixed economy - to be a weighted average of the before-tax and after-tax rates of return on private sector investments can be found in A. C. Harberger' "On Measuring the Social Opportunity Cost of Public Funds" in Project Evaluation (Markham, Chicago 1973) and A. Sandmo and J. Droze, "Discount Rates for Public Investments in Closed and Open Economies", Econometrica, November 1971 (also reprinted in Niskanen et al., (ed), Benefit Cost and Policy Analysis 1972, (Aldine, 1973).

Our assumption that $r=i$ thus selects from this range the extreme which produces results most favorable to a nationalization policy.

sent value of the foregone taxation out of the sector to be nationalized amounts to seven times the base year profits of the sector; the third term shows that the present value of net personal income of that sector is equal to eight times the base year profits of the sector.

Table 1 shows that the value of N_1 ranges from 0 to 8, while that of N_2 lies between -5 and 3 for values of k between 1 and 0. The difference between these two ranges reflects the fact that, independent of the value of k , nationalization policies that maintain the previous reinvestment rate will yield an additional transfer of five times the base year profits of the sector in relation to a situation where the reinvestment rate becomes zero.

The value of dR_s has been obtained by assuming the reinvestment rate in the other sectors falls by 20%, as a result of the nationalization policy, from a value of $1-\beta_s = 0.5$ to a value of $1-\beta_s = 0.4$ ^{1/}. This implies a value of $dR_s = -1.1$ ^{2/}.

For γ we have chosen two alternative values, one and two; in other words we assume the sectors whose investment behavior is negatively affected by the nationalization policy have (in the base year) profits which are at most twice the profits of the sectors

^{1/} We are again assuming here that most of the investment undertaken in these other sectors is financed internally.

^{2/} This figure was obtained as $R(\beta_s + \Delta\beta_s) - R(\beta_s)$ and not through formula (19). The reason^s is that the^s coefficient of $d\beta_s$ in (19) is highly sensitive to the value of β_s .

to be nationalized.

Perhaps the most important message of table 1 is:

- (a) it shows the importance of the post-nationalization reinvestment policy to be undertaken by the government. The value of $N(k)$ appears very sensitive to this policy, even reaching negative values; this means Ω could be negative in these cases, even disregarding the effect of the nationalization policy on other sectors of the economy ($\gamma dR_s = 0$).
- (b) it shows the large magnitudes that the (negative) value of γdR_s can achieve vis-a-vis the value of $N(k)$. In other words it shows the importance - on the value of Ω - of the negative effect that the nationalization policy can have on the investment behavior of the rest of the economy^{1/}.

^{1/} We have attempted to compute the value of dR_s according to the change in investment behavior outlined in footnote 1, page 11. For such exercise we have used $\alpha = 0.5$ (investment drops down by 50% in the year of nationalization) and an adjustment factor of $\mu = 0.23$; that adjustment factor implies approximately half of a "recovery" in three years and 95% of "recovery" in 10 years. The value of dR_s derived under these conditions was -0.8.

Figure 2 summarizes the information concerning Ω that appears in table 1; it shows the value of Ω as a function of k for alternative values of γ .

From Figure 2 it is clear that if the nationalization policy is characterized by zero net investment only extremely low figures of k are able to generate positive values of Ω ($k \leq 0.10$ for $\gamma=2$ and $k \leq 0.25$ for $\gamma=1$). On the other hand in the best of all situations - a constant reinvestment policy and a value of $\gamma=1$ - the government can pay at the most a compensation equal to $k = .85$ if a positive net transfer wants to be achieved.

Table 2 shows the annual equivalent of the net transfer as a fraction of GNP and government expenditure. We have assumed the government decides to spread the use of the net transfer over an infinite period of time and as a constant fraction f_Y of that year's Gross National Product Y_T :

$$(28) \quad \Omega \cdot \Pi_0 = \int_0^{\infty} f_Y Y_T dT$$

Expression (28) shows that the present value of the annual equivalent $f_Y \cdot Y_T$ must be equal to the present value of the transfer. Denoting g_Y as the exponential growth rate of GNP we get:

$$(29) \quad \Omega \cdot \Pi_0 = \frac{f_Y Y_0}{r - g_Y}$$

$$(30) \quad f_Y = \frac{\Pi_0}{Y_0} \Omega (r - g_Y)$$

**Table 1: Present value of the net transfer (Ω)
in terms of the base year profits
of the sector to be nationalized**

Reinvestment Policy Followed	k (1)	S(t) (2)	R (3)	kV (4)	N (5)=(2)-(3)-(4)	γdR_s		Ω		Δt	
						$\gamma=1$	$\gamma=2$	$\gamma=1$	$\gamma=2$	$\gamma=1$	$\gamma=2$
						(6)	(7)	(8)=(5)-(6)	(9)=(5)-(7)		
Constant ($l=1$)	0	15.0	7	0	8	-1.1	-2.2	6.9	5.8	0.69	0.58
	0.3	15.0	7	2.4	5.6	-1.1	-2.2	4.5	3.4	0.45	0.34
	0.5	15.0	7	4.0	4.0	-1.1	-2.2	2.9	1.8	0.29	0.18
	0.8	15.0	7	6.4	1.6	-1.1	-2.2	0.5	-0.6	0.05	
	1.0	15.0	7	8.0	0	-1.1	-2.2	-1.1	-2.2		
Zero net reinvestment ($l=0$)	0	10.0	7	0	3	-1.1	-2.2	1.9	0.8	0.19	0.08
	0.3	10.0	7	2.4	0.6	-1.1	-2.2	-0.5	-1.6		
	0.5	10.0	7	4.0	-1.0	-1.1	-2.2	-2.1	-3.2		
	0.8	10.0	7	6.4	-3.4	-1.1	-2.2	-4.5	-5.6		
	1.0	10.0	7	8.0	-5.0	-1.1	-2.2	-6.1	-7.2		

FIGURE 2

PRESENT VALUE OF THE NET TRANSFER
IN TERMS OF THE YEARLY PROFITS OF
THE BASE YEAR OF THE SECTOR TO BE
NATIONALIZED.

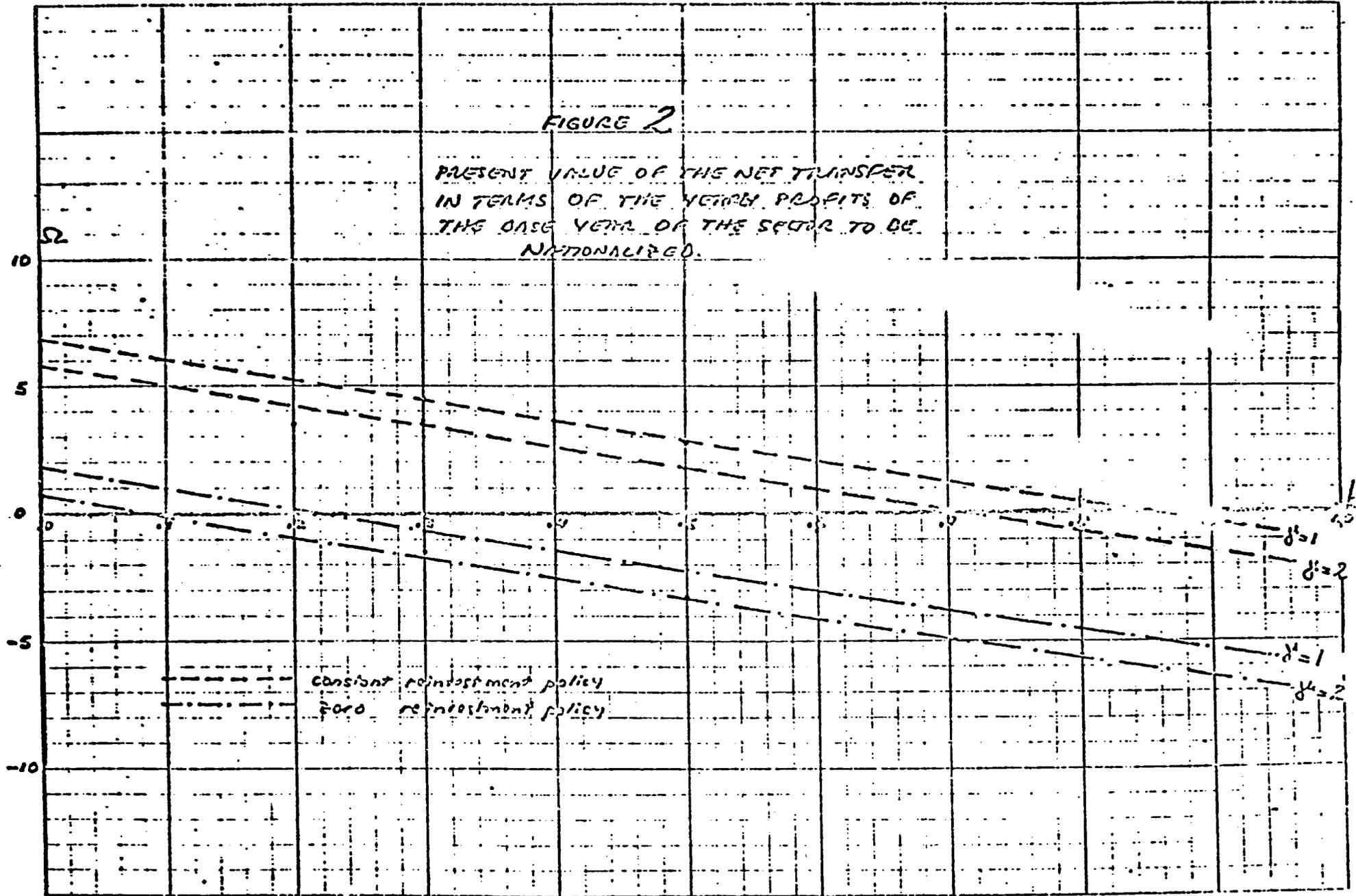


Table 2: Annual equivalent of the net transfer as a proportion of GNP and government expenditure, E.

Reinvestment Policy followed	k	As a percentage of GNP		As a percentage of E	
		$\gamma = 1$	$\gamma = 2$	$\gamma = 1$	$\gamma = 2$
Constant	0	1.38	1.16	6.90	5.80
	0.3	0.90	0.68	4.50	3.40
	0.5	0.58	0.36	2.90	1.80
	0.8	0.10	-0.12	0.50	-0.60
	1.0	-0.22	-0.44	-1.10	-2.20
No reinvestment	0	0.38	0.16	1.90	0.80
	0.3	-0.10	-0.32	-0.50	-1.60
	0.5	-0.42	-0.64	-2.10	-3.20
	0.8	-0.90	-1.12	-4.50	-5.60
	1.0	-1.22	-1.44	-6.10	-7.20

If government expenditure represents a constant fraction ϵ of GNP, the annual equivalent of the net transfer as a fraction of that expenditure becomes:

$$(31) \quad f_X = \frac{1}{\epsilon} : f_Y$$

In order to compute f_Y and f_X we have used the following values^{1/}:

$$\frac{\Pi_0}{Y_0} = \text{"declared" profits of the sector to be nationalized as a fraction of GNP at the base year} = 0.05$$

$$\epsilon = 0.20$$

$$s_Y = 0.06$$

Table 2 shows that the annual equivalent of the net transfer - as described above - can range between -1.4% and +1.4% of GNP and between -7% and +7% of government expenditure, according to the value of k and γ being used^{2/}.

(ii) Assume the government decides to undertake a nationalization

^{1/} These values appear consistent with data from the Chilean economy. See Appendix.

^{2/} If the government decides to pay a compensation based on a static firm we can use the values of k' and k'' (as defined in footnote 1, page 6) to derive the value of the transfer in tables 1 and 2. These values are $k' = 0.4$ and $k'' = 0.8$.

policy so as to obtain an annual equivalent of the transfer equal to, lets say, 0.5 and 1.0 percent of GNP ($f_y = 0.005$ and $f_y = 0.010$). What are the choices open to the government concerning the two policy variables $(1-k)$ and l - the expropriation factor and the reinvestment policy - consistent with those magnitude of the transfer.

Solving for Ω from expression (29) and substituting into (27) we obtain, for given values of γ , the combination of $(1-k)$ and l able to generate a value of f_y equal to 0.005 and 0.010 respectively. These combinations are shown in the "isotransfer" lines presented in Figure 3.

From the figure it becomes clear that, in the best of situations ($\gamma=1$), a transfer of 0.5 percent of GNP cannot be achieved if the post nationalization reinvestment rate is less than one quarter of the previous rate. Similarly, a transfer of 1 percent of GNP cannot be achieved if l becomes smaller than 0.8.

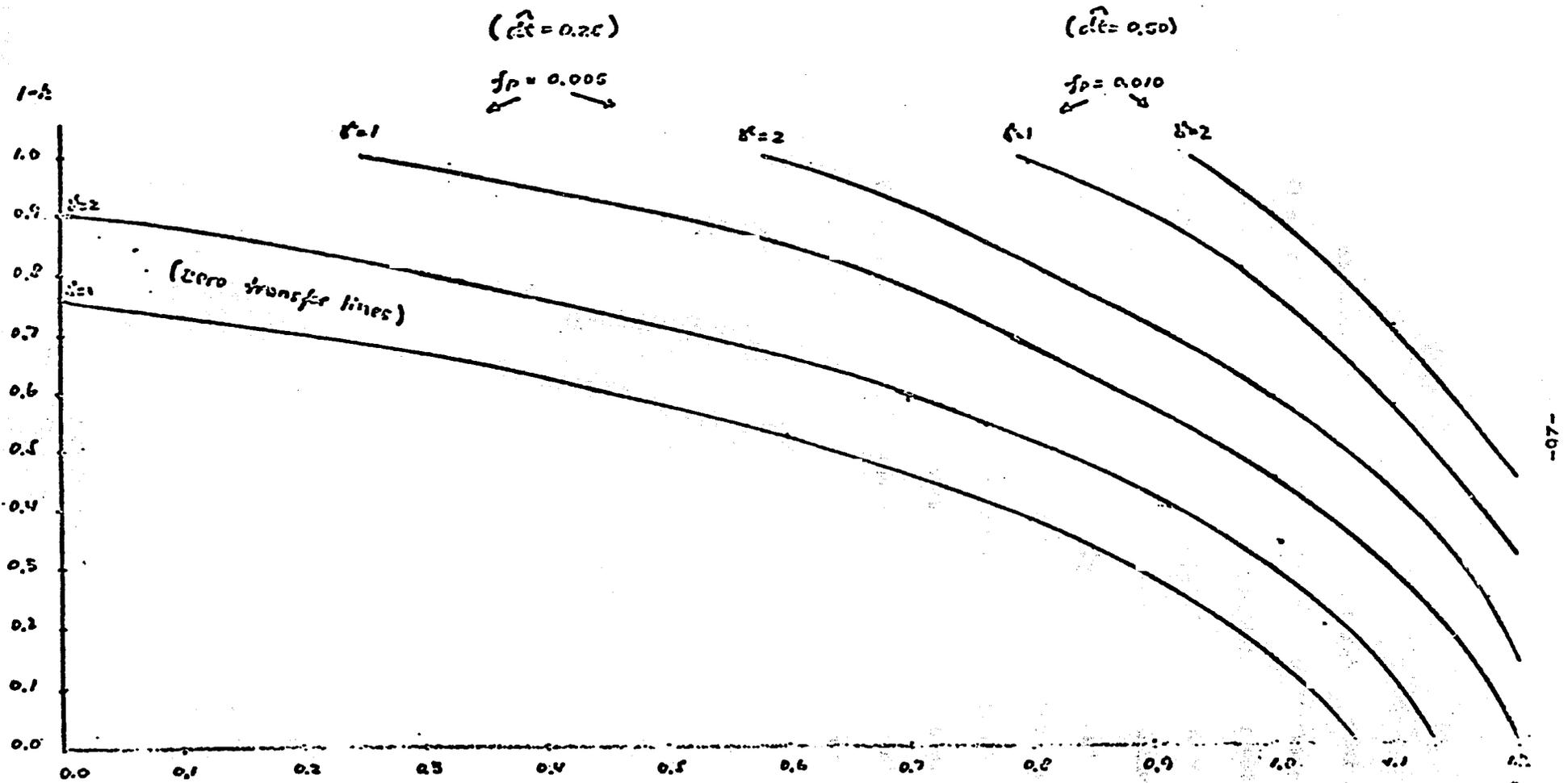
On the other hand, by choosing a relatively high expropriation factor, equal to three quarters, the value of l cannot be lower than 0.725 and 1.0 if the target transfer is 0.5 and 1.0 percent of GNP respectively; in other words by maintaining the reinvestment rate ($l=1$) the government can raise a transfer equal to 1 percent of GNP only by expropriating 75 percent of the private personal income of the sector.

(iii) What is the additional tax on dividends that can be considered as a substitute for the nationalization policy in the sense of yielding an equivalent magnitude of the net transfer? Those values of \hat{dt} - obtained through expression (20) - are shown (for positive values of the net transfer) in the last two columns of table 1. It shows, for example, that a nationalization policy characterized by $l=1$ and $k=0.5$ will yield - under $\gamma=2$ - the same net transfer as an additional tax on dividends of 18%.

Figure 3 shows those values of \hat{dt} for an annual transfer amounting to 0.5 and 1.0 percent of GNP; the values of \hat{dt} are 25% and 50% respectively.

FIGURE 3 "ISOTRANSFERS"

(as a function of the expropriation factor and the post-nationalization reinvestment policy).



- t : Expropriation factor
- \hat{c} : Post-nationalization reinvestment factor
- t : Relative dimension of the sectors subject to uncertainty
- f_p : Transfers as a proportion of GNP
- \hat{c} : Additional tax \hat{c} on dividends equivalent to the nationalization policy.

II. THE DISTRIBUTION OF THE NET TRANSFER

In the last section we attempted to identify the determinants of the magnitude of the net transfer out of the nationalization policy. This section discusses the alternative channels open to the government to redistribute such a transfer. We will define two broad categories of channels: those that redistribute the transfer to productive factors within the nationalized sectors, and those that distribute the transfer to the rest of the economy.

1. Redistribution within the nationalized sector

Two main channels appear clear: to use the net transfer to increase the real wage of currently employed labor in the sector over and above its marginal productivity and/or to use such transfer to finance additional employment over and above the level where market wage equals the productivity of labor. These alternatives can be seen through Figure 4.

For any year the volume of employment - if, as we have assumed before, the nationalized firms attempt to maximize their yearly surplus or profits - will be determined where the market wage is equal to the marginal productivity of labor. The annual equivalent of the net transfer, can now be used either to increase the real wage over the initial wage and/or finance additional employment over and above the initial value of L .

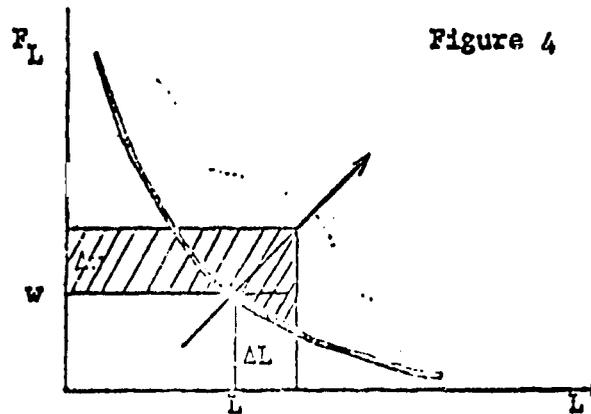
If the transfer is used to finance a combination of changes in real wages and employment it can be shown as the shaded area in Figure 4. Defining $a(T) = f_Y \cdot Y_T$ and linearizing the demand for labor that area can be written as:

$$(32) \quad a(T) = \Delta w \cdot (L + \Delta L) + \frac{1}{2} (\Delta F_L \cdot \Delta L)$$

and where F_L represents the marginal productivity of labor; after manipulating the last term so as to express it in terms of the elasticity of the demand for labor and dividing by W or the initial wage bill we get:

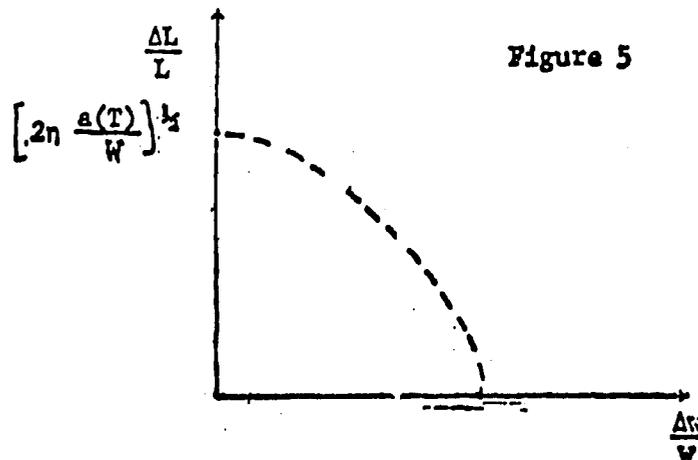
$$(33) \quad \frac{a(T)}{W} = \frac{\Delta w}{w} + \frac{\Delta L}{L} \left[\frac{\Delta \eta}{\eta} + \frac{1}{2} \frac{1}{\eta} \frac{\Delta L}{L} \right]$$

where η is the elasticity of demand for labor, (here defined as $\eta > 0$).



Expression (33) shows the combinations of increases in real wages (over the marginal productivity of labor) and changes in employment (over the one determined under maximization conditions) able to be financed by the net transfer $\frac{a(T)}{W}$. These combinations are also shown in Figure 5^{1/}

The higher the elasticity of demand for labor the larger the change in



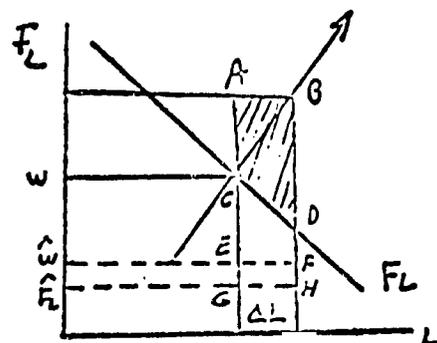
^{1/} The concavity or convexity of the function will depend on the relative magnitudes of $a(T)/W$ and $1/2 \eta$. In the case of the figure $a(T)/W > 1/2 \eta$.

employment that can be financed given the values of $a(T)/W$ and $\frac{\Delta W}{W}$; the reason is that larger elasticities imply a smaller decline in the marginal productivity of labor as employment increases: this means a smaller gap between the wage rate and the marginal productivity of labor to be financed by the net transfer. On the other hand, given the value of $a(T)$, the initial wage bill W is crucial in determining the values of $\frac{\Delta W}{W}$ and $\frac{\Delta L}{L}$: Given that the ratio $\frac{a(T)}{W}$ is a function of the ratio $\frac{\pi}{W}$, it is clear that the magnitudes of $\frac{\Delta W}{W}$ and $\frac{\Delta L}{L}$ will depend crucially on the (ex-ante) shares of capital and labor.^{1/}

At this stage it is important again to notice that $a(T)$ is a function of the difference between the yearly net-of-reinvestment surplus generated in the now nationalized enterprises minus foregone taxation and minus compensation payments, which are assumed to be taken care of adequately. This is not without some significance for the institutional arrangements required to implement the above described redistribution; we will come to this point later on.

^{1/} The change in income of the additionally employed labor can be larger or smaller than the volume of the transfer $ABDC$; if their wage in alternative activities (\hat{w}) was smaller than their productivity in the corporate sector (F_L) the change in their income becomes equal to $ABFE$, a magnitude larger than $ABDC$.

On the other hand the employment of ΔL can have a net effect on GNP if the productivity of that labor in other sectors (\hat{F}_L) was smaller than the productivity in the corporate sector F_L . This net increment in GNP becomes $CDHG$ in this particular case. Notice that if $\hat{F}_L = \hat{w}$ this increment in GNP is exactly equal to the difference between the change in the income of that labor and the volume of the transfer.



2. Redistribution to the rest of the economy

The net transfer $a(T)$ can be redistributed to the rest of the economy through two mechanisms:

(a) An increase in the government budget that now can be used to finance public programs not directly related to the nationalized sectors.

(b) By following a price policy by which the goods produced by the nationalized sector are sold at a lower price than the "real" or clearing price implicit in the earlier evaluations of Π ; in other words the net transfer can be seen as an implicit subsidy to the price that otherwise would have been faced by consumers in that particular market.

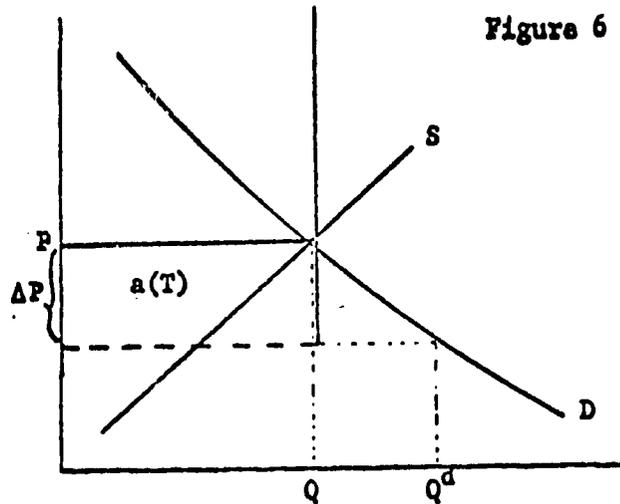
For any year T we can write:

$$(34) \quad Q \cdot \Delta P = a(T)$$

where Q is the quantity produced under maximization of the (ex-ante distribution) surplus and ΔP is the decline in the price faced by the consumers in relation to the clearing price that otherwise would have prevailed in that particular market. Notice that Q is invariant to the way the government distributes the transfer and therefore is not "revised" according to the price policy followed by the government.

$$(35) \quad \frac{\Delta P}{P} = \frac{a(T)}{Q \cdot P} = \epsilon_Y \cdot \frac{Y_T}{Q \cdot P}$$

Expression (35) shows that the "implicit" percentage subsidy that can be financed is equal to f_y divided by the ratio of total sales (valued at the ex-ante clearing price) to GNP. This is also shown in Figure 6.



It is important to notice that the real redistributive effect of this policy will depend heavily on how the government rations the quantity Q , given that at the new price the quantity demanded is larger (Q^d). If that rationing is exactly equal to the structure of the pre-nationalization consumption pattern then the implicit subsidy will be proportional to how much of that good was originally consumed by different income groups. Otherwise it will depend completely on the new criteria followed by the government concerning how to ration the quantity Q .

III. THE NET REDISTRIBUTIVE EFFECT AND FURTHER CONSIDERATIONS

1. The net redistributive effects

In discussing the redistributive effect among different income groups out of the nationalization policy it is useful to distinguish between two situations.

(a) A situation where the government can control the (net of reinvestment) surplus generated in the nationalized sectors in such a way it can finance kV , R and γdR_s out of that surplus and not through the use of the government budget. In other words the mechanisms by which Ω is generated are internal to the sector to be nationalized and do not induce transfers from other sectors of the economy. This is the implicit framework used in the preceding section.

If this is the case, the net redistributive effect will depend on the relative income brackets of the stockholders of the nationalized industries vis-a-vis the income brackets of the groups that are favored by the particular channel (or combination of channels) of distribution being used to transfer the value of Ω .

<u>Channels used to distribute Ω</u>	<u>Determinants of the net redistributive effect</u>
(1) $+\Delta w$	Income brackets of the workers currently employed in the sectors to be nationalized.
(2) $+\Delta L$	Income bracket of workers additionally employed.
(3) $-\Delta P$	Propensity to consume the goods of the sector to be nationalized by different income groups. Rationing criteria to be used.

(4) + Budget

Income brackets of the groups favored by public programs that now can be financed by an increased government budget.

Even if the government can control the value of Ω as described above the question arises to what extent it can in practice control the channel to be used to distribute it. In other words, is it realistic to assume that the channel used to distribute Ω is independent of the mechanism by which Ω is generated?

This is obviously an empirical question. At this stage and given the empirical evidence, it would seem channel (1) has the highest chance and channel (4) the lowest.

(b) A somehow more complicated situation, but perhaps a more realistic one, arises when the government is unable to generate Ω without inducing some transfers from other sectors of the economy; in other words Ω is raised by mechanisms that are not completely internal to the sector to be nationalized.

The most relevant example is a situation where the value of the compensation, or perhaps more importantly the decline in general government revenues due to R and dR_g , cannot be replenished from the surplus generated in the enterprises now nationalized. In this case not only does the government not have any control of the mechanism by which Ω is generated; almost surely it also will not have control of the channel to be used to distribute it.

Assume a situation where the workers of the now nationalized industries do not allow the enterprise surplus to be taxed in order to pay for kV and the replenishment of the government budget due to $-R$ and $-\gamma dR$

In this situation we observe the following effects for the case where the reinvestment rate is being maintained ($l=1$):

<u>Income of workers in the nationalized sector</u>	<u>Previous stockholders'</u>	<u>government budget</u>
+ $V(1-k)$	- $V(1-k)$	
+ Vk		- kV
+ R		- R
		- γdR_g
Total	$V + R = S$	$-kV - R - \gamma dR_g$

The total transfer to the workers, equal to $V + R = S$ or present value of the net of reinvestment surplus of the sector, is obviously larger than Ω ; part of the transfer, $V(1-k)$ or the expropriation component, is financed by the previous stockholders; the compensation factor kV and the previous taxation R are implicitly being financed by the income groups affected by a reduction of government spending in the rest of the economy. The value of γdR_g , although it does not represent a gain in income for the workers in the nationalized industries, is nonetheless a cost for the income groups affected by that reduction in government spending.

It is perhaps interesting to obtain some orders of magnitude for the the ratio $kV+R/V+R$, or the fraction of the present value of the increased income of already employed workers in the sector that is financed under this scenario by the rest of the economy via a decline in government expenditure in other sectors.

	V	kV	R	$kV+R/V+R$
k=0	8	0	7	46,6%
k=0.3	8	2.4	7	62,7%
k=0.5	8	4.0	7	73,3%
k=0.8	8	6.4	7	89,3%
k=1.0	8	8.0	7	100,0%

This ratio ranges from 46,6% to 100% for the extreme values of k; for a value of k=0.5 the ratio is 73,3%. In this case almost 3/4 of the higher wages that now can be financed in the sector will come at the expense of the income groups affected by the decline in public funds available for other programs in the rest of the economy. This is without taking into account the effect of $-\gamma dR_g$ which also must be borne by these income groups^{1/}

2. What happens if Ω is negative?

As we saw in table 1 there is a possibility of a negative Ω , particularly in the cases where net reinvestment becomes zero after the nationalization. What are the net redistributive effects of a negative Ω ?

An easy way of interpreting a negative Ω is the following: after the government has taxed the surplus in the now-nationalized industries so as to finance compensation payments as well as induced declines in government revenues (R and γdR_g) - therefore holding constant the level of real expenditure in other sectors - the end result is that those enterprises run into a deficit.

To the extent that deficit - as defined above - is financed by a subsidy out of the government budget the channel by which the (now negative)

^{1/} We are not considering here other short run adjustment mechanisms particularly deficit financing of the budget; deficit financing through an increased indebtedness with the Central Bank can be particularly important for some countries.

value of Ω is being distributed is clear: again it will be at the expense of the income groups affected by a decline in government spending in other sectors of the economy.

From the above it would appear that under a negative Ω the government has very little choice concerning the channel by which that negative value can be "distributed"; it is hardly conceivable that labor in the now nationalized sector would accept a decline in their real income vis-a-vis the pre-nationalization situation.

3. Adjustments for tax evasion at the level of the enterprise

Up to now we have used the same concept of Π , namely the declared profits as they appear in the national accounts, in computing the present value of the surplus after nationalization, the value of the compensation and the foregone taxation out of the sector.

To the extent there is a difference between effective and declared profits (to which the legal rate τ is applied) an adjustment must be made to the present value of the surplus after nationalization. This obviously will increase the present value of the net transfer Ω .

We can define:

$$\Pi \text{ effective} = (1 + \lambda)\Pi$$

where λ is the implicit rate of evasion and where Π represents the declared profits to which the legal rate τ is applied. The value of Ω will increase by an amount that will depend on the investment policy followed after nationalization:

Constant reinvestment: $\frac{\lambda}{r-g} = 25 \lambda$

Zero reinvestment: $\frac{\lambda}{r} = 10 \lambda$

If we assume $\lambda = 0.10$ the value of Ω increases in an amount equal to 2.5 and 1.0 for the alternative investment policies.

Table 3: Value of the net transfer corrected by tax evasion

Annual equivalent

	Ω		As percentage of GNP		As percentage of Gov't. Expenditure	
	$\lambda=0$	$\lambda=0.10$	$\lambda=0$	$\lambda=0.10$	$\lambda=0$	$\lambda=0.10$
max.	6.9	9.4	1.38	1.88	6.90	9.40
min.	-7.2	-6.2	-1.44	-1.24	-7.20	-6.2

Table 3 shows the effect of correcting the extreme values of the net transfer by a rate of tax evasion at the level of the enterprise equal to 10% ($\lambda = 0.10$)

4. Adjustments for changes in productivity

In the earlier exercise we have implicitly assumed that the productivity of capital p is maintained after the nationalization takes place; to the extent there are changes in efficiency in the use of resources in the sector that productivity ought to be adjusted and correspondingly the value of the net transfer Ω .

IV. CONCLUSIONS

In this exercise we have attempted to organize a framework in which the main parameters determining the magnitude of the net transfer could be identified. As such the most important conclusions are perhaps its implications for further research.

Two aspects appeared important in determining such a transfer: first, the reinvestment policy to be followed by the government vis-a-vis the policy that otherwise would have been undertaken by the private sector; second, the effect of the nationalization policy over the investment behavior of other sectors of the economy.

The effect of nationalization policies in one sector over the investment behavior of other sectors will depend (a), on the amount of uncertainty created by such policy on these sectors and (b), on the effect of uncertainty on investment behavior. As economists how much can we say about (a)? What are the ways of implementing a nationalization policy so as to minimize the amount and therefore the cost of the uncertainty created in other sectors?

With respect to the net redistributive effect of such a transfer it appears to depend crucially on the ability of the government in maintaining its level of expenditure in other sectors constant; otherwise the net transfer out of the expropriated stockholders can be easily be accompanied by perhaps much bigger transfers out of the income groups affected by a decline in public programs not related to the sector in question.

The above considerations lead us to conclude that the redistributive effect will depend crucially on the ability on the part of the government in choosing the channels of distribution. If this ability changes as a result of new pressure groups - associated with the nationalization policy - the effective redistributive effects can be quite different to the ones expected when the policy was conceived. These considerations are reinforced under the case of a negative transfer.

Appendix

The orders of magnitude of the numerical example

The figures used in the numerical exercise of the text can be compared with some observed magnitudes in the Chilean economy in the late sixties.

Table 4 shows that (given the value of the parameters used in the exercise) a nationalization policy whose target is a sector representing profits equal to 5% of GNP would mean, for the case of Chile, the following:

- (a) Nationalization of a fraction of the corporate sector whose savings represent 0.625 of the total savings of the sector.
- (b) Nationalization of a fraction of the corporate sector paying 0.600 of total corporate taxation.

In other words the policy described in the exercise would mean nationalizing almost 2/3 of the corporate sector in the case of the Chilean economy. On the other hand the implicit tax structure used in the exercise suggests that income taxes (on dividends) in the nationalized sector represent 24% of total personal income taxation.

Comparison between hypothetical values from the exercise and figures for Chile

	Out of the sector to be nationalized (figures from the exercise)	Overall cor- porate sector (observed figures) ^{4/}	Ratio
Corporate savings over GNP	0.020 ^{1/}	0.032	0.625
Corporate taxes over total taxation	0.060 ^{2/}	0.100 ^{5/}	0.600
Personal income taxes derived from dividends over total taxation	0.024 ^{3/}	0.100 ^{6/}	0.240

$$1/ \quad = \frac{\text{Reinvestment}}{\Pi_o} \cdot \frac{\Pi_o}{\text{GNP}} = 0.40 \times 0.05 = 0.02$$

$$2/ \quad = \frac{\tau}{\Pi_o} \cdot \frac{\Pi_o}{\text{GNP}} \cdot \frac{\text{GNP}}{\text{Expend}} \cdot \frac{\text{Expend}}{\text{T. Taxation}} = 0.20 \times 0.05 \times 5 \times 1.2 = 0.600$$

(The value of $\frac{\text{Expend}}{\text{T. Taxation}}$ is from Chile)

$$3/ \quad = \frac{(1-\tau)\beta t}{\Pi_o} \cdot \frac{\Pi_o}{\text{GNP}} \cdot \frac{\text{GNP}}{E} \cdot \frac{E}{\text{T. Taxation}} = 0.08 \times 0.05 \times 5 \times 1.2 = 0.024$$

4/ Ministro de Hacienda: Exposición sobre el Estado de la Hacienda Pública, 1969,
and ODEPLAN, Cuentas Nacionales de Chile, 1970.

5/ Copper excluded.

6/ Includes personal income taxes from all sources.