AN ECONOMIC BASIS FOR THE "NATIONAL DEFENSE ARGUMENT" FOR PROTECTING CERTAIN INDUSTRIES

By

Earl A. Thompson

Discussion Paper Number 103
November 1977

An Economic Basis for the "National Defense Argument" for Protecting Certain Industries

Earl A. Thompson*
U.C.L.A.

The "National Defense Argument" has long been of a favorite of those who support special subsidies to various domestic industries. Yet the argument traditionally has been framed as an appeal to patriotic emotions, amounting to little more than the statement that the military has an unusually high wartime demand for the products of the subsidized industry. As such, we can hardly accept it as a sufficient economic argument for subsidizing an industry.

This paper is an attempt to specify an economically acceptable national defense argument and to apply the argument where it appears most appropriate.

An important result of the theoretical analysis is a specification of the form of the efficient subsidy -- whether, for example, the efficient subsidy is an output subsidy, a particular input subsidy, or a protective tariff. Another important result is a theoretical quantification of the subsidy justified by an economically acceptable national defense argument. These two results serve to distinguish an economically acceptable national defense argument from the more vague, emotional arguments. The empirical applications in this paper will employ these results.

I. NATIONAL DEFENSE AS AN ECONOMIC ACTIVITY

Our possible national defense arguments will be built upon an aggregative simplification of the author's previous general equilibrium model containing

---

*This paper owes much to several discussions with Professor Bob Rooney and to the comments by Dr. Edward Miller on a previous paper. Helpful comments on previous drafts from Professors Ron Batchelder, Harold Demsetz, Jack Hirshleifer, Walter Oi, George Stigler, and Cliff Stone, and from a skeptical referee of this journal, and financial assistance from the Foundation for Research in Economics and Education, are all gratefully acknowledged. Finally, I would like to express my thanks to Bob Williams for critical and enthusiastic research assistance.

national defense (1974). We shall outline this aggregative simplification before proceeding to the generalizations which permit the derivation of national defense arguments.

In this model, each "nation," or given subgroup of individuals, must defend its assets in order to own them, and each capital good is owned by some nation. In such a world, national defense is a necessary social expenditure rather than a waste of the world's resources. For any distribution of property between nations, there is a set of minimal national defense efforts required to prevent one nation from taking the property of another. When property is distributed so that rationally chosen defense efforts reach these levels, there is an equilibrium distribution of property across the various nations. We assume throughout that such an equilibrium is achieved.

At time t, a particular nation in this world will have a total capital stock, K^t, part of which, K_D^t, is devoted to national defense, D^t, a second part, K_C^t, to consumption, C^t, and the third and remaining part, K_I^t, to investment, I^t, i.e., to the creation of next period's capital, K^{t+1}. Thus, for the particular country, the current resource conservation equations and three production functions are, respectively:

$$(1) \quad K_D^t + K_C^t + K_I^t = K^t,$$

$$(2) \quad D^t(K_D^t) = D^t,$$

$$(3) \quad C^t(K_C^t) = C^t, \text{ and}$$

$$(4) \quad I^t(K_I^t) = K^{t+1}, \quad \text{for } t = 1, 2, \ldots$$

We assume that all of the above three production functions are differentiable, concave, and monotonically increasing.

Since there is a distributional equilibrium, the country will undertake the defense effort required to deter all foreign aggressors. That is, D^t is

set so that it is just sufficient to make nonpositive the most efficient aggressor's profit from successful aggression against the country, Π_A^t. In particular, letting $f^t(D^t)$ be the least-cost aggressor's resource cost of successful current aggression and assuming that $\frac{df^t(D^t)}{dD^t} > 0$, K_D^t, and thus D^t, are set for every t so that:

$$(5) \quad \Pi_A^t = K^t - f^t(D^t) = 0.^{1/}$$

Substituting (2) into (5) produces a simple dependency of K_D^t on K_t, where $\frac{dK_D^t}{dK^t} > 0$ in view of the monotonic increasing nature of both $f^t(\cdot)$ and $D^t(\cdot)$. The solution value of K_D^t for a given K_t is written $\bar{K}_D^t(K_t)$.

Giving consumers in the country under consideration a differentiable, quasi-concave utility function, $U(C^1, C^2, C^3, \ldots)$, we can determine a socially optimal allocation by maximizing it subject to (1) - (5). Substituting (2) into (5), this yields the following marginal condition for social efficiency:

$$(6) \quad \frac{\partial U}{\partial C^t} \Big/ \frac{\partial U}{\partial C^{t+1}} = \left[\left(\frac{\partial C^{t+1}}{\partial K_C^{t+1}} \cdot \frac{\partial I^t}{\partial K_I^t}\right) \Big/ \frac{\partial C^t}{\partial K^t}\right] \cdot \left[1 - \frac{d\bar{K}_D^t}{dK^t}\right].$$

Inspection of (6) reveals the left side to be the familiar, Fisherian marginal rate of time preference while the first term in brackets on the right side is the marginal rate of time transformation. In competitive markets, these

---

$^{1/}$We are assuming here, for simplification, that the successful foreign aggressor obtains all of his victim's capital. It is clear that he cannot do this in the real world, that only a certain part of a nation's capital stock is "coveted" by foreign aggressors. While the presence of non-coveted capital, which is allowed in the author's '74 paper, has no effect on the national defense arguments or applications below, we shall allow non-coveted capital to exist in testing the general empirical validity of our national defense arguments. To make the above theory consistent with this test, subtract a constant from K^t in equation (5), where the constant represents the fixed supply of non-coveted capital in the country.

two terms are equated by rational individuals, as the former is set equal to one plus the market's real rate of interest by utility-maximizing consumers while the latter is set equal to the same rate by profit-maximizing producers. The fact that capital which is produced for the next period generates an extra defense requirement is irrelevant to individuals in a standard competitive model because the government will bear the extra defense cost (their share of the extra cost in terms of lump-sum taxes being insignificant when the number of individuals is large). In this way an inefficiency would exist in a competitive economy with neutral, or lump-sum, taxes (such as a simple consumption tax in every period). This competitive inefficiency is easily cured through the introduction of a tax on capital in all periods, which amounts to a tax on I^t, so that the return to devoting a unit of K_t to the production of K^{t+1} is reduced by $d\bar{K}_D^t/dK^t$.

This result is easily proved: Privately optimal consumption decisions are such that $U(C_1, C_2, \ldots)$ is maximized subject to a constant wealth equal to $P^1C^1 + P^2C^2 + P^3C^3 + \ldots$, where P^t is a parameter representing the present price of consumption goods delivered in period t. This implies

$$(7) \quad \frac{\partial U}{\partial C^t} \Big/ \frac{\partial U}{\partial C^{t+1}} = P^t/P^{t+1}, \text{ all } t.$$

And privately optimal production decision are such that profits,

$$P^tC^t(K_C^t) + P_K^{t+1}I^t(K_I^t) - (1 + \lambda_t)P_K^t(K_C^t + K_I^t),$$

are maximized, where P_K^t is the parametric present price of capital goods in period t and λ_t is the parametric tax rate on the use of capital in time t. This maximization implies

$$(8) \quad P^t \frac{\partial C^t}{\partial K_C^t} = P_K^t(1 + \lambda_t) \quad \text{and}$$

$$(9) \quad P_K^{t+1} \frac{\partial I^t}{\partial K_I^t} = P_K^t(1 + \lambda_t) \text{ for every } t.$$

Dividing (8) by itself in the next period,

$$(10) \quad P^t/P^{t+1} = \left[\frac{P_K^t \,/\, P_K^{t+1}}{\frac{\partial C^t}{\partial K_C^t} \,/\, \frac{\partial C^{t+1}}{\partial K_C^{t+1}}}\right] \left[\frac{1 + \lambda_t}{1 + \lambda_{t+1}}\right].$$

Using (9), this becomes

$$(11) \quad P^t/P^{t+1} = \left[\frac{\partial C^{t+1}}{\partial K_C^{t+1}} \cdot \frac{\partial I^t}{\partial K_I^t} \,/\, \frac{\partial C^t}{\partial K_C^t}\right] \left[\frac{1}{1 + \lambda_{t+1}}\right].$$

Combining (11) with (7), and comparing the result with (6), the private system (whose description is completed by adding equations (1) - (5)) achieves Pareto optimality as long as the capital tax rates are set so that

$$(12) \quad \frac{1}{1 + \lambda_{t+1}} = 1 - \frac{d\bar{K}_D^t}{dK^t} .$$

In summary, an asset accumulator in a competitive, private property system in which the government provides for the collective defense of the nation's capital creates an external diseconomy in that he increases the level of defense expenditures his nation requires to protect its capital stock. A periodic, ad valorem, capital tax is thus rationalized by the above argument. Assuming that all capital goods are sold when they are originally created, an equivalent to such a tax is an income tax with depreciation and depletion allowances (Thompson, 1974, Part II).

II. "NATIONAL DEFENSE ARGUMENTS."

Two distinct "National Defense Arguments," i.e., reasons for subsidizing certain activities based on the special nature of national defense, emerge from a two-step generalization of the above model of national defense. We shall now

take the first step.

A. Argument Number 1: Private Capital Deters Foreign Aggressors.

The first argument is the result of an extension of the above model in which the capital used in the private sector simultaneously aids in the provision of national defense as a joint product. Thus, equation 2 becomes:

$$(2') \quad D^t = D^t(K_D^t, K^t),$$

where the partial derivatives of (2') are always positive. This occurs because the costs of successful foreign aggression against a nation depend upon the resources that the nation has on hand to mobilize in order to withstand an enemy attack.[2/] (See, e.g., Miller.) Substituting (2') into (5) will again yield a simple dependency of K_D^t on K^t, a Pareto optimum described by (6), and an efficient tax formula which adds $d\bar{K}_D^t/dK_t$ to the cost of a unit of investment. But it no longer follows that $d\bar{K}_D^t/dK^t > 0$. That is, an increase in the nation's capital stock may now decrease its national defense requirement given (2') and (5) because an increase in the capital stock may provide a greater deterrent than an attraction to the relevant foreign aggressor. If this were the case, a subsidy to capital would be in order; i.e., the first national defense argument would apply. If the opposite were the case, then the generalization of (2) to (2') would simply reduce the magnitude of the efficient capital tax, no capital subsidy would be rationalized, and the first national defense argument would not apply.

Assuming observed defense expenditures are rationally undertaken, we can test which is in fact the case by relating observed defense expenditures to

---

[2/] In a more realistic model, one complicated by heterogeneous capital goods, some kinds of capital goods cannot be economically converted to wartime use. However, such goods often serve either as substitutes for others that are economically converted into wartime use or as inputs in the production of (or trade for) some war related goods. Hence, it is probably safe to assume, at least for expositional purposes, that the entire peacetime capital stock is useful in producing current defense services as a joint product. The empirical test below, however, will explicitly assume that some kinds of private capital do not, even indirectly, aid a country's war effort.

the observed capital stock. If there is a positive relation, then the positive external value of private-sector capital resulting from its ability to discourage foreign aggressors would fall short of the negative value of private-sector capital resulting from its attractiveness to foreign aggressors. No net subsidy would be justified, and our first national defense argument would not apply.

Some complications do arise in applying this test to a more realistic world, one with heterogeneous capital goods. For, in the more realistic environment: (1) only part of a nation's capital stock is "coveted," i.e., relevant to foreign aggressors as an asset, and (2) only part, a generally different part, of its private capital stock is a potential input into the defense effort. But we can safely exclude non-marketable capital assets (such as memories of pleasant experiences), domestic cash balances, and most private-sector technology from both types of capital. Also, since a large subset of consumer durables are non-coveted and a large, but generally different, subset of consumer durables are not even indirect inputs into the defense effort, it is perhaps best to exclude all consumer durables from the capital stocks used to test the first national defense argument. This leaves us with commonly measured, industrial capital stocks plus human capital. Since data on aggregate industrial and human capital stocks are available for very few countries while NNP data are available for most countries and allow us to approximate the relative sums of the human and non-human, industrial capital stocks of the various countries, we use NNP data for our test. But one important defect in such a measure is that it fails to net out the maintenance of the country's human capital. For a given NNP, the lower a nation's subsistence requirement, the greater is both the stock of capital which its enemies

covet and the stock of capital which it can divert to a war. So a lower subsistence requirement, cet. par., will lower the country's defense requirement if the first national defense argument is valid but raise it if it is invalid.

In view of the above, we regressed national defense expenditures, taken from a 1970 cross section of 96 countries, on: (1) NNP, taken from data published by the Stockholm International Peace Research Institute, and, to account for subsistence requirements, (2) population, obtaining data from the UN Statistical Yearbook (1973). The assumption here is that the subsistence requirements of our countries are proportional to their populations.

The least squares fitted equation, where Y is income and P is population, is

$$D = \underset{(t=43.10)}{.07Y} - \underset{(t=-2.53)}{8.49P} \; ; \; R^2 = .96.$$

The addition of a constant term did not have any economically significant effect on the regression; nor did the exclusion of various groups of the poorest countries; nor did the use of a 2-step, weighted regression procedure (Glejser) to eliminate significant heteroscedasticity in the least squares residuals; nor did the inclusion of a variable representing an age distribution parameter.[3/] The sign and significance of the coefficients are ample evidence for us to confidently reject our first national defense argument.

[3/] The coefficient of the age distribution parameter which we used, namely the proportion of the country's population which is of fighting age (19-34 years of age) also provided an additional test of the first national defense argument. For if the deterrent effect of the availability of capital especially useful in supplying defense were dominant, then having a high proportion of fighting-age citizens would, cet. par., significantly reduce a country's defense requirement. Obtaining our data from the United Nations Demographic Yearbook, 1975, we found the effect of an increase in the fraction of a country's population which is of fighting age on the country's defense expenditures to be highly insignificant (t=-0.22 on raw data and t=+0.23 for data transformed to remove the significantly heteroscedastic residuals).

Our estimate of per capita subsistence income based upon this estimated equation, the annual income per capita which would make defense expenditures zero, is 8.49/.07 = $121.29. The reasonableness of this figure is additional evidence in support of our general theory of the nature of national defense.[4/]

B. National Defense Argument Number 2.

Our second national defense argument is based on the observation that price ceilings and rationing are periodically imposed on certain products during certain, recurrent "national emergencies," or "wars." A direct consequence of these controls is that the owners of the capital goods which produce such products are unable to capture the wartime social values of their capital. This in turn implies that the production of such capital goods during peacetime is undervalued by private investors. A policy which raises the peacetime value of such capital up to its social value is a peacetime subsidy to this capital. With such a subsidy, $\partial I^t/\partial K_I^t$ as perceived by peacetime producers increases because the total subsidy payment to $I^t (= K^{t+1})$ will be increased if and only if more K^{t+1} is produced while the total subsidy payment to K^t is given at time t and independent of the division of K_t between K_I^t and K_C^t. The second national defense argument thus implies that the peacetime increases in the $\partial I^t/\partial K_I^t$ terms as perceived by private producers due to the optimal subsidies just exactly match the artificial, privately

---

[4/] As subsistence would probably be higher than this for the highly developed countries, we could improve the model by making the theoretical coefficient on population rise in a linear fashion with income per capita. This would yield the same estimation form but would change the interpretation of the Y coefficient to the effect of income on defense minus the effect of per capita income on subsistence. Since the latter effect is positive, our estimated Y coefficient is a downward-biased estimate of the effect of income on defense in a nation for a given level of subsistence.

perceived increases in the $\frac{\partial U}{\partial C_t}/\frac{\partial U}{\partial C_{t+1}}$ terms due to the existence of future price controls and rationing.[5/]

Since there is already a tax on capital in every period when we apply the argument of Parts I and IIA, this special national defense subsidy is achievable by simply reducing the peacetime tax rate on capital which produces the goods which are undervalued during a war, assuming that the subsidy rate does not exceed the tax rate of Parts I and IIA above.

This should, perhaps, be shown more formally. The existence of effective wartime price controls allows us to write, now taking C to be a type of consumer good whose price is effectively controlled during a war and taking t to be peacetime and t+1 wartime,

$$(7') \qquad \frac{\partial U}{\partial C^t} \Big/ \frac{\partial U}{\partial C^{t+1}} = P^t/P^{t+1}(1 + \alpha), \text{ where } \alpha > 0.$$

Or, using (11)

$$= \left(\frac{\partial C^{t+1}}{\partial K_C^{t+1}} \cdot \frac{\partial I^t}{\partial K_I^t} \Big/ \frac{\partial C^t}{\partial K_C^t}\right) \frac{1}{(1+\lambda)(1+\alpha)} .$$

Hence, for Pareto optimality, again using (6), λ must be set so that

$$(1 + \lambda) = \left(\frac{1}{1 + \alpha}\right)\left(\frac{1}{1 - d\bar{K}_D^t/dK^t}\right).$$

So the existence of wartime price controls simply lowers the optimal peacetime capital tax rate on the kinds of capital that produce the war-controlled consumer goods.

Since the capital tax was achieved by taxing the return to capital via an ordinary income tax, in which original investment costs are written off

---

[5/] When, realistically, there are heterogeneous capital goods, this exact equality implies that I^t is not economically useful in producing wartime outputs other than the price-controlled output. This is elaborated below in Section IIIA.

in the future according to the rate of depreciation or depletion of the capital, a natural method of achieving this subsidy is to allow peacetime purchasers of such capital to expense a portion of the original capital cost in the year of the original investment. A 100% initial write-off would completely neutralize the capital tax, as the tax rate on the future income produced by the capital would then be completely offset by the equal subsidy rate on the capital through the 100% initial write-off of the investment. Similarly, allowing p percent of the initial investment to be expensed, with the rest depreciated at the rate of actual depreciation times (1-p), would be equivalent to a special capital subsidy of p percent. Observed U.S. tax policies corresponding to this theoretical policy are the immediate write-off of intangible drilling expenses granted to oil and gas drillers and the immediate write-off of certain investment expenditures given to cattle breeders. These will be discussed in greater detail in Section IIIB.

An inefficient protection policy would be a peacetime subsidy to the products which suffer wartime price controls. While this policy would encourage original investment in the capital that produces those goods which suffer wartime price controls, it would fail to encourage investment in subsequent years by failing to encourage the original adoption of relatively durable forms of capital. In terms of our notation, an output subsidy has the effect of proportionately increasing both the $\partial C^{t+1}/\partial K_C^{t+1}$ and $\partial C^t/\partial K_C^t$ terms that appear to the private producers, leaving unaffected the $\partial I^t/\partial K_C^t$ term which also goes into determining the time rate of transformation, thereby leaving the time rate of transformation at the same allocation unaffected. So simple output subsidies are inefficient as they fail to remove the undervaluation of future relative to present outputs.

Opening up the discussion to allow international trade, a small peacetime tariff on imports of capital which will be undervalued during wartime, by increasing the country's price of this capital in every period, has the same effect on our domestic efficiency condition as does a correspondingly small capital subsidy. More capital is produced in each period, more is available for wartime, and the social inefficiency which appears in the absence of the policy is reduced.[6/] The problem, of course, is that the policy drives a wedge between domestic and foreign peacetime real costs of production. But if, realistically, international contracting is sufficiently costly between some countries that lump-sum payments cannot be practically made in return for free trade policies, driving the small wedge creates a well-known monopsony gain to the country imposing the tariff. (See, e.g., H. Johnson.) This means that, under realistic constraints on international agreements, an incipient tariff is superior to a capital subsidy in reducing the inefficiency described in the second national defense argument.[7/] But the net monopoly return is maximized at a finite tariff. If the original undervaluation of capital is sufficiently small, a peacetime tariff on these capital imports will suffice as the single, best policy. But if the original undervaluation is sufficiently large, there will still be an undervaluation of

---

6/ We are simplifying the problem here by assuming that wartime imports of the capital goods in question are insignificant because of the high wartime cost of international shipping. The case in which the country relies on substantial wartime imports despite the high shipping costs is discussed later in this section.

7/ This result runs counter to the apparently accepted argument in the international trade literature that a domestic distortion is efficiently handled with a domestic subsidy even in the presence of a monopoly in trade (See, e.g., Bhagwati). The tacit assumption in the accepted argument which we are dropping here is the assumption, wholly inappropriate in our case, that a tariff has no effect on the magnitude of the domestic distortion.

capital when the financial losses begin to result from further tariff increases. Thereafter, a capital subsidy such as the one described above should be used as well as a tariff. While our quantitative analysis in Section III below will be limited to large capital undervaluations, several qualitative applications of the above argument for moderate import protection will arise.

C. Alternative Methods of Capital Subsidy.

1. Subsidies to Investments in Skill

Since the original accumulation of skill is achieved to a significant degree by the foregoing of current income and the capital good, skilled labor, is not sold when produced, there is no taxable transaction approximating the value of the current investment when labor accumulates its skill. Investments in skill are taxed indirectly when there is a higher tax rate on future, higher skilled wages than foregone, current, relatively unskilled, wages. The observed U.S. progressive income tax accomplishes this, taxing skill accumulation approximately neutrally with other kinds of capital accumulation (Thompson, 1974). One way to subsidize certain investments in human capital under national defense argument #2 is to reduce the degree of progression for those occupations warranting a subsidy. We observe very little of this. However, an alternative form of investment subsidy, justifiable by the extraordinary high marginal transaction costs of lending to the young investor in his own skills, is to directly subsidize the financial part of the human capital investment. We do, of course, observe this form of subsidy. Since the second national defense argument applies quite obviously to the accumulation of certain skills because of wartime conscription (a particularly direct form of price control), an obvious rationalization of some such investment subsidy exists. Furthermore, since the U.S. has been a small net importer of human

capital, the above argument for some degree of human capital import protection applies. (A more detailed empirical analysis appears in Section IIIE.)

2. Investment Subsidies to Foreign Suppliers

A difficulty arises when the outputs which are effectively price-controlled during a war are produced mainly by foreign capital. It is apparently impractical for a country to directly subsidize foreign capital because there is no obvious way for the subsidizing country to collect for the increase in benefits such a policy confers on numerous other foreign countries. A solution to this dilemma is for the importing countries to simply allow the foreign countries to "cartelize" their industry. This means that the exporting countries, while allowing free entry into the "cartelized" industry, purchase a significant part of the capital output or force prorationed production and thus excess capacity on the producers. In either case, the result is an increase in the price and production of foreign capital but a decrease in the normal, peacetime consumption of the products of this capital. During wartime, when the industry demand for this capital becomes infinitely elastic (in the relevant range) at the effectively controlled price (which is no lower than the peacetime price) the foreign capital is no longer rationally held off the market, and wartime use of the capital jumps to an amount which exceeds that which would exist without the cartel. Viewed in this way, cartels of exporters merely act as replacements for the private speculators in inventories or excess production capacity that are discouraged by the wartime price controls. For appropriately set price parameters, the economic behavior of these cartels is identical to that which would result if there were competitive markets and no wartime systems of effective price controls. To prove this, we treat the exporting and importing countries as a single country and represent the

cartel as an institution which induces its members to cut back its peacetime production of consumption goods so that equation (8) is rewritten, for peacetime, as

$$(8') \quad p^t \frac{\partial C^t}{\partial K_C^t} = (1 + \beta)P_K^t(1 + \lambda), \quad \beta > 0.$$

The cartel does not restrict entry so that the investment equations in (9) remain the same. Dividing (8') by (8) for t + 1, the next wartime period, and then using (9),

$$(11') \quad \frac{p^t}{p^{t+1}} = \frac{P_K^t(1+\beta)}{\frac{\partial C^t}{\partial K_C^t}} \Big/ \frac{P_K^{t+1}}{\frac{\partial C^{t+1}}{\partial K_C^{t+1}}} = \left[\frac{\partial C^{t+1}}{\partial K_C^{t+1}} \cdot \frac{\partial I^t}{\partial K_I^t} \Big/ \frac{\partial C^t}{\partial K_C^t}\right]\left[\frac{1 + \beta}{1 + \lambda}\right].$$

Using (7'),

$$(13) \quad \frac{\partial U}{\partial C^t}\Big/\frac{\partial U}{\partial C^{t+1}} = \left[\frac{\partial C^{t+1}}{\partial K_C^{t+1}} \cdot \frac{\partial I^t}{\partial K_I^t} \Big/ \frac{\partial C^t}{\partial K_C^t}\right]\left[\frac{(1 + \beta)}{1 + \lambda}\right]\left[\frac{1}{1 + \alpha}\right].$$

Hence, we may set the degree of peacetime monopoly, β, equal to α, so that the cartel agreement induces a Pareto optimum with no alteration in the optimal capital tax rate given by equation (12). Alternatively, a cartel may act directly as an accumulator of inventories beyond peacetime competitive levels. In this case, the only change in the system is that equation (9) for peacetime becomes

$$(9') \quad (1 + \beta)P_K^{t+1} \frac{\partial I^t}{\partial K_I^t} = P_K^t(1 + \lambda).$$

Substituting (9') into (10) and using (7'), we again arrive at (13).

It may be argued that the observed degree of monopoly is set at the simple profit-maximizing level for the producers and is independent of negotiations to achieve joint efficiency. But evidence to the contrary is found in the fact that

the two most durable post-WWII cartels, those in tin and coffee, negotiate with -- and even have their quotas enforced by -- the consuming countries. There is also abundant evidence supporting the hypothesis that the newest effective international cartel, that in crude oil, charges substantially less than simple monopoly prices because of political and military considerations.

Additional evidence that observed international cartels are not simple monopolies is that the cartel countries have not jointly imposed monopolistic export taxes, such taxes representing the optimal monopoly policy when side-payments are precluded. (See e.g., H. Johnson.) These taxes would discourage entry and investment (changing the $(1 + \beta)$ coefficient in (9') to $1/(1+\beta)$, interpreting β now as the ordinary degree of monopoly), thereby preventing the achievement of joint optimality.

An empirical application of the second national defense argument to foreign suppliers is contained in Section IIIB.

3. Regulated Industries

Certain industries in the real world have their peacetime prices set by government agencies.[8/] If peacetime prices of the products of these industries are set so as to induce competitive supplies and clear markets, but wartime prices are effectively controlled below their marginal social values, under-

---

8/ This is perhaps because the underlying legal structure induces sufficient divergences from perfectly competitive supplies. For federally regulated transport industries, which will furnish our most interesting empirical applications of the second national defense argument to regulated industries, a plausible justification for some regulation is the legal imperfection that people who die do not have to compensate their friends (toward whom they are not sufficiently benevolent to unilaterally transfer lump-sums). Without intervention, people would overly risk their lives. For certain goods, government-imposed safety standards suffice. For others, where government safety-detection is sufficiently costly, the nominal price may be set sufficiently above the free-market price, and non-safety dimensions of product quality sufficiently restricted, that safety-quality competition will induce a social optimum. The prices and supplies which we shall call "competitive" for such industries are those generated by the regulatory policy described above.

investment will characterize the regulated industries. However, if peacetime prices are set above competitive levels, and either industry supplies are optimally prorationed among the producers to prevent excessive quality competition or capacity-specific quality competition is permitted, then an investment subsidy equivalent to that achieved in the international cartel model above will be achieved as long as investment and entry are not both artificially limited by government policy.

The view that federally regulated industries in the U.S., largely the ICC-controlled transport industries, receive above-competitive prices but are induced to develop more capacity than is in the joint interest of the individual firms has become increasingly popular, and the view has received substantial theoretical and empirical support in the pathbreaking article of Stigler and more recent studies by Moore and DeVany. The contribution of our theory is to point out the possible equivalence of this type of cartel to a real investment subsidy rather than a simple monopoly and suggest the possible social optimality of this type of cartel. An empirical application of the second national defense argument to regulated industries appears in Section IIIC.

D. Why Argument Number 2 is Not Necessarily a Second Best Argument.

It may appear that our national defense argument, resting as it does on the existence of special wartime controls, is a "second-best" policy in that it may appear more efficient to simply remove the wartime controls and so end the peacetime capital subsidy. This may be true. However, we shall argue in this section that under quite realistic conditions, efficient wartime policy requires a system of price controls. This argument is provided by the following elaboration of our national defense model, an elaboration ultimately admitting individually rational decisions about the level of national defense.

As above, a nation protects its capital by committing itself to devote sufficient resources to the punishment of foreign aggressors that the costs of aggression to all potential aggressors are never below the returns. Such protection generally requires that the protecting nation commit itself to lose more utility in punishing an act of foreign aggression against it than the gain in utility from having the protected capital (Kahn). National defense expenditures communicate this commitment. While a certain level of defense expenditures is always necessary for a nation to display its ability to sufficiently punish a foreign aggressor, occasionally an abnormally high level of defense expenditures must be incurred in order that the defending nation also display its willingness to apply the requisite, narrowly irrational punishment in case of actual foreign aggression. That is, a nation's willingness is occasionally tested by its potential aggressors. These test periods are the "national emergencies," or "wars," referred to above.[9/]

We now assume that decisions with respect to the magnitude of peacetime defense expenditures are made in the respective periods by the nation's citizens, say by a majority vote. During peacetime, when there is no act of foreign aggression against the country, defense expenditures are rationally chosen to be $\overline{K}_D^t$. Any lower level would mean that country would surrender its capital, and a higher expenditure level would be a 100% deadweight loss (Buchanan-Tideman). But during wartime, when there is an act of aggression

---

9/ Since costly aggression does not occur in a distributional equilibrium, our wars are generally between countries who are each simultaneously displaying their own defense commitments and testing the defense commitments of others.

Our theoretical model can be generalized to admit costly aggression in "equilibrium" by replacing our certainty-equilibrium with more general sequence of temporary equilibria in which various nations may incorrectly estimate the costs of aggression. While the substitution of the resulting, statistical, equilibrium concept for our certainty-equilibrium has no effect upon our theoretical results, it does have some effect on the calculations of optimal subsidy rates. Our estimates of optimal subsidy rates in Section III will be based on a relatively realistic, statistical equilibrium model.

against the country to test its willingness to devote sufficient resources to protect its capital, the citizenry cannot be counted on to choose the level of K_D^t which would display a commitment to protection. This is because it is not in the interest of the citizenry to defend its capital against a foreign aggressor who commits himself to imposing more damage on the citizens if they do not surrender their capital than the capital is worth to them. The only way for the protecting nation to defend itself against a commitment of the latter kind is to pre-commit itself to fight the foreign aggressor anyway; and the citizens cannot be so committed if they are free to choose any level of K_D^t during wartime. So a rational military leader retains the power to choose K_D^t during a defensive war. He maintains his own share of the nation's capital if and only if he defends it and pays no part of the cost of the war. He is willing for his nation to lose more in defending its capital than the capital is worth because he personally does not pay the costs of war. The military leader thus will choose $\bar{K}_D^t$ during a war, thus demonstrating the nation's defense commitment. In a distributional equilibrium, these displays of willingness to fight are communicated without making the citizens actually suffer more from the wars than the nation's capital is worth to them.

While the peacetime defense expenditure level, which is efficiently determined by the rational votes of the nation's citizens, is achieved by a familiar, tax-expenditure process (Buchanan), the wartime defense expenditure level, which is militarily determined, is achieved by other means because the military has no direct power of taxation in a democracy. In particular, the military leaders, living within a dollar expenditure budget set by the voters, set the real defense expenditures by establishing a system of price controls, where the government forces private producers to sell to the military at

government-determined prices. Without such controls, given the well-known limitations of alternatives such as money creation and debt financing, the military's confiscatory wartime powers would be generally too limited to provide the requisite level of defense.[10/]

10/ Several perceptive readers of an earlier draft of this paper have pointed out that it is unnatural to constrain the military by disallowing it direct taxation power. By applying direct taxation during a war, the military could avoid the inevitable misallocation costs of wartime price controls. However, we are not forced to the conclusion that the second national defense argument is a second-best argument. We can assume, we believe realistically, that people are sufficiently better off living under the illusion that they are the employers rather than the slaves of a benevolent military (the illusory nature of this thought is shown in Thompson, 1977) that the illusion of freedom from military domination induced by the absence of direct military taxation is worth the misallocation costs of wartime price controls. An optimal response to this preference is a benevolent deception in which military leaders avoid the use of direct taxation even though it is a feasible policy. An implication of this assumption is that prior to the rapid development of the modern, popular governments of the past two centuries, when military leaders could not afford to be so charitable (Thompson, 1977), there would be no deception and no special, authoritarian wartime price controls. But national, authoritarian price controls would be ubiquitous among developed countries in recent wars. Correspondingly, we observe (see, e.g., Schuettinger and Nef) that while virtually all major powers involved in World Wars I and II had comprehensive, national, authoritarian, wartime price controls, such controls were a rarity prior to the American and French Revolutions. The only pre-eighteenth century cases in Western Civilization noted in Schuettinger's historical survey was the famous Edict of Diocletion in 305 A.D. and the subsequent adoption of similar controls by Emperor Julian sixty years later. However, historical studies of this period (Michell, Gibbon) clearly indicate that the near-bankruptcy of the Roman Empire, all practical sources of direct taxation being long exhausted, accounted for these attempts to enhance the Roman military effort by forcing down the prices which the military had to pay for their consumption goods. Thus, even these ancient wartime price controls can be rationalized by an argument in which the marginal economic return to direct taxation exceeds its marginal economic cost. The particular forms of direct wartime taxation and borrowing relied upon prior to the 18th century, and the switch to the use of price controls, rationing, and modern conscription from the 18th century to WWII, are described in Nef.

Modern military organizations probably come closest to direct taxation through their conscription of human capital. But even here they steer clear of the surface efficiency of allowing draftees to buy their way out. Allowing such purchases would apparently overly expose the citizens to the power of the military leaders. Evidence for this is the extreme unpopularity of the U.S.'s Civil War draft in which the draftees could buy their way out (Lindsay).

A more conventional, alternative formulation of the above rationalization of the modern prohibition of direct military taxation is that the military cannot be trusted with such power. However, this more palatable alternative reflects a view of social organization which is inconsistent with rationality, perfect communication, or realisitic punishability (Thompson, 1977).

In summary, based on the politico-military model outlined above, it is not unreasonable to assume that price controls during a war are efficient economic policies despite the inevitable wartime misallocations generated by the controls.

III. AN EMPIRICAL APPLICATION OF THE SECOND NATIONAL DEFENSE ARGUMENT

Due to the ubiquity of recent wartime price ceilings in modern developed countries, we can select any modern developed country which has been involved in a major war over its claimed capital for an empirical application of our second national defense argument. However, studies of the degrees of effectiveness of various wartime price controls were found only for the United States. So the U.S. is our only candidate for quantitative application of the second national defense argument. The last U.S. war over significant amounts of U.S.-claimed capital, World War II (1941-1945), will serve as our empirical model of expected future wars over U.S.-claimed capital.

Since the prices of virtually all marketed products were formally controlled during most of WWII, it is tempting to apply the second national defense argument to all marketed capital goods. But it would be grossly naïve to accept blanket price ceilings as a generally effective policy. This is made abundantly clear in the study of U.S. white collar crime during WWII by the sociologist, Marshall Clinard (1952).[11/] Nevertheless, since the social benefits of wartime price controls stem mainly from charging artifically low prices to the military, higher, above-ceiling, essentially free-market, wartime prices charged to civilians through quality-deterioration,

---

11/ This book, together with the U.S. Government Office of Price Administration's Historical Reports on War Administration, is the source for most of the empirical generalizations below regarding the nature and effectiveness of wartime price controls.

tie-in sales, or other forms of hidden charges do not undermine the controls.[12/] In any case, significant capital undervaluations may occur only (1) in those industries where wartime price ceilings on civilian trades cannot be easily evaded or (2) in the production of outputs which are sold intensively to the military at significantly sub-competitive prices. The following discussion uses these criteria in an attempt to identify the set of capital goods which may be significantly undervalued.

A. Capital Goods Which May Be Significantly Undervalued.

In industries where rational quality-deterioration would create severe economic wastes due to the sheer magnitudes of the wartime shortages, we observe the development of governmental rationing systems to complement the price ceilings or direct production controls. With a rationing system, civilian quantities demanded at the controlled price are limited by the supplies of available ration coupons so that sellers have no incentive to apply the above evasive devices. The effective demand does not justify hidden charges. Hence, for significantly rationed commodities, the real prices paid to producers by civilian as well as military customers are significantly below the corresponding real commodity values to the customers. Relatively large capital undervaluations are therefore possible when the capital produces

---

12/ The effectiveness of price controls in lowering the nominal war costs faced by the military is quite apparent from numerous OPA industry studies. Aggregate statistical evidence also exists. During the pre-control years, 1940-41, the implicit price index of federal government purchases of goods and services rose about seven times faster than an implicit GNP delator. In contrast, during the peak-control period, 1942-44, the implicit price index of government purchases rose at about one-half the rate of the GNP delator. (U.S. Bureau of Census, Series F-67, 82, 87, and 101). The low price inflation for government relative to private purchases cannot be explained by a relatively slack government demand during the peak control period. Real government purchases rose over 63% while real GNP rose only 19% from 1942 to 1944 (U.S. Bureau of Census, Series F-87 and 101.)

commodities which are significantly rationed during wartime. In World War II, significant coupon rationing programs existed for the following commodities: Gasoline, meat, shoes, dairy products, canned goods, coffee and sugar.[13/] With direct production controls, the government directly restricts the production of certain consumer durables in order to hold down the prices of the capital used to produce them. In WWII, the government restricted the production of numerous consumer durables (e.g. autos and copper and nylon products). In other exceptional industries, none of the various devices to evade price controls will work. These industries are largely the so-called regulated industries, where a government agency closely regulates transactions during peacetime and thus can substantially prevent wartime quality deterioration, tie-in sales, and other hidden charges. The only such industries we could find for WWII were in the transportation and utility sectors.

Finally, among the few capital goods whose owners evade wartime price controls on civilian transactions but which warrant a significantly positive investment subsidy anyway because of the sheer magnitude of the military's underpayment, skilled human capital is by far the most important. While other, quantitatively less important, undervaluations of this latter variety will be considered, most of the remainder of the paper is devoted to estimating optimal investment subsidies for each of the cases of significant undervaluation mentioned above. But our empirical argument first requires the following pair of additional limitations on the set of capital goods to which the second national defense argument may significantly apply.

[13/] Other, apparently much less stringent, non-coupon, rationing programs existed for tires, rubber footwear, stoves, typewriters, used cars and trucks. Here, an application to a nearby government administrator demonstrating a "need" (non-speculative value) for the commodity was required in order to have the right to purchase the good. Such discretionary rationing will be included in our analysis under the heading of direct controls.

First, final goods held by consumers are precluded from substantial subsidization under the second national defense argument. For such goods normally are consumed by their holders and are therefore impervious to any kind of wartime price controls. Thus, rational consumers do not require any significant subsidy to induce them to accumulate the optimal peacetime stockpiles of consumer goods in anticipation of wartime shortages. This does not, of course, preclude the possibility that wartime price controls induce an undersupply of producer goods which create consumer goods during wartime.

Second, to limit the set of producer goods eligible for a significant subsidy under the second national defense argument, recall from Section IIB that the degree of wartime undervaluation of a capital good was equal to the degree of wartime undervaluation of its product in a world containing heterogeneous capital goods only when the undervalued capital good is specific to the production of undervalued products. When it is non-specific, the optimal capital subsidy rate must be reduced: (a) Because only a fraction of the value of all of its wartime products is represented by the value of its effectively price-controlled product and (b) Because wartime reallocations of this capital to the production of goods which are effectively price-controlled lower its marginal product there. Thus, due to the large total value of non-controlled, wartime products which it produces, labor used to produce effectively price-controlled wartime products would merit little peacetime subsidy if it were not for the extreme wartime undervaluation of labor's product via conscription. And normal plant and equipment which will be used in producing undervalued wartime products apparently warrants a relatively small subsidy because a given plant worked more intensively during a war (say by use during nights and weekends), while implying a lower, future, peacetime capital stock, normally efficiently provides sufficient extra services

to make its marginal social wartime product fall significantly towards peacetime levels. But large subsidies are possibly warranted for semi-durable, specific capital inputs, i.e., industry-specific capital inputs whose existing inventories are normally largely used up within a period of time equal to the expected duration of a war.

B. Application to the List of Industries Facing Wartime Coupon Rationing.

Therefore, our second national defense argument, when applied to our list of industries facing wartime coupon rationing, applies mainly to its specific raw material inputs. That is, the argument should concentrate not on gasoline stations or refineries, but on crude oil inputs; it should concentrate not on slaughterhouses, dairies, and shoemaking plants, but on cattle itself; it should concentrate not on sugar refineries, but on raw sugar; not on canneries but on tin; not on coffee roasting plants but on coffee beans.

Since the U.S. imports virtually all of its tin and coffee beans, the cartel argument applies here. Correspondingly, we observe that the only two international commodity cartels in existence throughout most of the post WWII period were in coffee beans and tin (Kindleberger and Herrick). And the recent development of an effective cartel of oil exporters has come pari passu with the rapid development of a U.S. dependence on foreign oil. All this seems to suggest that there has already been a significant policy response to the peacetime underinvestments which would have otherwise occurred.

Moreover, the two most substantial specific raw material inputs in the production of the domestic products on our list of war-rationed commodities, oil reserves and cattle, both receive a special subsidy in an optimal form, viz., by an immediate tax write-off on a large part of the investment expenditures which create the capital. But are the magnitudes of these subsidies optimal?

To provide more realistic estimates of these magnitudes, we now drop our extreme, simplifying assumption that the starting date of future wars is known with certainty. In its place, we assume that the current, peacetime probability that a major war will begin during a given future year is the same for all future years. While the qualitative conclusions of Section II remain uneffected by the introduction of such uncertainty, we shall rely on the simple estimation exercises below to illustrate this fact rather than explicitly reformulating the theory.

The excesses of implicit values over normal money prices of crude oil and cattle during WWII, using black market price data found in Clinard, can both be roughly estimated to be about 400% of the controlled prices. Hence, a current, peacetime, year-long, one dollar, oil-drilling or cattle-raising investment which yields four subsequent annual payments having present values of 25 cents each, would have an additional, total social value of $4.00 if a major, 4-year war started in the following year, $3.00 if it started two years hence, $2.00 if it started three years hence and $1.00 if it started four years hence. From the historical experience of the U.S., we estimate that the current peacetime probability that a major, 4-year war will start during any future year is 1/50. Hence, the expected present value of external social value from the investment is $\frac{\$4}{50} + \frac{\$3}{50} + \frac{\$2}{50} + \frac{\$1}{50} = \$0.20$, or 1/5 of the market value of the investment when wartime prices are effectively maintained at peacetime levels. That is, the expected loss to a peacetime investor in an oil drilling or cattle raising project due to the presence of emergency price controls and rationing is -- very roughly -- 1/5 of the market value of the total return, or 1/5 of the cost of the project.

Are the orders of magnitude of observed U.S. subsidy rates comparable to this rough estimate of the optimal rate? First we consider an oil investment. Since about 4/5 of the capital expenditures of a typical oil drilling firm are

expensed as "dry hole" or "intangible drilling" expenses and the value of an immediate tax write-off on an oil drilling investment over a realistic depreciation allowance on the investment is about one-half of the marginal tax rate times the investment (Rooney), the value of the immediate tax write-offs for a typical oil drilling investment, using a marginal tax rate of 50%, is about $\frac{4}{5}\cdot\frac{1}{2}\cdot\frac{1}{2} = \frac{1}{5}$ of the cost of the investment. This rough estimate of the actual rate is the same as our rough estimate of the optimal subsidy rate. While the exact equality should certainly not be taken seriously, it does strongly suggest that the orders of magnitudes of optimal and actual subsidy rates to oil investments are about the same.

A breeder and raiser of cattle in the U.S. can write-off a large portion of his investment expenditures, largely feeding and labor expenditures, as current expenses. As the magnitude of these expenses relative to total capital expenditures is similar to the magnitude of dry hole and intangible drilling expenses relative to total capital expenditures in the oil industry, the investment subsidy resulting from this "loophole" is similar in magnitude to that for the oil industry.

Natural gas, a joint product of oil exploration, also benefits from the dry hole and intangible drilling expense write-offs. But the product also warrants an investment subsidy because its product price has, since 1954, been effectively federally regulated at prices which do not exceed competitive levels and would likely be so regulated in a future war. And the order of magnitude of the optimal investment subsidy for gas is likely the same as that for oil because oil and gas are considered to be close substitutes in the aggregate, normally selling for around their B.T.U. equivalency. [14/]

[14/] The fact that the prices of domestic crude oil and natural gas are currently controlled at levels which are significantly below competitive would — if permanent -- be a major error in U.S. economic policy. However, a possible, second-best, economic rationale for temporary controls of this sort is that even more severe unemployment would have resulted since the value of oil and gas jumped in 1973-74 if all firms had to pay the true increase in the value of oil and gas in 1973-74 (Thompson, 1977a).

Finally, sugar was also rationed in the U.S. during World War II. And, again according to examples in Clinard, the percentage wartime undervaluation of raw sugar was roughly the same order of magnitude as the percentage undervaluations of cattle or crude oil. Corresponding to this wartime undervaluation, the U.S. has had, for most of the Post-WWII period, a special, indirect subsidy to U.S. investment in raw sugar production. Through various Sugar Acts, the U.S. paid 10-25% output subsidies to domestic and a few, allied foreign producers of raw sugar who accepted prorationing of their outputs. (See, for example, Ballinger or D. Gale Johnson). As above the magnitude of this subsidy is in line with the optimal subsidy suggested by WWII sugar rationing.[15/]

Following the "optimal tariff" argument of Section IIB, moderate tariffs or import quotas, whose benefits are largely terms-of-trade advantages, are also in order for imports of crude oil, cattle, and sugar, all of which were imported to moderate degrees during the post WWII period. Furthermore, to generate the smaller net capital subsidies due oil refineries, slaughterhouses and dairies, and confectionary plant and equipment, positive net, or "effective" (see, e.g., Balassa), tariffs on imports of refined petroleum products, meat, leather, and dairy products, and confectionaries are also in order. In fact, significantly positive effective tariffs or import quotas on all of the above inputs and products have apparently existed during much of the Post-WWII period.[16/]

[15/] The Sugar Acts, which were developed when Cuba (an important source of raw sugar) was a close ally of the U.S., were finally repealed in 1975, after fifteen years of disappointing attempts to replace Cuba in the scheme. The emerging, 1977 system is following an outline suggested by our theory: First, a system of unusually high domestic raw sugar price supports through governmental purchases has just passed into law. Second, a large group in the U.S. Senate is aggressively encouraging previously monopsonized foreign sugar producers to break from the past by establishing a cartel and stepping the world price of sugar all the way up to the supported, domestic, U.S. level.

[16/] Since crude oil import quotas were shared by the U.S. oil refineries, there was an obvious net subsidy to oil refineries. Since live cattle imports, mostly from Canada, were very small compared to meat, leather, and dairy imports, even before the relatively small, 10% cattle tariff (U.S. Department of Agriculture),

C. Industries Facing Effective Civilian Price Controls Without Rationing.

As argued above, federally regulated industries, which are largely transportation industries in the U.S., cannot practically employ large-scale, quality-deterioration or other hidden charges during wartime to circumvent wartime price ceilings. Furthermore, WWII price ceilings were relatively unfavorable to this sector. In fact, the nominal BLS price index of transportation services actually fell during the widespread inflation of '42-'45. Yet very little WWII non-price rationing of transport facilities was observed, and the relative quantity of transportation services rose dramatically during the war as transportation output grew at a rate which was several times larger than the GNP growth rate.[17/] It is a problem to explain the increased supply since there was neither a massive introduction of cost-saving innovations in consumer transportation during the period nor significantly decreasing costs for the somewhat competitive transportation sector. The peculiar supply and price pattern can, however, be explained by regarding the sector as one of our "cartels", wherein the prior peacetime output prices are set above their competitive levels and peacetime industry outputs are prorationed among producers according to their respective capacities while investment is basically unrestricted.

A recent estimate of the degree of transport "over-capacity" due to transport prorationing and an estimate of the degree of net abnormal wartime demand appear to be about the same. According to Moore, the "artificial" overcapacity in the domestic U.S. surface transport industry has been about 20% while the magnitude of the abnormal transport demand during the peak years

---

the substantially higher rate of protection for these processed imports (Balassa) implies substantial effective tariffs on them. References for the effective tariff on U.S. refined sugar imports are Ballinger and D. Gale Johnson.

17/ Source: U.S. Bureau of Census: Tables E 113-139 for price data, F-29 for value-added data, and Table F-87 for GNP data.

of WWII was only slightly in excess of 30%.[18/] Since it is not unreasonable to assume a 10% expansion of transport services from any given stock, it is not unreasonable to conclude that the estimated degree of excess capacity in the U.S. transport sector does not significantly differ from the optimal degree of excess capacity.

Perhaps the most direct evidence for the existence of significant excess capacity in U.S. regulated industries since WWII is the notorious absence of peak-load pricing in these industries.

Local public utilities, which provide water, electricity, telephone service, etc., also have their prices regulated. And WWII controls also appear to have maintained an effective ceiling on these prices at about peacetime levels. But the observed demand for utilities during WWII, in contrast to the observed demand for transportation, did not rise dramatically. And we expect, from the relative durability of the capital in the utility sector, that marginal costs would not rise as fast for public utilities as for the transportation industries. As a result, a much smaller peacetime investment subsidy is apparently due the public utility sector than the transport sector based on the second national defense argument. The existence of some "overinvestment" by public utilities through their peculiar incentive structure is strongly suggested by the well-known Averch-Johnson model. However, in agreement with our view of the optimum, the estimated magnitude of such overinvestment is relatively small (Peterson, Graham).

D. Industries Facing Relatively Ineffective Price Controls on Civilian Transactions.

As indicated above, for goods and services which are undervalued during wars only to the extent that they are sold to the military at artificially low prices, the resulting capital undervaluations can also normally be expected

---

18/ By dividing the average of the real values added by transportation in the years 1941 and 1947 into the average of the real values added in the peak war years, 1943 and 1944, we obtained an estimate of abnormal wartime transportation activity of 31.3%. (Ibid.)

to be relatively small. The one obvious exception, the undervaluation of skilled human capital due to the extreme underpayment for the wartime services of such capital, is discussed in the next subsection. Disregarding labor, the largest of these relatively small undervaluations presumably occurs for those semi-durable capital inputs whose wartime products are sold intensively to the military at prices closely supervised by the price-controlling agencies. An examination of the Reports of the Office of Price Administration reveals that by far the most significant inputs of this kind were: Most agricultural commodities, various chemicals and non-ferrous metals; iron and steel; wool and cotton. For most agricultural commodities, extra peacetime inventories are induced in the U.S. through various agricultural price support programs. Moreover, "set-aside," or "land bank," programs also exist which subsidize farmers to create fresh, fertile croplands. These correspond closely to our cartel model of II.C.2. For various chemicals and non-ferrous metals such as copper, lead and zinc, we observe the governmental accumulation of large peacetime stockpiles. This policy shortcuts the various subsidy methods we have been discussing. Iron and steel, wool and cotton are not so substantially stockpiled by the government. (Neither is aluminum, but its production was subsidized heavily during the War.) These goods are, to moderate degrees, imported during peacetime. Correspondingly, we observe significant import protection rather than domestic investment subsidies for iron and steel, wool and cotton producers. The optimality of concentrating on import protection rather than domestic subsidies for moderate imports with sufficiently small undervaluations was implied by our special optimum tariff argument of Part IIB. Furthermore, the requisite, significantly positive, effective tariff rates which are due processors of iron and steel, wool and cotton are also observed (Balassa.)

Optimal import protection for national defense reasons differs from classical, monopsonistic import protection in at least two observable ways. First, inputs warranting import protection under the second national defense argument normally warrant a larger degree of protection then other imports. The reason is that the financial gain from a given amount of protection is larger because the more a country becomes dependent on imports of an undervalued input, the more likely its optimal policy is to switch from being a world monopsonist to an unfortunate, but willing, cartel-victim. For, as we have argued above, once sufficient import dependence is developed, it pays to allow an international cartel in order to induce the optimal, peacetime, foreign accumulation of the input. Import protection in the Post-WWII U.S. has, in fact, concentrated on the narrow group of goods we have been discussing, i.e., cattle, oil, sugar, iron and steel, wool, cotton, and their products. For example, according to a survey by Bergsten, over 85% of the protection in the Post-WWII U.S. has concentrated on this small group.

Second, when import protection is a simple monopsony device, then tariffs are superior to import quotas in that random fluctuation in the levels of demands or costs for a given policy cause much smaller deviations from the optimal monopsony policy with fixed tariffs than with fixed quotas (cf., Fishelson.) But when import protection is also used to prevent dependence on wartime imports, then import quotas may well be superior to tariffs. In fact, the set of Post-WWII imports which sufferred most from our World War II price controls, (crude oil, cattle, sugar, cotton, wool, iron and steel, various agricultural commodities, and products of these materials) is virtually identical to Bergsten's list of commodities which have been subject to significant U.S. import quotas!

E. Skilled Human Capital.

As argued above, military conscription, part of our general system of price controls in which the government can buy at the artificially low, controlled price, may have been particularly injurious to skilled labor in WWII because the military's payment to a significant fraction of the U.S. supply of skilled labor was apparently far below the marginal supply price. The second national defense argument may thus provide a rationale for the significant subsidization of investments in skilled labor. Such subsidies are observed in the form of general subsidies to higher education.[19/]

An apparent difficulty is that these observed subsidies also apply to the development of skills in the fine arts and humanities, skills which suffer little wartime undervaluation. However, Marshall's externality argument for supporting higher education -- that we subsidize everyone's education because we cannot identify potential creative geniuses, most of whom cannot collect the huge benefits they provide to society -- applies largely to these latter skills and very little to the practical skills that are undervalued during a war. So Marshall's argument must be added to the second national defense argument in order to rationalize observed subsidies to higher education. Since both the second national defense argument and the Marshall argument apply to science skills, the observation of a discriminatory subsidy in favor of science education is rationalized.

In order to isolate a significant area where the national defense undervaluation is large relative to Marshall's, we considered two year colleges, schools which appear to be largely directed toward developing standard, low

---

19/ A rationalization for the observed subsidization of earlier, childhood education emerges quite naturally from a model admitting parental malincentives (Ruhter, Thompson, 1974.)

risk, technical skills. We estimated the observed rate of subsidy to investments in these skills to be about 18%.[20/] But what is the optimal rate?

To estimate the degree of wartime undervaluation of labor via military conscription, we first estimated the percentage increase in labor's supply price to the military from the level of our armed forces just prior to the WWII draft to the average WWII level. To do this, we divided the percentage increase in the U.S. military personnel from the 1940 level to the average '41-'45 level (U.S. Bureau of Census, Series Y-763) by the most recently estimated elasticity of supply of military manpower, 1.25 (Cooper). The result, $\frac{8.66}{.452} / 1.25 \simeq 1533\%$, is an estimate of the percentage increase in military wages which would have been necessary to fight WWII on an all-volunteer basis. Since military pay relative to civilian manufacturing wages decreased from 1940 to 41-45 by about 15% (U.S. Bureau of Census, Series D-626, F-167, and Y-763), the supply price increase for the armed forces during WWII is estimated to be $1533/.85 \simeq 1800\%$. But this estimate is biased on the high side in that it fails to adjust for the patriotic shift in the supply of military labor during the war, a shift which we have been unable to objectively estimate from WWII observations. However, during the U.S. Civil War, when the Union's average armed force was only 18% of the 15-39 year old male population compared to about 29% for WWII (Ibid, Series Y-763 and A 74-78), there was only an inconsequential draft [accounting for only about 2% of

---

20/ Total governmental non-capital expenditures per student to all 2-year colleges in the U.S. in fiscal 73-74 (from the U.S. National Center for Education Statistics, Current Funds Revenues and Expenditures) was $950 per student. Adding five percent interest on the book value of the assets of public 2-year colleges (from the U.S. National Center for Educational Statistics, Property Accounts) brings this total level of governmental support to $1068 per student. Total 1973 investment cost per student -- the sum of non-capital total expenditures, $1,229, (Ibid, Current Funds) 5% interest on the book value of all 2-year colleges, $130 (Ibid, Property Accounts) and the 9-month average 1973 income of full-time workers with only a high school degree, $4,672 (U.S. Department of Commerce, Current Population Reports) -- is 6,031. Hence, our estimated government subsidy rate to trade education for young adults is 1,068/6031 = 17.7%.

those actually serving compared to 60% for WWII (Ibid, Series Y715 and 734)]. The Civil War military wage grew at about the same rate as the average manufacturing wage during the war (Shannon.) If, instead, the relative military wage had dropped the 15% that it did during WWII, then, using our 1.25 supply elasticity, we would have had a .15 x 1.25 ≈ 19% smaller Union army. Thus, with the WWII wage pattern, the 18% volunteer army would have shrunk to about 14½%. Hence, using the Civil War as a standard, we estimate the patriotic shift in supply to be 14½% of the eligible male population during WWII, or one-half of the actual average WWII armed force. The number of men which would have required higher wages to volunteer during WWII is thus estimated to be about one half of the observed armed force. Hence our revised estimate of the wages necessary to induce the observed average World War II armed force is $\frac{4.33}{(.452)(1.25)(.85)} \approx 9$ times the actual wage rather than 18 times.[21/] Now about 1/3 of those registered for the draft actually served during the average WWII year (Bureau of Census, Series Y-763 and Y-917). So the wartime undervaluation of the product of this group drops down to about 1/3 of 800%.

To compute the resulting undervaluation of investments in human capital, we add the assumption that workers are equally eligible for the draft during the first twenty years of their working life and are not during the remaining 20 years of their 40-year working life. Then, using our above assumptions on war probabilities, war length, and real interest rates, the present, expected, percentage undervaluation of a young adult's investment in human capital which increases his wages by $\Delta W(t)$, is

$$\sum_{t=1}^{20} \frac{8}{3} \cdot \frac{\Delta W(t)}{(1.05)^t} \cdot \frac{4}{50} \Big/ \sum_{t=1}^{40} \frac{\Delta W(t)}{(1.05)^t}.$$

[21/] An independent estimate arriving at about the same figure but relying mostly on Civil War pay differentials between volunteers and draftees is available on request from the author.

Assuming that $\Delta W(t)$ grows with aggregate real wages at the rate of 2% per annum, this ratio is easily calculated to be 14%.[22/] While the actual rate is a little higher than this optimal rate, the Marshall argument should count for at least a couple of percentage points. So again, since our rough point estimates of actual and optimal subsidy rates are in very close agreement, the evidence does not contradict the hypothesis that the orders of magnitude of optimal and actual subsidy rates are about the same.

The international trade results of Section IIB also apply to human capital. Since (1) a large human capital subsidy is justified by the second national defense argument and (2) mild imports of human capital exist, import quotas to protect our skilled human capital can be justified. In fact, such protection exists. Since the U.S. pays domestic rather than world market prices for its imported human capital, the conventional international trade argument for the existence of a net pecuniary gain to a small amount of protection does not apply. Nevertheless, if we can assume that the aggregate U.S. production function is linearly homogeneous and that U.S. citizens have net holdings of equity capital outside the U.S., then a positive net benefit from a small immigration restriction must accrue to U.S. citizens.[23/]

F. Industries Facing Direct Allocation Controls.

As noted above, the production of several kinds of durable consumer goods was restricted by fiat through direct allocation controls during World War II. The salutory effect of these controls again was to reduce the nominal

---

22/ Statistical eveidence of rising relative wages of the relatively better trained persons (Mincer, Taubman-Wales) might appear to contradict this assumption. However, this evidence can be explained by the existence of greater on-the-job training by the relatively educated and thus does not directly bear on the validity of our assumption regarding the effect of a single period's increase in training.

23/ To see this, first differentiate the familiar Euler equation for linearly homogeneous functions partially with respect to labor. This shows that the increase in payments accruing to laborers from a small decrease in the labor supply exactly equals the induced decrease in aggregate profits. If the country's citizens have a net equity position in foreign capital, they receive

cost of certain resources so as to artificially lower the cost of the defensive war. It may appear that an additional peacetime subsidy is due semi-durable producer inputs into several consumer durables industries based on our second national defense argument. However, the demand for consumer durables, taken as a group, is known to substantially "pent up." Indeed, the post-World War II pent-up demand for consumer durables is widely considered to be the primary cause of the macroeconomic boom that followed World War II. Under such a condition, it is not likely that any significant subsidy is in order based on the second national defense argument. For with such inter-temporal substitution possible, it is likely that even without controls the wartime increase in the competitive equilibrium price of new consumer durables would have reduced the rational purchases of these goods to insignificance anyways.

G. A Note on Rent Controls.

A typical observation of WWII bureaucrats and contemporary economists was that while WWII price controls were largely ineffective in keeping down quality-adjusted civilian prices other than for industries facing rationing or government regulation, the ceiling on apartment rentals was a singular exception. (See, e.g., Harris.) While there was some effective rent control during the War in a few military zones, enabling the military to acquire ancillary services at artificially low costs, wartime ceilings on civilian rents were largely nonbinding given the shift of people of household-formation age into military housing. However, the Post-WWII surge in U.S. housing demand was met with a two-year extension of WWII price controls which was apparently somewhat effective despite the high incidence of hidden charges via tie-in

---

a component of gain from the immigration restriction in that the profits from their foreign investment expands. The net result is then that the country's capitalists lose less than its laborers gain from the immigration restriction. The immigration restrictions which suddenly emerged in the 1920's, following as they did the significant labor conscription of WWI and the U.S. foreign investment boom of the late 19th and early 20th centuries, are therefore rationalized with our theory.

furniture sales, security deposits, early rent payments, and quality deterioration (Clinard). (Direct evidence for this effectiveness is the somewhat lower rate of price appreciation for apartment buildings than for owner-occupied housing in the 45-47 period (Gage).) Since the resulting capital undervaluation must be considered relatively small, only a small peacetime subsidy to non-owner-occupied real estate is justified. Since the postwar increase in housing demand was concentrated on low-income units, the effective price controls were apparently concentrated there. (See Friedman and Stigler.) So these controls justify small subsidies to investments in low-income housing. But the argument lacks power as an explanation of the small subsidies to low-income housing observed in the U.S. for (1) the observed subsidies can also be rationalized by the parental malincentive problem (Thompson, 1974) and (2) postwar rent controls lack the efficiency justification of wartime price controls and therefore cannot be comfortably expected to recur given our results.

Real estate tax shelters cannot be justified with the second national defense argument. However, observed U.S. tax shelters for non-owner-occupied real estate can be rationalized by the fact that without such a tax shelter there would be an inefficient, double capital tax on this real estate compared to owner-occupied units, both of which are taxed at approximately the normal U.S. capital tax rate through local property taxation (Thompson, 1974).

H. Trends.

Since the likelihood of another U.S. war of the WWII variety has probably been decreasing over the past couple of decades (see, e.g., Brodie), it would be reasonable to expect the magnitudes of the above optimal investment subsidies to mildly decrease over time. Correspondingly, we have in recent years observed mild decreases in: (1) The effective write-off for intangible drilling expenses (2) The effective write-off for cattle-feeding, (3) The cartel-held inventories of tin and coffee, (4) excess capacity in the regulated

industries, (5) the subsidy rate to expenditures on higher education, (6) real agricultural price supports and subsidies, and (7) import quotas.

I. A Perspective on the Results.

The results in the empirical part of this paper complement those in the author's 1974 paper. In fact, tax shelters, where individuals are allowed to expense certain original capital investments, were one of only two elements of the explicit U.S. tax structure which could not be rationalized using the simple theory in that paper.[24/] The current extension of that simple theory appears to largely explain these shelters, for the significant ones are widely recognized to exist only in cattle, oil and gas, real estate, and, to lesser extents, in certain agricultural investments. The other, implicit, capital subsidies discussed above, i.e., government inventory accumulation, cropland conservation payments, provision of higher education, cartelizing regulation, and import protection were not considered in the 1974 paper and also cannot be rationalized with that model.

The capital goods which do not merit significant domestic subsidies under the second national defense argument, are, from above, consumer goods, plant and equipment, and mature human capital. Correspondingly, we do not observe large subsidies to capital goods within these categories other than those subsidies rationalized in the '74 paper as warranted by the non-coveted nature of the capital or by a parental malincentive problem.

24/ The other unrationalized feature of the U.S. tax structure was the alleged absence of taxation on luxury consumer durables other than residences. Since valuable art, precious metals, jewelry, and furs are fairly easily hidden from a foreign aggressor (as evinced in the German occupation of France in WWII), the list of coveted luxuries is probably fairly short. What the author had in mind were yachts and expensive cars. But he was unaware of the fact that the one kind of consumer good which is taxed, fairly uniformly throughout the U.S., by local personal property taxes is the pleasure boat. And the capital tax rates appear to fall in the optimal range of 1-3%! He was also unaware of the fact that state auto license fees typically have an ad valorem capital-tax component which also falls within this range.

The two papers thus combine to strongly indicate that a more realistic model of national defense than that which is implicit in traditional economic doctrine leads to a description of a Pareto optimal overall economic fiscal policy for the U.S. which is surprisingly close to the actual policy.

Since no such theory of national defense was available to the government decision makers that evolved these policies, we conclude that existing political processes in the U.S., rather than being dominated by broad social thinking, have simulated an allocation system guided by a compensation principle. Under such a system, the potential gainers from proposed legislation always ammend the proposal if the change is perceived to raise the expected utility of any individual without reducing the expected utility of any other. For such an amendment can only increase the political support of the bill's proponents, decrease the resistance by the bill's opponents, or both. If perceptions of individual gains and losses are accurate in such a system, any allocation generated by the system must obviously be Pareto optimal. Our results thus suggest that the ability of individuals in a large political system to act under their enlighted self interest and the resulting efficiency of the invisible hand in government have been substantially underestimated.

IV. SUMMARY

Two independent national defense arguments have been developed. The first states that an increase in the private sector capital stock of a nation raises the costs of successful aggression against the country and thereby lowers the country's required level of national defense expenditure. Since this effect is external to the private holders of such capital, the argument implies the optimality of a capital subsidy. However, an increase in the nation's capital stock may also increase the <u>return</u> to successful aggression

to foreign aggressors. Furthermore, this latter effect appears to exceed the former, as empirical evidence strongly indicates that an increase in a nation's measured private capital stock increases rather than decreases its national defense expenditures. This suggests the optimality of a net tax on capital. The first national defense argument does not appear to be an empirically valid justification for any form of subsidization.

The second national defense argument states that certain kinds of capital are undervalued by private investors during peacetime because the products of the capital are subject to effective wartime price controls. The capital goods which are generally most qualified for significant support are semi-durable producer goods which are specific to industries suffering effective wartime price controls. But, because simple price controls are ordinarily readily avoided by quality changes and other forms of hidden charges, the argument applies significantly to only a very restricted set of industries.

For domestic industries facing significant wartime coupon rationing as well as price controls, the efficient subsidy is granted by treating a certain part of its expenditures on specific, semi-durable capital as ordinary business expenses for tax purposes. The most important U.S. products affected by WWII rationing were gasoline and meat. These products were produced largely by domestic industries. Correspondingly, significant tax write-offs of specific, semi-durable, capital expenditures in these industries are justified. In fact, such tax breaks are given, and the magnitudes of the observed tax breaks roughly approximate the optimal rates.

For foreign industries suffering from both wartime rationing and price controls, an efficient investment subsidy is provided by allowing the foreign exporters to jointly raise the peacetime prices of their outputs by accumulating a stockpile of their outputs or by forcing prorationing according to capacity

on the producers in the industry. The foreign industries supplying the U.S. in WWII which suffered significantly from U.S. rationing programs were the tin and coffee industries. Correspondingly, the tin and coffee cartels have been the only significant international cartels in operation throughout most of the Post-WWII period. And the recent development of a U.S. dependence upon foreign oil was soon followed by an oil cartel with significant price and production effects. In this view, observed international cartels are not simple monopolies which gain by restricting output and the entry of inputs into their industries; they are institutions which simulate what would be competitive behavior in the absence of wartime price controls and rationing by encouraging peacetime capital accumulation in these industries.

For federally regulated industries, procedures for effective government control of the quality of privately traded goods are relatively highly developed during peacetime so that wartime price controls are very difficult to evade. Efficient peacetime incentive systems are those which induce more capacity than the companies would freely choose given their artificially low wartime product prices. Such incentive systems appear to exist, and the estimated amount of "over-capacity" where estimates are available appears to be of the same order of magnitude as the optimal amount.

For industries which largely evade wartime price ceilings on sales to civilians and therefore suffer from effective wartime price ceilings only on sales to the military, a generally much lower level of support is justified. However, one exception appears in the "industry" which sells the services of human capital. The singularly low wage paid by the military for skilled labor services, together with the large magnitude of the armed forces during the last world war, indicates that a significant subsidy is due youthful

producers of skilled labor inputs. A plausibly efficient form of subsidy is a direct subsidy to educational expenditures by young adults. Our rough estimate of the optimal U.S. subsidy to higher education closely approximates the observed subsidy rate.

For the other industries whose wartime products are not effectively price-controlled in civilian sales but are sold in significant quantities to the military at sub-competitive prices, some, relatively small, subsidies are due their specific, semi-durable capital inputs. For the most important inputs in this category, we do observe relatively small, effective capital subsidies: For easily storable, specialty chemicals and non-ferrous metals, we observe special government stockpiles. And for most agricultural outputs, we observe governmental commodity price supports and cropland development subsidies. For the less easily storable commodities in this catagory, iron and steel, wool and cotton, we observe significant tariff or import quota systems. These restrictions on international trade are optimal to rely on when there are realistic constraints on international arguments and when the magnitudes of both the wartime import and undervaluation levels are relatively small.

Significantly undervalued inputs whose wartime imports are small, warrant import quotas as well as domestic subsidies under realistic constraints on international bargaining. Effective protection should also be extended to processors of these inputs. In fact, our significantly undervalued inputs which were moderately imported during most of the Post-WWII period were all afforded import quotas during the period. And effective protection was also apparently extended to their processors. In fact, well over 85% of U.S. import protection in 1970 was concentrated on our short list of qualified commodities under the second national defense argument.

Finally, plant and equipment, consumer goods, and mature human capital warrant no significant domestic subsidies under our second national defense argument. Correspondingly, no significant, domestic capital subsidies are observed within these catagories other than those rationalized in a related analysis of national defense.

In view of the above results, a more refined economic analysis is required if we are to derive suggestions for improvements in U.S. economic policy based on our surviving national defense argument.

Averch, Harvey, and Leland Johnson, "Behavior of the Firm Under Regulatory Constraint," American Economic Review, December 1962, pp. 1053-1069.

Balassa, Bela, "Tariff Protection in Industrial Countries, an Evaluation," Journal of Political Economy, December 1965, pp. 573-595.

Ballinger, Roy A., "A History of Sugar Marketing," U.S. Department of Agriculture, Agricultural Economic Report, Number 197, 1971.

Bergsten, Fred C., "The Cost of Import Restrictions to American Consumers," in International Trade and Finance, Baldwin, Robert and J. David Richardson, (eds.) Little-Brown, 1974, esp. p. 140.

Brodie, Bernard, War and Politics, Macmillan, New York, 1973.

Buchanan, James M., Supply and Demand of Public Goods, Rand McNally, Chicago, 1968.

Buchanan, James M. and Nicholas Tideman, "Thompson Taxes and Lindahl Prices," working paper, Virginia Polytechnic Institute, 1976.

Bhagwati, Jagdish N., "The Generalized Theory of Distortions and Welfare." Trade, Balance of Payments, and Growth, Bhagwati, et al., North-Holland, London, 1971, pp. 69-70.

Clinard, Marshall, The Black Market, Rinehart and Company, New York, 1952.

Cooper, Richard, V.L., Defense Without the Draft, forthcoming.

DeVany, Arthur S., "Capacity Utilization Under Alternating Regulatory Constraints: An Analysis of Taxi Markets," Journal of Political Economy, February 1975, pp. 83-95.

Fishelson, G., "The Nonequivalence of Tariffs and Quotas under Uncertainty," Journal of International Economics, November 1975, pp. 385-389.

Friedman, Milton and Stigler, George J., "Roofs or Ceilings? The Current Housing Problem," Popular Essays on Current Problems, Vol. I, No. 2., Foundation for Economic Education, Inc., Irvington-on-Hudson, New York, Sept., 1946.

Gage, Daniel P., "Wartime Experiment in Federal Rent Control," Journal of Land and Public Utility Economics, February 1947, pp. 50-60.

Gibbon, Edward, The History of the Decline and Fall of the Roman Empire, Bigelow-Brown and Co., New York, 1906, vol. 4.

Glejser, H., "A New Test of Heteroscedasticity," Journal of the American Statistical Association, March 1969, pp. 316-323.

Graham, David, "A Test of the Averch-Johnson Model," UCLA Ph.D. Dissertation, 1976.

Harris, Seymour, Price and Related Controls in the United States, McGraw-Hill, 1945, esp. Ch. XII.

Johnson, D. Gale, The Sugar Program, American Enterprise Institute, Washington, D.C., 1974.

Johnson, Harry G., International Trade and Economic Growth, Harvard University Press, 1967, Chapter 2.

Kahn, Herman, On Thermonuclear War, Princeton University Press, Princeton, 1960.

Kindleberger, Charles P. and Bruce Herrick, Economic Development, 3rd Edition, McGraw-Hill, New York, 1977, Chapter 20.

Klein, Burton, Germany's Economic Preparations for War, Harvard University Press, Cambridge, 1959.

Lindsay, Cotton M., "Our National Tradition of Conscription: Experience with the Draft," in Why the Draft?, James C. Miller, (ed.) Penguin Books, Baltimore, 1968.

Marshall, Alfred, Principles of Economics, 8th Edition, McMillan, London, 1920, p. 216.

Michell, H., The Edict of Diocletian: A Study of Price Fixing in the Roman Empire," Canadian Journal of Economics, February 1947, pp. 1-12.

Miller, Edward M., "The Defense Externality," The American Journal of Economics and Sociology, July 1976, pp. 271-275.

Mincer, Jacob, Schooling, Experience, and Earnings, National Bureau of Economic Research, New York, 1974.

Moore, Thomas G., "Deregulating Surface Transportation," in Promoting Competition in Regulated Markets, Almarin Phillips, (ed.) Brookings Institution, Washington, D.C., 1971, pp. 55-99.

Nef, John U., War and Human Progress, Russell and Russell, New York, 1968, esp. Chs. 5, 12, and 13.

Peterson, H. Craig, "An Empirical Test of Reulatory Effects," The Bell Journal of Economics and Management Science, Spring 1975, pp. 111-127.

Rooney, Robert F., "Taxation and Regulation of the Domestic Crude Oil Industry", Ph.D. Dissertation, Stanford U., 1965.

Ruhter, Wayne E., "Human Capital Development and Parental Incentives," UCLA Ph.D. Dissertation, 1976.

Schuettinger, Robert L., "A Survey of Wage and Price Controls over Fifty Centuries," in The Illusion of Wage and Price Control, Fraser Institute, Vancouver, 1976.

Shannon, Fred A., The Organization and Administration of the Union Army, 1861-1865, Volume II, Peter Smith, Gloucester, Mass., 1965, Chapters 1 and 2.

Stigler, George J., "The Theory of Economic Regulation," The Bell Journal of Economics and Management Science, Spring 1971, pp. 3-21.

Stockholm International Peace Research Institute, World Armaments and Disarmament, SIPRI Yearbook: 1974, MIT Press, Cambridge, Massachusetts, pp. 205-229.

Taubman, P.J., and T.J. Wales, "Higher Education, Mental Ability and Screening" J.P.E., Jan./Feb. '73, Table I.

Thompson, Earl A., "Taxation and National Defense," Journal of Political Economy, July/August 1974, pp. 755-781.

Thompson, Earl A., "A Pure Theory of Social Organization," UCLA Working paper, 1977.

Thompson, Earl A., "A Reformulation of Macroeconomic Theory," UCLA Working paper, 1977a.

U.S. Bureau of the Census, Historical Statistics of the United States from Colonial Times to 1957, U.S. Department of Commerce, Washington, D.C., 1959.

U.S. Department of Agriculture, Agricultural Report Number 196, U.S. Government Printing Office, Washington, D.C., 1959.

U.S. Government Office of Price Administration, Historical Reports on War Administration, U.S. Government Printing Office, Washington, D.C., 1943-47.