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

by

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

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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

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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. The existence of such an equilibrium, while assumed here, is proved in Thompson - Faith (1976). 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 periods capital, K_I^{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

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$^{1/}$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 a kind of 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 discriminatory 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 $dK_{I)}^t/dK^t$.

(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,

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

are maximized, where P_K^t is the parametric present price of capital goods in period t and λ_t in 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,

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

Using (9), this becomes

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

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

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

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.[2/3/] Substituting (2') into (5) will again yield a simple dependency of K_D^t on K^t except that it no longer necessarily follows that $\frac{dK_D^t}{dK^t} > 0$. That is, an increase in the nation's capital stock may now decrease its national defense requirement as an increase in the capital stock may provide a greater deterrent than an attraction to the foreign aggressor given (2') and (5). If this were the case, a subsidy to capital would be in order -- 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

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[2/] This ancient argument has been elaborated most recently by Edward Miller (1976).

[3/] In a more realistic model, some kinds of capital goods cannot be economically converted to wartime use. However, such goods normally 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, as we have, that the entire peacetime capital stock is substantially useful in producing current defense services as a joint product.

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. Since arbitrage can be assumed to equate real interest rates around the world in a given time period, we can test for the applicability of the first national defense argument simply by relating observed defense expenditures to observed national incomes in an international cross section.

To this end, we fitted a linear regression equation to a 1970 cross section of national defense expenditures and national income for 96 countries taken from data published by the Stockholm International Peace Research Institute.

We also standardized for population, obtaining our data from the UN Statistical Yearbook (1973), as a country's total subsistence income, which is proportional to its population, requires no defense (see footnote 1).

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 had no noticable effect on the regression, nor did the exclusion of various groups of the poorest countries. The significance of the Y coefficient is ample evidence for us to confidently reject our first national defense argument.

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.

B. National Defense Argument Number 2.

Our second national defense argument is based on the fact that price controls and rationing are periodically imposed on certain products during certain, recurrent, "national emergencies," which we call "wars." A direct consequence of these controls is that the owners of the capital which produces such products are unable to capture the wartime social values of their capital. This in turn implies that the production of such capital during peacetime is undervalued by private investors. That is, since such capital will have a social value in wartime which exceeds its private value, the social value of producing this capital during the prior peacetime period exceeds its private value. A policy which raises this private up to the social capital value to producers of such capital is a peacetime subsidy to this capital. $\frac{dI^t}{dK_1^t}$ as perceived by private 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. In terms of a multi-commodity generalization of (6), the second national defense argument implies that the increases in the $\frac{dI^t}{dK_I^t}$ terms as perceived by private producers due to the optimal subsidies just match the artificial, privately 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.

4/ As subsistence would probably be higher than this for the highly developed countries, and lower for the less 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.

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 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,

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

Substituting (11) into (7'),

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

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 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 in the future according to the rate of depreciation or depletion of the capital, a natural method of achieving this subsidy is to allow 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 III.[5/]

An inefficient policy would be to allow a depreciation allowance on the entire investment and a subsidy to the original investment. This was the case for several decades in the U.S. oil industry, where the percentage depletion allowance approximated a realistic depreciation allowance on the entire investment [Thompson, 1974]. This allowance provided an overly large subsidy to early withdrawal, although the resulting incentive to over-deplete was almost completely offset by state severence taxes and certain royalty payments, both expenses being fixed fractions of gross income.

Another inefficient 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 goods which are controlled in the wartime, 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 rate of time transformation, thereby leaving the rate of time transformation at the same allocation unaffected. The violation of the

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[5/] We also reserve for Section III our analyses of the optimal forms of subsidy to human capital and capital in "regulated" industries.

efficiency condition in (6) resulting from the undervaluation of future relative to present outputs would remain with simple output subsidies.

For the same reason, we can reject the use of protective tariffs on goods whose wartime production is undervalued by the use of price controls and rationing. These tariffs, like output subsidies, are beneficial to the extent that they serve to increase the incentive to produce the capital which produces the controlled wartime outputs. But they fail to increase the incentive to conserve such capital in wait for a national emergency.[6/]

Thus, while output subsidies and protective tariffs are frequently supported as devises which allow a country to build its capacity to produce wartime products, the argument cannot be economically rationalized (unless we assume an unrealistically fixed relationship between capital and outputs). The problem is that an optimal tax encouragement must subsidize the use of such capital in peacetime to produce itself in the next period relative to producing other outputs. Such a subsidy is provided by the reduction in the normal depreciation allowance on such capital which accompanies the expensing of certain capital expenditures as discussed above but is not provided by protective tariffs or output subsidies.

This is not to say that there is no rationale whatsoever for protective tariffs. The "optimal tariff" argument still applies against countries with whom contracting is sufficiently difficult that lump-sum payments cannot be made in payment for free trade policies. The superiority of tariffs (or import quotas) over other forms of taxation for the purpose of benefiting from terms-

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[6/] Rather than demonstrating this rather obvious result by formally extending our model to cover international trade, we refer the reader to the analysis of Bhagwati (1971). It contains an explanation of the Pareto superiority of domestic output subsidies over tariffs in responding to an inequaltiy between the domestic marginal rate of substitution and marginal rate of transformation in a world with international trade.

of-trade effects in efficient, domestically competitive economies is well-known (cf., Johnson). The highly discriminatory nature of observed tariffs and import quotas systems seems to reinforce the view of tariffs that they concern international monopoly problems rather than a social undervaluation of domestic production. Nevertheless, if such a tariff program exists for an industry which is also due an investment subsidy, it may be administratively cheaper to simply increase the tariff in order to encourage domestic investment, forgoing the efficient, conservation-for-wartime incentive but saving the costs of setting up a special investment subsidy for the industry. This would especially apply when the total value of the optimal, first-best, investment subsidy to such an industry is relatively small.

3. Why Argument Number 2 is Not 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. However, as we shall argue in this section, generally 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 cost of aggression to all potential aggressors is 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 are 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. 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 $\bar{K}_D^t$. 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 against the country to test it willingness to devote sufficient resources to protect its capital, the citizenry cannot be counted on to chose the level of K_D^t which would display a commitment to protection. This is because it is not in the interest of the citizens to defend its capital against a foreign aggressor which commits itself to imposing more damage on the citizens than their capital is worth to them if they do not surrender the capital. 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 we bring in a military decision maker to choose K_D^t during a defensive war. The decision maker 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 utility defending its capital then the capital is worth to them

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 must be 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 government at government-determined prices. Without such controls (recognizing the 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.

For the above reason, then, we can assume that price controls during a war are efficient economic policies despite the inevitable wartime misallocations generated by the controls.

4. An Extension of the Second National Defense Argument allowing International Trade.

A special difficulty arises when the outputs which are effectively price controlled during a war are produced 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

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

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),

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

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 degree of monopoly is set at the simple profit-maximizing level for the producers 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 (or import) taxes, such taxes representing the optimal monopoly policy when side-payments are precluded (Johnson). Such taxes discourage entry and investment (changing the $(1+\beta)$ coefficient in (9') to $1/1+\beta$, interpreting β now as the expected degree of monopoly), thereby preventing the achievement of joint optimality.

III. APPLICATION OF THE SECOND NATIONAL DEFENSE ARGUMENT.

A. The Nature of Wartime Price Controls and Rationing.

Since the prices of virtually all marketed products were formally controlled during our last defensive war in the U.S. (1941-1945), it is tempting to apply the second national defense argument to all capital goods. But it would be grossly naïve to accept blanket price controls as a generally effective policy. This is made abundantly clear in a book of the sociologist, Marshall Clinard (1952). This book, together with the United States Office of Price Administration Historical Reports on War Administration, is the source for most of the empirical generalizations below regarding the nature of wartime price controls.

As we have argued, the purpose of the controls is to cheapen certain goods to the government. If private buyers must pay a higher, free-market price through quality deterioration, tie-in sales, or other forms of hidden charges the price controls may still be achieving their basic purpose. We assume that these evasive devises in dealings with private buyers do, in fact, work for most industries. However, in certain, exceptional industries, where the rational use of these evasive tactics creates severe economic wastes due to the sheer magnitudes of the wartime shortages, we observe the development of (1) governmental rationing systems to complement the price controls or (2) direct production controls. With rationing systems, private 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 devises and the real prices paid to producers by private as well as government customers are significantly below the corresponding real commodity values to the private customers. In World War II, significant rationing programs existed for: Gasoline, meat,

shoes, dairy products, canned goods, coffee and sugar.[7/] With production controls, the government directly restricts the production of certain consumer durables in order to keep down the prices of the capital that produces them. In World War II, the government restricted the production of numerous consumer durables (e.g. autos and copper and nylon products). Finally in other exceptional industries, none of the various devises to evade price controls will work. These industries are largely the so-called regulated industries, where a government agency closely regulates transactions during normal times and can substantially prevent wartime quality deterioration, tie-in sales, and other hidden charges. The only such industries we could find for WWII were the transportation and utility sectors.

Effective price controls of any kind do not harm all of the producers within an industry faced with these controls. Intermediate producers, wholesalers, and retailers, all of whose purchases of price controlled products during the war are a significant fraction of their wartime sales, may easily benefit from the controls. This appears to be the case for World War II as the price-control administrators fixed prices so that the mark-ups to processers were at least sufficient to keep an honest businessman earning a normal profit given the quantities that it could legitimately buy and sell at the controlled prices. (See, for example, Dickerson.) The numerous evasion techniques, such as exaggerating processing costs and requisite mark-ups and dealing in black-markets, thus served to enrich the normal, imperfectly honest processor. The burden of the wartime controls is therefore shifted back to primary industrial

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[7/] Other, apparently much less stringent, non-coupon, rationing programs also existed for tires, rubber footwear, stoves, typewriters, used cars and trucks. Here, 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. Because of its relatively discretionary nature, such rationing will be included in our analysis under the heading of direct controls.

producers. Thus while industrial production and manufacturing profits rose dramatically from 1941 to 1943, after the advent of rationing from late 1942 to mid 1943, industrial production and manufacturing profits fell annually during the 1943 - 1945 period. (See Tables 1 and 2.) In contrast, reported profits from wholesale and retail trade increased annually during the 1943 - 1945 period. (See Table 2.)

The decline in manufacturing in the middle of the war is perhaps evidence against our assumption that controls are worth the attendant misallocation costs. It appears that the controls hit the basic sectors so hard that the ability of the U.S. to sustain a lengthy war is in doubt. The same, however, may be true of the foreign aggressor. Germany, which also had severe price controls and an increasing reliance direct production controls, had decreasing oil production in the later stages of the war while their armament production had expanded at a tremendous rate, indicating some truth to the German field generals' complaints that they had plenty of weapons but no gasoline to move them. (See Klein.)

Nevertheless, the effectiveness of price controls in keeping down the costs to the government during the war is quite apparent. During the pre-control years, 40-42, when the implicit GNP deflator rose at about 14% per year, the implicit price index of federal government purchases of goods and services rose at over 90% per year.[8/] In contrast, in the 42-44 period, when the GNP deflator rose at about 7% per year, the implicit price index of government purchases rose at less than 4% per year. The low price inflation for government relative to private purchases cannot be explained by a relatively slack government demand

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8/ The statistics used in this paragraph come from Historical Statistics of the United States from Colonial Times to 1957, U.S. Bureau of the Census, pp. 142,143.

TABLE 1

Industrial Production Index, 1941-1945

(1935-1939 = 100)

YEAR	TOTAL INDUSTRIAL PRODUCTION	MANUFACTURERS		
		TOTAL	DURABLE	NONDURABLE
1941	162	168	201	142
1942	199	212	279	158
1943	239	258	360	176
1944	235	252	353	171
1945	203	214	274	166

SOURCE: Data from The Economic Report of the President. January, 1949 (Washington: Government Printing Office, 1949).

TABLE 2

Corporation Net Profits, before Taxes, by Major Industrial Groups, 1941-1945

(Index numbers: 1939 = 100; all money figures in millions of dollars)

YEAR	MANUFACTURING		WHOLESALE		RETAIL	
	PROFITS	INDEX NUMBER	PROFITS	INDEX NUMBER	PROFITS	INDEX NUMBER
1941	$10,439.3	292	$ 904.4	274	$ 997.0	246
1942	13,659.6	382	1,037.0	314	1,326.5	327
1943	16,593.7	463	1,190.5	361	1,647.8	406
1944	14,864.3	415	1,215,5	368	1,787.9	441
1945	10,256.8	286	1,216.3	368	1,889.5	467

SOURCE: Computed from Statistical Abstract of the United States, 1942-1948.

during the period. Real government purchases rose over 63% while real GNP rose only 19% from 1942 to 1944.

B. Application to Industries Facing Wartime Rationing.

Since our second national defense argument, when applied to an industry facing wartime rationing as well as price controls, should be applied only to the primary sectors of the industry, the argument applies not to gasoline refining or retailing but to crude oil production. It applies not to slaughterhouses, dairies, and shoemakers, but to cattle breeders. Regarding the rationing of canned goods and roasted coffee, the argument applies to tin and coffee beans, respectively. 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 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, regarding the two most domestic industries to which the second national defense argument applies, oil drilling and cattle breeding, we observe special subsidies to both crude oil producers and cattle breeders in their optimal form, viz., immediate tax write-offs on a large part of the capital expenditures in these industries. But are the <u>magnitudes</u> of these domestic investment subsidies optimal?

C. Rough Estimates of Optimal and Actual Subsidy Rates for Domestic Industries Facing Wartime Rationing.

The magnitude of the optimal peacetime subsidies are those which will give the crude oil or cattle investor the same return that he would have earned if

there were no emergency price controls or rationing. We again use World War II as a model of a typical national emergency. Rough estimates of the implicit, average black market prices of crude oil and meat during World War II are about three times the respective controlled prices (from Clinard), and a rough estimate is that emergencies of like magnitude occur in about one out of every fifteen years (e.g., one such four-year war every sixty years). Hence we can estimate, very roughly, the expected loss to a peacetime investor in an oil drilling or livestock breeding project due to the presence of emergency price controls and rationing to be about 3/15 = 1/5 of the market value of the total return or 1/5 of the cost of the project in a competitive economy.

How do actual subsidy rates compare to this conservative estimate of the optimal rate? First we consider an oil and gas investment. Since about 4/5 of the capital expenditures of a typical oil and gas drilling firm are expensed as "dry hold" or "intangible drilling" expenses, and since 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, 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 very rough estimate of the optimal subsidy rate.

Cattle breeding is a well-known "tax shelter". The breeder of a herd 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. (While the average length of life

of such an investment is typically less than the average length of life of an oil and gas investment so that the value of the subsidy through the early write-off is less then in oil and gas, a capital gains treatment is afforded the income, which somewhat increases the magnitude of the subsidy to both the initial investment and the subsequent accumulation of livestock.)

Finally, sugar was also rationed in the U.S. during World War II, although the total value of U.S. sugar consumption is only a small fraction of the value of meat or oil consumption and the wartime undervaluation of new sugar was probably smaller than the undervaluation of cattle or crude oil. Corresponding to this wartime undervaluation, the U.S. has had, at least until very recently, a special, indirect subsidy to U.S. investment in raw sugar production. Through the Sugar Act of 1934, the U.S. had paid 10-25% output subsidies to domestic producers of raw sugar who accepted prorationing of their outputs. But the Act also provided for a complex system of import quotas and failed to encourage investment by foreign sugar growers. Since the repeal of the Act, the U.S. has evolved a uniform tariff of about 15% on U.S. sugar imports. While the magnitude of the production subsidy is again in line with that suggested by WWII sugar rationing, such protection, as we have already seen, fails to subsidize the accumulation of inventories or excess producing capacity. It is possible, however, that the small magnitude of the problem has resulted in its being handled by a tariffs, incurring slight misallocation costs in return for not having to set up a special subsidy for investors in sugar inventories or excess production capacity.

D. Application to Industries Suffering from Effective Price Controls on Private Transactions without Rationing.

Regulated industries, largely the public utility and the transporation industries in the U.S., have the qualities of their products in private

transactions governmentally controlled during peacetime. It is therefore not plausible to assume that tie-in sales, quality-deterioration, or other hidden changes will arise during wartime to circumvent the wartime price controls in these industries. During WWII, price control levels were relatively unfavorable to these industries. In fact, utilities and transportation were the only two of the eighteen major BLS groups of consumer good whose money prices fell, albeit slightly, from 1942 to 1945; yet relative quantities demanded for these goods clearly rose as their net outputs grew at rates far above the total private GNP growth rate during the period.[9/] For the largely competitive transportation industries, this pattern of price and output behavior is consistent with viewing the industry as a "cartel," an industry with a peacetime price of its final outputs set above marginal-cost levels, unrestricted investment, and prorationed production of the final outputs. Moreover, this latter view of the various sectors of the transport industry has recently received substantial empirical and theoretical support (Stigler, DeVany). The contribution of our theory is to suggest the social optimality of this cartel-type of behavior. Furthermore, the order of magnitude of the observed degree of "overcapacity" and the degree of abnormal wartime demand appear to be the same. According to Moore, the artificial overcapacity in the domestic U.S. surface transport industry is about 20% while the magnitude of the abnormal transport demand during the peak years of WWII was only slightly in excess of 30%.[10/]

[9/] Source: Historical Statistics of the United States from Colonial times to 1957, U.S. Bureau of Census. Page 125 for price data, page 140 for value added data, and page 143 for private GNP data.

[10/] 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%. Our data sources are the same as those identified in the previous footnote.

While the orders of magnitude are less clear, the existence of peacetime "overinvestment" by public utilities through the peculiar incentives facing private suppliers of these utilities is strongly suggested by existing theories of utility regulation, especially the theory of Averich and Johnson. Recent empirical support for the general hypothesis that regulation increases the capital intensity of the industry exists; especially robust are the results of Peterson. Perhaps the most direct evidence for the existence of excess capacity in the U.S. utility and transport industries since WWII is the persistence of non-peak-load pricing of utility and transportation services throughout the period.

E. Industries Facing Only Price Controls

We have assumed that unregulated industries which face only price controls during national emergencies suffer only to the extent that they must sell their products to the government at the controlled prices. Of course, they also suffer administrative costs of avoiding the price controls in sales to private customers. But neither kind of cost will make a normal processor suffer subtantially given that price controllers set prices so as to keep honest men earning at least normal profits. These industry administrative costs will thus fall to a large degree on firms which normally purchase relatively small amounts of goods from other firms and sell their products largely to other firms. Consequently, a peacetime subsidy is in order to the capital of such firms. Primary intermediate firms such as mining, forestry, and farming firms fall into this catagory, although the subsidy due to farming is particularly small because of the presence of direct, discriminatory farm subsidies during WWII. In any case, we find it optimal to subsidize, to some degree activities such as mineral, forestry, and agricultural development. We see this done in the U.S. through the special tax sheltered treatment given

these activities. Another possibly justifiable policy given this argument is the governmental accumulation, or subsidization of private accumulation, of reserves of agriculatural, mineral, or lumber products. While steel is not a primary commodity, the primary commodities which produce it are largely owned by integrated steel producers. Hence, the second national defense argument also applies to steel. As for sugar, we observe tariff protection rather than investment subsidy for steel producers. This can only be rationalized by some relatively shakey, second-best argument. Our quantitative analysis and data in this general area are so sketchy that we are unable to provide even rough estimate of the actual or optimal subsidies to the capital in firms which normally purchase very few of its inputs from other firms.

Perhaps the most important primary intermediate capital input is the human capital that produces skilled labor services. While civilian wage controls during WWII were ineffective except for sporadic areas accompanied by direct controls, the price controls on the products of skilled labor sold to the government and the controls on the products sold to civilian users, whether effective or harrassing, kept civilians wages from jumping. Furthermore, military conscription, part of our general system of price controls in which the government can always buy at the controlled price, was particularly injurious to skilled labor because the government's price for the skilled labor which it drafted was apparently well below the civilian price. The second national defense argument thus provides a rationale for the subsidization of investments in skilled labor. Such subsidies are observed in the form of general subsidies to higher education.[11/]

11/ An apparent difficulty is that these subsidies are observed to also apply to the development of skills in the fine arts and the humanities, skills which receive little wartime undervaluation. However, Marshall's externality argument for supporting higher education -- that we subsidize everyone's

F. Industries Facing Direct Allocation Controls

As mentioned in the text above (and in footnote) 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 was again to reduce the cost of primary resources so as to artificially lower the cost of the defensive war. It may appear that an additional peacetime subsidy is due 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. This is because it is likely that even without controls the free market, competitive price of consumer durables would have risen during the war to the point that few of these goods would have been rationally purchased anyways.

To the extent that primary individual producers, especially integrated steel producers, suffered because of the direct controls on the production of consumer durables, some additional subsidy is in order. But as the subsidy's magnitude is limited because of the high degree of intertemporal substitutability between peacetime and wartime consumer goods, and, as we have already rationalized subsidies of unestimated magnitude to such producers, there is little here to add to the above argument.

11/ (Cont'd) 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 it is necessary to combine the second national defense argument with Marshall's argument in order to rationalize observed subsidies. The apparently high internal rate of return to youth is the most likely rationale for subsidizing the expenditure on the investment **rather than the return to the investment. Since both the second national defense argument and the Marshall argument applies to science skills, a particularly high subsidy to science education is justified.**

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 return 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 wartime rationing and price controls. Hence, during wartime, these products have a greater social than private value. This argument applies to only a very special set of industries and rationalizes only particular kinds of subsidies. For domestic industries facing wartime rationing as well as price controls, the efficient subsidy is granted by treating a certain part of its primary capital expenditures as ordinary business expenses for tax purposes. Other forms of subsidy such as final output subsidies or protective tariffs are inefficient. The domestic products most significantly affected by World War II rationing were gasoline and meat. Correspondingly, significant tax write-offs of primary 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 rationing and price controls in waring countries, an efficient investment subsidy is provided by allowing the foreign countries to jointly raise the peacetime price of their outputs by accumulating a stockpile of their outputs or by forcing production prorationing 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 the peacetime capital output of, and entry into, these industries.

For regulated industries, where procedures for effective government control of the quality of traded goods are relatively highly developed, efficient peacetime incentive systems are those which induce more capacity than the companies would freely choose give their artifically 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 general order of magnitude as the optimal amount.

Finally, numerous producers of primary inputs are in line for investment subsidies under the second national defense argument. Perhaps most important are the producers of skilled labor inputs. We observe such subsidies in the

form of direct governmental support for higher education. Other important producers of this sort include integrated steel producers. While we do observe tariff protection for this industry, this form of investment subsidy is relatively inefficient under our assumption of competition, for this form of protection does not subsidize the peacetime development of excess capacity.

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