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Costly Trade Liberalizations: Durable Goods and Capital Mobility

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Abstract

We study the social costs of a temporary liberalization policy in the context of an economy with infinitely-lived individuals and no intertemporal consumption substitution. However, importable goods could be stored. Storability is the central source of distortions in this paper. Possible welfare costs of the induced inventory accumulation are shown to be significant. We also argue that temporariness is formally equivalent to "lack of credibility." Since international capital mobility is the vehicle that magnify the above-mentioned distortions, our results suggest that an optimal trade liberalization without full credibility could call for controls on international capital mobility.

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Summary

This paper investigates the costs of temporary trade liberalization policies. The motivation for this analysis is the observation that policies fall into the "temporary policy" category any time that their credibility is less than perfect. Since perfect credibility is more likely to be the exception than the rule, the case of temporary trade liberalization should be more relevant for actual policymaking than the free-trade-forever paradigm that has played such a central role in trade theory.

The paper presents simple examples in which a temporary trade liberalization policy reduces social welfare, because under these circumstances the private sector engages in an over-accumulation of inventories. From the private sector's point of view, inventory accumulation is profitable, because of the expected increase in future tariffs. From a social point of view, however, inventory accumulation is costly because--in the examples--the objective environment surrounding the economy as a whole is assumed to be constant. The paper experiments with a wide set of parameters, between which it finds empirically plausible cases in which the welfare costs of temporary trade liberalization match or exceed the benefits of free trade forever.

The paper also shows that temporary trade liberalization is formally similar to a situation in which the trade liberalization policy is not fully credible, even though the policymakers intend to cut tariffs permanently. The examples indicate that this lack of credibility could have substantial welfare costs. Furthermore, the paper suggests that policymakers should be cautious in opening up the economy to international capital flows during a process of trade liberalization that is not fully credible to the private sector since welfare costs are magnified by international capital mobility.

I. Introduction

The purpose of this paper is to present some further examples aimed at developing our intuition about the costs of a temporary trade liberalization policy, or, what amounts to very much the same thing, the costs of policies that are expected to be temporary. The motivation for this line of research is the observation that policies fall into the "temporary policy" category any time that their credibility is less than perfect. Since perfect credibility is likely to be more the exception than the rule, it follows that the case of temporary trade liberalization should be more relevant for actual policymaking than the free-trade-forever paradigm that has played such a central role in trade theory.

As elaborated in a previous study (Calvo (1987)), some of the costs of temporary policy are due to the intertemporal substitution in consumption that it generates. In contrast, the present paper will completely shut off those effects by assuming that there is no intertemporal substitution of that kind; instead, we will assume that consumption goods are durable and storable, thus opening the door for "supply-side" intertemporal substitution.

In our examples we assume the existence of a representative infinitely-lived individual; there are two goods: exportables and importables, and the economy is endowed with a fixed amount of each. Most of the paper assumes that consumption takes the form of importable goods, although extensions to fixed proportions are discussed. Moreover, the country is assumed to be "small" in both goods and capital markets; the latter are perfectly competitive. In order to highlight the role of durability we further assume that individuals always choose a constant consumption path, so, given wealth, consumption is not affected by changes in rates of interest.

Section 2 discusses the basic and simplest example where goods are perfectly durable and storable at no cost, and where trade liberalization is announced at time 0 ("initial time") and is expected to be instantaneously reversed. We call it the case of "instant liberalization". This policy is costly because it leads the private sector to accumulate inventories in anticipation of the future tariff. More interestingly, however, is that these costs (measured as the proportional loss of consumption in relation to free-trade) could be quite significant. The model is extended in Section 3 to consider finite-horizon liberalizations and imperfect durability, and to allow for the consumption of exportable goods. We show here that quantitative results are not significantly changed.

A common feature of the above examples is that they imply inventory levels that could perhaps be considered unrealistically high. This is so partly due to the assumption that the economy can accumulate indefinite amounts of inventories at a point in time at no extra cost. Section 4 deals with this issue by discussing the implications of quantitative constraints, and of storage costs. Examples are given to show that the presence of the

latter succeeds in lowering the inventories/GNP ratio to more realistic levels, but still the cost of the liberalization policy continues to be sizable. The reason for this is that although storage costs help in reducing the social opportunity costs associated with speculative inventory accumulation, such costs contribute significantly to the total cost of temporary policy.

In Section 5 the paper closes with some brief notes on temporariness, credibility and capital mobility.

II. The Basic Model: Instant Liberalization

We assume that the economy is populated by identical individuals, each of whom receives an exogenous path of "mana-type" income in terms of exportable goods. Utility, however, depends only on the consumption of importables (extensions are discussed in Section 3). For the sake of contrast with previous studies (Calvo (1987); also Section 5), we will assume that there is no intertemporal substitutability, and that, therefore, in the absence of uncertainty, as assumed in this paper, consumers choose a level of consumption which is constant over time.

Individuals are perfect competitors in goods and bond markets. For simplicity, we assume that the terms of trade are constant--and equal, by normalization, to unity--and that the rate of interest, r (i.e., the own-rate of interest of tradable goods in international markets), is a positive constant through time. Furthermore, we will assume that consumer goods can be stored with no direct cost to the consumer, and are perfectly durable. These assumptions will be relaxed in Sections 3 and 4.

The domestic relative price of importables, in terms of exportables, is denoted by p. The latter will differ from unity on account of tariffs (p - 1 = tariff rate). We assume the proceeds of the tariff are given back to the public in a lump-sum (equalitarian) manner.

The 'present' is time t = 0. The experiment examined in this section consists of setting the tariff equal to zero for t = 0, with the understanding, or the expectation, that it will be greater than zero (and constant) forever after. In other words, this is a case of an 'instant' trade liberalization. Hence, more formally, we assume

$$p_o = 1 \qquad (1a)$$

$$p_t = p \text{ (a constant greater than 1), for } t > 0 \qquad (2a)$$

Under the present circumstances, it is clear that if a utility-maximizing individual purchases inventories of importable goods at t = 0 (denoted by Z), he will plan to consume from his stock until it becomes depleted. Moreover, it is also clear that after t = 0 he would have no

incentive to accumulate stocks any further because the interest rate is positive and p is expected to be constant. 1/

Thus, without loss of generality, the relevant budget constraint for the representative consumer could be expressed as follows:

$$K + Y + G - Z - pc \int_{\tau}^{\infty} e^{-rt} dt = 0 \qquad (2)$$

where, in terms of exportables, K, Y and G denote the present values of the initial holdings of the international bond, claims on future endowments of the exportable good and (tariffs-related) government lump-sum transfers, respectively; furthermore, c stands for the constant level of consumption, and τ denotes the time at which the stock of importables, Z, is depleted. The integral in (2) runs from time τ because, as noted before, the individual is not going to import anything until his stock of importables reaches zero. Subsequently, he will import only what he requires for consumption.

Perfect durability implies that the inventory depletion time, τ, satisfies the following equation:

$$\tau c = Z \qquad (3)$$

Hence, by (2) and (3),

$$r(K + Y + G) - c(x + pe^{-x}) = 0 \qquad (4)$$

where,

$$x = r\tau \qquad (5)$$

We assume, of course, that the representative individual attempts to maximize his consumption level, c, subject to his budget constraint (4). This obviously leads him to choose x so as to minimize:

$$x + pe^{-x} \qquad (6)$$

which yields,

$$e^{x} = p \qquad (7)$$

Hence, by (5) and (7), the individually optimal value of τ is determined solely by r and p, and it is positive if and only if $p > 1$.

Now, given our assumption about the distribution of the tariff

proceeds, we have:

$$G = (p-1)\hat{c}\int_{\hat{\tau}}^{\infty} e^{-rt}dt \tag{8}$$

where "^" on a variable denotes the value of c and τ chosen by all the other individuals. But, since everybody is identical, we have from (4), (5), (7) and (8):

$$\hat{c} = \frac{r(K + Y)}{\log p + 1/p} \tag{9}$$

Clearly, a planner who maximizes welfare of the representative individual will choose c constant and equal to r(K + Y). Thus, it is natural to define the cost of the present policy, ϕ, as follows:

$$\phi = 1 - \frac{\hat{c}}{r(K + Y)} \tag{10}$$

Hence, by (9) and (10), we have

$$\phi = 1 - \frac{1}{\log p + 1/p} \tag{11}$$

An attractive feature of the present case is that the cost of the policy is just a function of p, it does not depend on the interest rate. 2/ Table 1 (first column) displays the value of ϕ for some relevant values of p. We see that the 1 percent cost mark, a relatively large number in this literature (see Harberger (1959)), is quickly reached when the import tariff is less than 27 percent. As indicated in Table 2 (last column), however, the value of τ is also very sensitive to p, implying perhaps implausible long periods before the stock of importables is totally depleted, and unrealistically high inventories/GNP ratios. This, in addition to sheer common sense, dictates that the model be extended to account for realistic features like imperfect durability.

Table 1. Costs(%) of Liberalization. Variable (rT)

Price, p	rT=0 1/	rT=0.04	rT=0.12	rT=0.2
1.03	0.04	0.04	0.04	0.04
1.27	2.57	2.47	2.29	2.12
1.60	8.68	8.36	7.71	7.21
2.20	19.55	18.92	17.73	16.59
2.89	28.94	28.12	26.53	25.00
3.40	34.12	33.23	31.48	29.78
4.00	38.88	37.94	36.08	34.25

1/ Corresponds to ϕ (Section 2).

Table 2. Inventories Depletion Time, τ--Number of Years

Price, p	ρ=0.1	ρ=0.5	ρ=1.5	ρ=2.5	$\rho=\infty$ 1/
1.03	0.07	0.24	0.44	0.53	0.73
	(0.07)	(0.23)	(0.44)	(0.56)	(0.74)
1.27	0.50	1.99	3.58	4.27	5.97
	(0.60)	(2.14)	(3.70)	(4.33)	(5.82)
1.60	1.07	3.92	7.05	8.39	11.75
	(1.32)	(4.23)	(7.27)	(8.37)	(10.73)
2.20	1.79	6.57	11.80	14.08	19.55
	(2.53)	(7.75)	(11.79)	(13.15)	(15.86)
2.89	2.41	8.84	15.92	18.95	28.94
	(3.79)	(10.57)	(15.00)	(16.35)	(18.53)
3.40	2.78	10.20	18.36	21.85	34.12
	(4.65)	(12.17)	(16.59)	(17.87)	(20.16)
4.00	3.15	11.55	20.79	24.75	39.89
	(5.57)	(13.67)	(17.96)	(19.15)	(21.18)

Note: we assume r = 0.04 per year.

1/ Corresponds to perfect durability, i.e., $\delta = 0$.

Numbers in parentheses indicate the ratio of inventories, Z, to annual GNP at time 0, r(K+Y).

III. Imperfect Durability, Finite Liberalization, and Consumption of Exportable Goods

An easy extension of the above results is to assume that the liberalization lasts for $T > 0$ periods. It is quite intuitive that individuals will wait until time $t = T$ before storing importable goods. At that point they will solve exactly the same problem that we discussed in the previous section, but the inefficient accumulation of inventories happens at a later time, so one would expect the cost to be lower than before. In fact, if we define the cost of this policy as above, and we indicate it by ϕ_T, one can show that:

$$\phi_T = 1 - \frac{1}{e^{-rT}/(1 - \phi) + 1 - e^{-rT}} \tag{12}$$

Clearly, ϕ_T is a function of the product (rT). Table 1 shows some relevant numbers. 3/ To confirm our intuition, the picture that emerges shows that costs are smaller than if $T = 0$; 4/ but, most importantly, their quantitative significance is not shown to be substantially diminished.

A slightly less obvious extension would be to allow for imperfect durability. Consider, for example, the case where durable goods depreciate at the constant rate $\delta \geq 0$. Clearly, equation (3) becomes:

$$\frac{c}{\delta}(e^{\delta\tau} - 1) = Z \tag{3'}$$

and, hence, (4) becomes:

$$r(K + Y + G) - c[r(e^{\delta\tau} - 1) + pe^{-r\tau}] = 0. \tag{4'}$$

Thus, consumption maximization is equivalent to minimizing the squared-bracketed expression in (4') with respect to τ, which yields:

$$\tau = \frac{\log p}{\delta + r} \tag{13}$$

An implication of the above is that

$$-\frac{\partial\tau}{\partial\delta} / \tau = (\delta + r)^{-1}. \tag{14}$$

Consequently, evaluating the above expression at $\delta = 0$ (the case of perfect durability), and assuming $r = 0.04$ per annum, it follows that a one percent per annum increase in the rate of depreciation results in a 25 percent

shortening in the depletion time of inventories, τ. This shows in the simulations exhibited in Table 2 why there is such a sharp decrease in the depletion time as δ is increased above zero--the case of perfect durability.

Denoting by ϕ^{δ} the cost of an instantaneous liberalization policy (i.e., (1)) when the rate of depreciation is $\delta > 0$, recalling (8), (4') and (13), we get: 5/

$$\phi^{\delta} = 1 - \frac{1}{p^{1/(1+\rho)}(\rho + 1) - \rho - (p - 1)/p^{1/(1+1/\rho)}} \qquad (15)$$

where

$$\rho = r/\delta. \qquad (16)$$

Thus, contrary to the results of Section II, costs are a function of the ratio of the rate of interest to the rate of depreciation.

Notice that, given r, there is no a priori reason to expect the cost to be a monotonic function of durability. When goods are instantly perishable ($\delta \to \infty$), costs would be zero because there will be no inventory accumulation; but if stocks of durable goods reproduce themselves at the rate r (i.e., $\delta = -r$), then, once again, costs would be nil because the economy as a whole would be indifferent between holding a foreign bond and carrying inventories of importable goods. Since in-between cases exhibit positive costs, it follows that it would not be possible to say in general whether more durability would increase or decrease the costs of a trade liberalization policy like equation (1).

Table 3. Costs(%) of Liberalization--Variable Durability

Price, p	ρ=0.1	ρ=0.5	ρ=1.5	ρ=2.5	$\rho=\infty$ 1/
1.03	0.00	0.01	0.03	0.03	0.04
1.27	0.27	0.97	1.66	1.94	2.57
1.60	1.13	3.75	6.06	6.90	8.68
2.20	3.40	10.29	15.20	16.73	19.55
2.89	6.58	17.80	24.37	26.15	28.94
3.40	9.00	22.81	29.92	31.68	34.12
4.00	11.83	28.05	33.56	36.97	38.89

1/ Corresponds to perfect durability, i.e., $\delta = 0$.

In Table 2 we notice a sharp fall in the depletion time, τ, and in the inventories/GNP ratio with respect to the perfect-durability case, making the results somewhat more realistic. In Table 3 we notice that even when we experiment with a wide variety of depreciation rates (if the annual r = 0.04, our simulations cover the cases of δ = 0.4, 0.08, 0.027, 0.016 and 0 per annum), the 1 percent cost mark continues to be reached in most cases when the tariff is less than 30 percent. Furthermore, costs of more than 10 percent are still quite possible except for the rather extreme case in column corresponding to ρ = 0.01 in Table 2; for this computation we keep assuming r = 0.04 per annum).

Finally, we will relax the assumption that only importable goods are consumed domestically. A simple way to do this is to assume that individuals consume both goods in fixed proportions. / Thus, if the ratio of the duals consume both goods in fixed proportions. 6/ Thus, if the ratio of the consumption of exportables to the consumption of importables is α, the budget constraint (2) becomes

$$K + Y + G - Z - c(pe^{-r\tau} + \alpha)/r = 0 \qquad (2')$$

Hence, if in this case we denote the costs under perfect durability by $\phi(\alpha)$, one can show, on the basis of Equations (3), (4) and (2'):

$$\phi(\alpha) = 1 - \frac{1 + \alpha}{\log p + 1/p + \alpha} \qquad (17)$$

which, as expected, boils down to ϕ in Equation (11) when α = 0. Clearly, costs are a decreasing function of α. However, as shown in Table 4, costs continue to be sizably large, even when individuals are assumed to consume equal values of importables and exportables goods.

Table 4. Costs(%) of Liberalization; α = 1

Price, p	$\phi(1)$	Z/r(K+Y)
1.03	0.02	0.74
1.27	1.30	5.89
1.60	4.53	11.21
2.20	10.83	17.58
2.89	16.91	22.04
3.40	20.57	24.30
4.00	24.14	26.30

Note: The last column assumes r = 0.04.

IV. Quantity Constraints and Direct Costs

Our numerical examples are not yet fully persuasive because they tend to imply levels of inventories which are several times the annual GNP. Without this enormous accumulation of inventories costs would probably not exceed the usual 1 percent or 2 percent levels.

The equilibrium level of inventories may change substantially if the accumulation of inventories is quantity-constrained. The latter could be due to the existence of physical constraints, like maximum port capacity, or to the existence of import quotas. The first type of constraint is likely to play some role under extreme circumstances, but it would probably be hard to argue that, as a general rule, physical constraints will be the dominant force in limiting the size of inventories of international goods. 7/ The second possibility, quotas, is just one of the policies that could be employed to reduce the costs of the lack of a stable tariff policy and therefore does not affect the relevance of our previous results. 8/

Another important factor that may have a sizable effect on the level of inventories and social welfare is the existence of direct costs of holding inventories, for example, warehousing costs. Consider a case in which the cost of accumulating a stock of inventories Z is βZ, where $\beta \geq 0$. The budget constraint for the representative individual becomes:

$$r(K + Y + G) - rZ\ (1+\beta) - cpe^{-r\tau} = 0 \qquad (4'')$$

For the sake of brevity we will examine an instant liberalization policy like (1) when goods are perfectly durable. Recalling equations (3) and (8), and the procedure followed in Section 2, we get the following expression for the cost of policy (1)--defined in the same manner as in Section 1:

$$1 - \frac{1}{(1+\beta)[\log p + 1/p - \log (1+\beta)]} \qquad (18)$$

On the other hand, the inventories depletion time, τ, satisfies:

$$\tau = \frac{\log p - \log (1+\beta)}{r} \qquad (19)$$

Table 5 shows some experiments in which β was chosen high enough so that the inventories/GNP ratio is approximately equal to unity--a substantial reduction with respect to the corresponding numbers in Table 2. We note, first, that the required β is very large relative to the tariff-related gross revenue per unit of inventories (= p - 1). Secondly, despite these enormous disincentives the welfare cost hovers very near the 1 per-

cent mark for a 27 percent tariff, and quickly rises above it. Finally, note that the depletion time of inventories, τ, is always less than five quarters.

The main lesson from these experiments is that although direct costs of holding inventories may induce a drastic reduction in their size, and therefore result in a sharp decrease in the total opportunity cost of the funds devoted to acquire them--in previous sections the only source of costs--total costs, inclusive of direct costs, may still be quite sizable.

Table 5. Costs of Instant Liberalization when $Z/r(K+Y)\simeq 1$

Price, p	β	Cost(%)	τ
1.27	0.22	0.95	1.00
1.60	0.53	2.41	1.12
2.20	1.11	4.51	1.04
2.89	1.77	7.06	1.06
3.40	2.25	9.30	1.12
4.00	2.82	11.57	1.15

Note: τ is number of years, and r = 0.04 per year.

V. Reinterpreting the Results: Credibility

The above framework is general enough to give us some insights into the costs of credibility. In normal parlance we use expressions like "incomplete credibility" of policy to denote situations in which the public believes that there is a positive probability that policy announcements will not be carried out. Consequently, a not-fully-credible policy is one that elicits the expectation that it is going to be modified in the future. With this interpretation in mind, therefore, the examples in previous sections would correspond to situations in which the free-trade policy is not credible, and the public expects that it will replaced by a constant-tariff policy after time T.

Obviously, the behavior of the economy during the transition (from 0 to T) will be the same as examples in this study. Furthermore, the actual cost of the noncredible liberalization policy would also be the same if: (a) inventories cannot be resold in international markets; and (b) a constant permanent tariff policy was expected after time T. Under these circumstances, let us consider the interesting case in which policy makers announce a free-trade-forever policy beginning at time zero, but, before time T, the public does not believe in its continuation after time T (the

next elections, say), when they expect (with probability 1) that a constant and permanent tariff will be imposed. Furthermore, assume that if they see free trade after time T, their disbelief will vanish altogether, and full credibility in the free-trade-forever policy will be ensured. Clearly, therefore, a free-trade-forever policy will be associated with exactly the same paths and the same welfare costs as in our examples. This illustrates the central point of the paper, namely, that a trade liberalization policy which is not fully credible may be costly, and its costs may not be negligible, particularly when they are compared with the usual estimates for the gains from trade. 9/

In closing, I would like to stress an obvious, and very important, point. In our model the credibility or temporariness distortions were shown to be harmful because we assumed the existence of perfect capital mobility. In the context of our models, if there were no international capital mobility, the accumulation of inventories simply could not occur, and hence the social costs would be nonexistent. This, therefore, suggests that the costs of imperfect credibility may be significantly smaller in a "debt crisis" environment--where borrowers are heavily rationed--than in the relatively permissive "petro-dollar recycling" period of the 1970s. 10/

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Footnotes

1/ This, incidentally, shows that if p was expected to be always constant (i.e., including t = 0), then there would be no incentive for storing importable goods.

2/ Notice that our calculations would also apply to an economy that produces the importable good, and such that the output of exportables and importables is not affected by the tariff.

3/ Notice that if r = 0.04 per year, Table 1 covers the cases of T = 0, 1, 3, and 5 years.

4/ This would not necessarily be so, however, if there was some intertemporal substitutability (Calvo (1987)).

5/ Costs are measured as in equation (10), with $\hat{c}$ standing now for the equilibrium consumption level when inventories depreciate at the rate δ.

6/ Given the purpose of this paper, this assumption is much less restrictive than it sounds, because in allowing for substitutability between importables and exportables we would imply the existence of gains from trade from which the present paper is trying to abstract.

7/ A more plausible constraint would be international credit market rationing. This aspect will not be examined here, however, because our focus is on the harmful effects of capital mobility when combined with the existence of storable goods, and, of course, rationing represents a constraint on capital mobility.

8/ In this respect, it is worth noting that in any application of the "quotas solution," the cost-reducing effect of a quota would have to be weighed against the rent-seeking costs that it may generate (Krueger (1974)).

9/ To avoid any confusion, I would like to point out that in the context of our model, a noncredible tariff--a tariff that is expected to be phased out in the future--would have no welfare effects because there would be no incentive to accumulate inventories of importable goods. However, this asymmetry disappears immediately once we allow for inventories of exportable goods. Consequently, the central problem is the lack of credibility of policy announcements, rather than the noncredibility of liberalization policies.

10/ The role of capital mobility in the staging of economic liberalization policies has been recently discussed by Edwards and van Wijnbergen (1986).