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Discretionary Trade Policy and Excessive Protection

By Robert W. Staiger and Guido Tabellini*

This paper proposes a positive theory of tariff formation, based on the idea that the optimal trade policy may be time inconsistent. A benevolent government with redistributive goals may have an incentive to provide unexpected protection, since the redistributive effects of trade policy are larger if the policy is unanticipated. The suboptimal but time-consistent policy involves an excessive amount of protection. Furthermore, in a time-consistent equilibrium tariffs may dominate production subsidies. Thus, the requirement of time consistency can lead to a reversal of the traditional normative ordering of tariffs and subsidies as instruments of trade policy.

Two central conclusions of the pure theory of international trade are that a policy of free trade is optimal for a small country and that, if a protective policy is nonetheless adopted, a production or consumption subsidy would be preferable to a tariff or other trade-distorting policy. Equally central to the empirical record is the observation that active protectionist programs are widely pursued by countries with little or no apparent world market power, and that tariffs or other trade-distorting policies form the heart of such programs. Given the normative implications of the pure theory, an intriguing question raised by these empirical observations is why governments choose to do what they do.

In this regard, one line of research has brought into question the empirical relevance of the assumptions underlying the normative case for free trade, attacking both the small country and the perfect market assumptions as empirically unreasonable, especially for many developing countries. However, as Anne Krueger (1984) concludes in her review of this literature,

By and large, theory and empirical evidence have combined to reassert the proposition that trade intervention is seldom optimal, even in the presence of market imperfections. It might even worsen the situation as contrasted with laissez-faire, especially if the intervention is too highly protectionist.

[Krueger, p. 566]

A second line of research has focused on the political economy of protection, describing the pattern of protection either as a result of the government’s politically motivated concern over the distribution of income across voters and powerful special interests, or as a means of achieving some exogonously postulated social objective (see Robert Baldwin, 1984a, and Wolfgang Mayer, 1984). In either case, a pattern of protection emerges which is at variance with the free trade implications of pure trade theory. Consequently, the political economy approach gives rise to a positive theory of protection that is at least potentially consistent with empirical observation. Moreover, once levels of protection are modeled as the outcome of a political process, tariffs can become socially preferable to production subsidies, provided there are sufficient differences in lobbying effectiveness under the two regimes (see Dani Rodrik, 1986).

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This paper suggests an additional determinant of patterns of protection, based on the idea that the optimal trade policy is time inconsistent, and hence may lack credibility with the owners of domestic factors of production. In the model we explore, it is the government's inability to precommit to an optimal policy of free trade that forces it to adopt a policy of protection, and which could lead it to prefer the use of tariffs over production subsidies.¹

We consider a model of a small open economy in which tariffs are used by the government to redistribute income from individuals with a low marginal utility of income to those with a high marginal utility of income, subsequent to the realization of an adverse terms of trade shock. Jonathan Eaton and Gene Grossman (1985) explore the use of tariffs in response to terms-of-trade shocks in a model in which labor is perfectly mobile ex ante and ex post, but where capital is only mobile ex ante, that is, before the shock is observed. Ex post capital is completely immobile. In such a model they show that a protective policy can be optimal ex ante, in the sense that it can achieve some beneficial risk sharing between risk averse individuals. They also note that this policy is time inconsistent in the following respect. The expected tariff policy influences the sectoral allocation of capital before the shock is observed. Hence, the government may have an incentive to announce a policy different from the one that it would implement ex post, in an effort to affect the pre-shock allocation of resources. Eaton and Grossman provide some numerical simulations, indicating that the difference between the optimal and time-consistent policy is negligible.

In this paper we consider the behavior of the government and of the private sector ex post, after the shock is observed. Hence, the time inconsistency analyzed by Eaton and Grossman does not arise. We show however that if the post-shock sectoral reallocation of labor is costly, the implementation of a protective policy of risk sharing can suffer from a second (and potentially more important) time inconsistency. In the model considered below, a benevolent government has an incentive to surprise the private sector after the shock is observed by providing more protection than expected. The incentive to surprise is due to the fact that, if the protective policy is anticipated, it tends to reduce the amount by which labor reallocates away from the injured sector; as a result, production is less efficient and the redistributive impact of the tariff is diminished. Surprise protection is therefore a more effective and less costly means of redistributing income. However, the government will not be able to systematically surprise the private sector with more protection than expected. If commitments to an optimal but time-inconsistent policy are not credible, a time-consistent equilibrium will obtain in which the post-shock relocation of labor across sectors incorporates the expectation of trade restrictions, irrespective of the government announcements; and the government fulfills those expectations with a socially excessive level of protection.

In order to focus exclusively on time inconsistency as a cause of trade restrictions, we consider a situation in which free trade is the optimal (but time inconsistent) policy, and the government's inability to commit leads to a time-consistent policy of protection. With respect to a positive theory of tariff formation, the notion of time inconsistency suggests that governments with some degree of discretion in trade policy may find commitments difficult to make, and may often be forced to choose inferior, overprotective but time-consistent policies. This comes about not as a result of lobbying pressures or other political concerns asso-

¹The main reference for the issue of time consistency of optimal economic policy is the seminal paper by Finn Kydland and Edward Prescott (1977). Kevin Roberts (1984) addresses some of the methodological points that arise in this paper. The notion of time inconsistency has also been applied to trade policy in Maskin and Newbery (1986). They have shown that, for a large importing country, the optimal tariff on an exhaustible resource is generally time inconsistent; the time-consistent tariff in their model can either exceed or fall short of the optimal. See also Arye Hillman, Elia Kim Katz, and Jacob Rosenberg (1987).
associated with the political economy literature. Rather, it is a consequence of the government's inability to precommit to trade policies that, \textit{ex post}, it would not find optimal to pursue.

Moreover, the policy requirement of time consistency can lead to a reversal of the traditional normative ordering of tariffs and subsidies as instruments of trade policy: under certain conditions on the parameter values of the model, we show that a time-consistent tariff policy is preferred to a time-consistent production subsidy. This result can contribute to an explanation of the empirical puzzle that was noted above: that is, why protection might take the form of trade distortions rather than of production or consumption subsidies.

Finally, these theoretical results contain a clear normative implication for improving on the time-consistent but suboptimal equilibrium: the government should be enabled to undertake binding commitments concerning its future behavior. From an operational point of view, this is suggestive of the important role that could be performed by an international organization like the GATT: namely, to enforce the domestic commitments to a policy of free trade. The GATT was originally conceived to facilitate international cooperation among individual countries; the results of the paper suggest that this institution can—and presumably to some extent already does—perform an equally crucial role in enforcing the cooperative outcome in a setting in which the strategic interaction is between each country and its own domestic residents.

The remainder of the paper proceeds as follows. Section I presents the model within which our analysis will be carried out. Section II considers the role of expected protection in determining the relocation of labor across sectors. The optimal tariff policy under the assumption that the government can undertake a binding commitment is derived in Section III. The time-consistent policy is derived in Section IV, and the results are compared with those of the previous section. Section V explores conditions under which a time-consistent tariff policy would be preferred to a time-consistent production subsidy. A concluding discussion appears in Section VI.

I. The Model

We consider a small open economy with two traded goods and two inputs to production, labor and capital. Capital is immobile across sectors, and technology is homogeneous of degree one in both inputs. To simplify notation, we assume that both sectors share the same production function, and that each sector is endowed with one unit of capital. The production technologies are given by

\[
\begin{align*}
    i &= f(N^i), \quad i = x, y, \\
    f'(\cdot) > 0, \quad f''(\cdot) < 0,
\end{align*}
\]

where \( N^i \equiv \) labor employed in sector \( i \); \( x \equiv \) exported good; and \( y \equiv \) imported good.

In each sector, firms combine labor with their fixed stock of capital, up to the point where the value of labor's marginal product is equated to the nominal wage measured in terms of any numeraire, \( W^i \):

\[
\begin{align*}
    (1) \quad p^x f'(N^x) &= W^x, \\
    p^y (1 + t) f'(N^y) &= W^y,
\end{align*}
\]

where \( p^x \) is the world price of the exported good, \( t \) is the \textit{ad valorem} tariff on imports, and \( p^y \) is the world price of imports. Wages are assumed to be perfectly flexible so that (2) yields the nominal wage that clears the labor market in each sector.

Throughout the paper, we will consider the reaction of private agents and of the government to a terms-of-trade shock that lowers the world price of good \( y \) by an amount \( \epsilon \). The case of a negative shock to the price of exports is symmetric, except that the government would choose an export subsidy rather than a tariff. Prior to the realization of \( \epsilon \): (i) labor is assumed to be allocated equally between the two sectors, with the initial sectoral employment normalized to unity; (ii) goods units are chosen so that the world prices of \( x \) and of \( y \) are equal, and their common prices normalized to unity; and (iii) free trade is assumed to prevail in the domestic country. Given this,
equation (2) implies that, prior to the terms-of-trade shock, nominal wages are equal in the two sectors: $W^x = W^y$.

The aggregate supply of labor in the economy as a whole is assumed fixed. Labor is mobile between sectors, and reallocates in response to the terms-of-trade shock on the basis of the expected intersectoral wage differential, $W^{ye}/W^{xe}$. A central feature of the model is that, in the absence of binding commitments, the government cannot irrevocably set tariff policy before the labor reallocation decision is made. In other words, the timing of the decisions after the shock is observed is that, either: (a) first workers reallocate and then a tariff is imposed; or (b) the labor reallocation and the tariff decisions are made simultaneously. Since the private sector is atomistic and takes the government tariff as given, there is no relevant distinction between (a) and (b): both are valid interpretations of the equilibrium presented below. Under either of these timing assumptions, and using (2), the expected wage differential subsequent to the shock is given by

$$
\frac{W^{ye}}{W^{xe}} = \frac{(1 - \varepsilon)(1 + t^e)f'(N^y(t^e))}{f'(N^x(t^e))}.
$$

Equation (3) makes clear that the expected wage differential depends on the expected tariff, $t^e$, since the actual tariff is observed only once the reallocation is completed. The relationship between $W^{ye}/W^{xe}$ and $t^e$ will be analyzed more thoroughly in the next section.

A crucial assumption of the model is that labor's intersectoral mobility comes only at a cost. Specifically, we assume that, whenever one unit of labor moves from one sector to the other, its marginal product falls by the fraction $(1 - \lambda)$, $1 > \lambda > 0$. This hypothesis can be motivated, for instance, by the notion that each worker has to acquire some sector-specific human capital, through experience or through training, before it can become as productive as workers already employed in that sector. Thus one can interpret $(1 - \lambda)$ as the fraction of labor time that a worker relocating from one sector to the other has to spend in acquiring new productive skills. Since we consider a one-period model, the issue of how the marginal product of the newly hired workers evolves over time does not arise. Section VI briefly discusses how to extend this approach to an explicit intertemporal framework.

From this assumption it follows that in equilibrium the expected wage differential between the two sectors of the economy is constrained by the following inequalities,

$$
\frac{1}{\lambda} \geq \frac{W^{ye}}{W^{xe}} \geq \lambda.
$$

If either inequality is violated, workers would find it optimal to move from one sector to the other, until condition (4) is satisfied. We abstract throughout the paper from corner solutions in which the entire labor force locates in a single sector.

The subsequent analysis will be simplified by expressing labor in efficiency units. Thus, letting $\alpha$ denote the fraction of labor that remains in sector $y$ after all reallocation has taken place, the effective quantity of labor employed in each sector when the adjustment to the shock is completed is given by

$$
N^y = \alpha, \quad N^x = (1 - \alpha)\lambda + 1.
$$

The first equation in (5) follows from having normalized to unity the quantity of labor initially in each sector. The second equation incorporates the notion that $N^x$ is expressed

---

\(^2\) See Gary Becker, 1962, and Baldwin, 1984b, for a more detailed motivation of this assumption. Baldwin, 1982, contains a discussion of the incomplete nature of adjustment assistance programs in eliminating the private costs of intersectoral labor movements. Michael Mussa, 1982, and Joshua Aizenman and Jacob Frenkel, 1986, model imperfectly mobile labor in a more general way, allowing for a continuum of $\lambda$'s that reflect individual-specific moving costs. Modeling imperfectly mobile labor in this way would alter the characterization of the optimal policy in our model, but would leave unaffected our basic result that the opportunity for discretion in trade policy leads to excessive protection. Finally, the formal analysis would be different, but the qualitative results would remain unchanged, if the mobility costs were modeled as subjective disutility costs rather than output losses, or as payments made to a third sector responsible for moving workers between sectors.
in efficiency units, and that labor which has relocated to sector $x$ from $y$ has a marginal product equal only to a fraction $\lambda$ of the marginal product of labor already employed in $x$. The fraction $\alpha$ of labor that remains in sector $y$ is determined endogenously in response to the expected wage differential. The determination of $\alpha$ is the focus of the next section.

Define $I$ as national disposable income valued at domestic prices. Imposing the condition of balanced trade at world prices, abstracting from domestic taxes, and assuming that the tariff is nonprohibitive, it follows that, subsequent to the shock

$$ (6) \quad I = f(N^x) + (1 - \epsilon)(1 + t)f(N^y) + T, $$

where the tariff revenue $T$ is defined by

$$ (7) \quad T = t(C^y - f(N^y))(1 - \epsilon), $$

$C^y$ being aggregate demand for the imported good $y$. Substituting (7) into (6), national income valued at domestic prices is given by

$$ (8) \quad I = f(N^x) + (1 - \epsilon)f(N^y) + t(1 - \epsilon)C^y. $$

In order to focus on the redistributive consequences of tariffs for the labor allocation decision, we assume that the distribution of income is determined solely on the basis of the wage differential between the two sectors. Thus, income from capital and tariff revenues is distributed to each worker in proportion to the share of his labor income in the economywide wage bill.\(^3\) Define the income share variable, $\phi$, as

$$ (9) \quad \phi^i = \frac{I^i}{W^i} = \frac{W^i}{W^x + \alpha W^y + (1 - \alpha)W^{yx}}, $$

$i = x, y, yx,$

where $I^i$ is total disposable income of a worker of the $i$th type (valued at domestic prices), and the superscripts $x, y,$ and $yx$ denote workers originally in sector $x$ who remain there, workers originally in sector $y$ who remain there, and workers originally in sector $y$ who move to sector $x$, respectively.

Each worker consumes a bundle of $x$ and $y$, chosen so as to maximize an identical homothetic utility function, subject to a standard budget constraint. The indirect utility function of a representative consumer of the $i$th type is assumed to exhibit diminishing marginal utility of income, and can be written in terms of the previous notation as

$$ (10) \quad V^i = V(p^x, p^y, I^i), \quad i = x, y, yx. $$

Letting $V^i_p$ and $V^i_I$ denote the partial derivatives of (10) with respect to $p^y$ and $I^i$, respectively, the consumption of $y$ on the part of consumers of the $i$th type can be expressed, using Roy's identity, as

$$ (11) \quad C^y_i = -\frac{V^i_p}{V^i_I} = \phi^i C^y, \quad i = x, y, yx. $$

The second equality follows from the assumption that the common utility function is homothetic.

Finally, the government chooses a level of protection in response to the shock $\epsilon$, so as to maximize a welfare function defined over the indirect utility functions of the three types of workers,

$$ (12) \quad J = \alpha V^y + (1 - \alpha)V^{yx} + V^x. $$

Thus, the weights in the social welfare function given to the three types of workers are chosen to be proportional to the size of the group to which each type belongs. A property of the model will be that, in equi-
librium, \( V^y = V^{yx} \) (that is, workers must be indifferent between staying in \( y \) or moving to \( x \)). Hence, the coefficient \( \alpha \) in (12) affects the equilibrium value of \( J \) only indirectly, through its effect on the equilibrium trade policy, and not directly as a weighting factor. We mention the implications of more or less egalitarian weighting factors for the resulting trade policy in a later section.

We assume the absence of any market mechanisms for reallocating the risk associated with the terms-of-trade shock. If such private insurance markets existed and worked perfectly, there would be no role for government intervention in the form of protection in our model. Support for such an assumption is contained in Eaton and Grossman (1985).

II. The Reallocation of Labor Across Sectors

As discussed in the previous section, workers will respond to a fall in the world price of imports by reallocating across sectors in order to take advantage of any expected wage differential in excess of \( \lambda \). We assume that the world price of \( y \) falls by an amount \( \epsilon > 1 - \lambda \). This inequality assures that, if a zero tariff were expected by workers in sector \( y \) (that is, if \( t^x = 0 \)), some sectoral movement of labor from \( y \) to \( x \) would take place.\(^4\)

The movement of workers across sectors in response to \( \epsilon \) will assure that, in equilibrium, the expected wage differential subsequent to the shock will satisfy the inequalities in (4). Making use of equations (3) and (5), the expected wage differential can be rewritten as

\[
\frac{W^{ye}}{W^{xe}} = \frac{(1 + t^x)(1 - \epsilon)f'(\alpha)}{f'([1 - (1 - \alpha)\lambda + 1])}.
\]

The fraction \( \alpha \) of workers that remain in sector \( y \) after the shock is a function of \( t^x \), defined implicitly by (13) and (4). The properties of \( \alpha \) as a function of \( t^e \) are summarized in the following:

**Lemma:** (i) For \( 1/(1 - \epsilon) \geq 1 + t^e \geq \lambda / (1 - \epsilon) \), \( \alpha \) equals unity, and \( W^{ye}/W^{xe} \) is a continuous, differentiable, and strictly increasing function of \( t^e \), with \( 1 \geq W^{ye}/W^{xe} \geq \lambda \). (ii) For \( \lambda / (1 - \epsilon) > 1 + t^e \geq 1 \), \( W^{ye}/W^{xe} \) equals \( \lambda \), and \( \alpha \) is a continuous, differentiable, and strictly increasing function of \( t^e \), with \( 1 > \alpha > 0 \).

**Proof:**

For \( \alpha = 1 \), the expected wage differential \( W^{ye}/W^{xe} \) is determined by (13) as \( W^{ye}/W^{xe} = (1 + t^e)(1 - \epsilon) \). Therefore, if \( 1/(1 - \epsilon) \geq 1 + t^e \geq \lambda / (1 - \epsilon) \) and \( \alpha = 1 \), equilibrium condition (4) is satisfied; given the initial allocation of labor, \( W^{xe} \geq \lambda W^{xe} \). Consequently, when the condition in part (i) of the lemma is met, no worker finds it worthwhile to relocate from sector \( y \) to sector \( x \). Finally, with \( \alpha = 1 \), the rest of part (i) follows immediately from (13). Alternatively, if \( \lambda / (1 - \epsilon) > 1 + t^e \geq 1 \), then the second inequality in (4) will be violated if \( \alpha = 1 \); under the initial allocation of labor, \( W^{ye} < \lambda W^{xe} \). Consequently, when the condition in part (ii) of the lemma holds, the second inequality in (4) will be in equilibrium hold with equality for some \( 1 > \alpha > 0 \), and labor will move from sector \( y \) to sector \( x \) until \( W^{ye} = \lambda W^{xe} \). The rest of part (ii) then follows immediately by applying the implicit function theorem.

The lemma is illustrated in Figure 1. The horizontal axis measures the fraction \( \alpha \) of workers remaining in sector \( y \). The vertical axis measures the wage rate. Given the concavity of the production function, \( W^y \) is decreasing in \( \alpha \), and is represented for \( t = 0 \) by the downward sloping solid curve. Conversely, the wage that can be earned by moving to sector \( x \), \( \lambda W^x \), is given by the upward sloping curve. If protection is neither anticipated nor forthcoming, the equilibrium allocation is given by \( \alpha(t^x = 0) \), and corresponds to the point where the cost of reallocating is just equal to the wage differential, \( W^y = \lambda W^x \). The imposition of a tariff shifts the \( W^y \) curve to the right, say to the dotted

\[^4\]This can be seen by noting that, in the absence of any intersectoral labor movement, \( N^y = N^x = 1 \), and (3) implies \( W^{ye}/W^{xe} = (1 - \epsilon) < \lambda \), which violates the labor market equilibrium condition (4).
line of Figure 1. With the tariff fully anticipated, the equilibrium labor allocation is now given by point $B$ in the diagram, where fewer workers have reallocated from sector $y$ to $x$, that is, $\alpha(t^e = \bar{t}) = 0 > \alpha(t^e = 0)$. As shown, $\alpha$ is strictly increasing in $t^e$ for $1 > \alpha > 0$.

Note also that the wage differential is unchanged as a result of this anticipated tariff ($W^y = \lambda W^x$ at both $A$ and $B$). Only if the expected tariff is greater than $\lambda/(1 - \varepsilon)$, will the private sector fail to fully offset the impact of the tariff on the resulting wage differential, and hence on the income distribution. The effect of an unexpected tariff is shown by point $C$ in the diagram. Here the labor allocation is unaffected by the imposition of (surprise) protection, and the wage differential is reduced by the full amount of the tariff.

This feature of the model is depicted in Figure 2 where, using the lemma, the complete set of possible equilibrium combinations of wage differentials and fully anticipated tariffs is depicted by the locus $abc$. As reflected in the line segment $ab$, for anticipated tariffs satisfying $\lambda/(1 - \varepsilon) > 1 + t \geq 1$, the relative wage is left unaffected at $W^y/W^x = \lambda$. For $1/(1 - \varepsilon) \geq 1 + t \geq \lambda/(1 - \varepsilon)$, all workers remain in their pre-shock sectors ($\alpha = 1$), and (13) implies a linear relationship between $W^y/W^x$ and $1 + t$ with positive slope $(1 - \varepsilon)$, reflected in the line segment $bc$. At $1 + t = 1/(1 - \varepsilon)$, wages in the two sectors are equalized, and higher tariffs need not be considered.

Also shown in Figure 2 are combinations of $W^y/W^x$ and $1 + t$ that would be attainable if the tariff were $\text{un}$anticipated. Using (2) and (5), the relative wage in the two sectors can be written as a function of both the actual and the expected tariffs as

$$W^y/W^x = \frac{(1 - \varepsilon)(1 + t)f'(\alpha(t^e))}{f'((1 - \alpha(t^e))\lambda + 1)}.$$  

For any (fixed) expected tariff level $t^e$, the intersectoral allocation of labor is given ($\alpha$ is fixed), and (14) describes a line with positive slope which crosses the equilibrium locus $abc$ where the actual tariff equals the expected ($t^e = t$). Thus, for example, the dashed line labeled $t^e = 0$ represents combinations of $W^y/W^x$ and $1 + t$ attainable if workers expect the government to maintain free trade after the terms-of-trade shock. This line
crosses the locus \(ab\) at \(t = 0\) (where actual protection is equal to expected) and has a positive slope which can be derived from the right-hand side of (14) for \(t^e = 0\).\(^5\)

Figure 2 reiterates the point that, when workers expect tariff levels below the critical value of \(\lambda/(1 - \epsilon) - 1\), only unanticipated protection can alter the wage differential from its equilibrium value of \(\lambda\). This is the sense in which, along \(ab\), a government that wishes to redistribute income from low- to high-marginal utility-of-income workers has an incentive to provide unanticipated protection.\(^6\)

The equilibrium must lie on the \(abc\) locus of Figure 2, since any point not on this locus would involve some unexpected protection. Which point on the \(abc\) locus is chosen depends in part on the government’s ability to influence workers’ expectations. For example, the combination of \(W^y/W^x\) and \(1 + t\) represented by the point \(z\) in Figure 2 can only be an equilibrium if the government can impose the tariff \(t\) and at the same time induce the domestic labor force to expect this level of protection. Any incentive to provide surprise protection at a point such as \(z\) will tend to undermine the credibility of the policy announcement, and may preclude \(z\) from being a feasible equilibrium point available to the government. We will return to these issues in the next two sections.

III. The Optimal Tariff Policy

In this section we characterize the optimal tariff, under the assumption that the government can undertake a binding commit-

\(^5\)Since \(\alpha\) is increasing in \(t^e\) over the range \(\lambda/(1 - \epsilon) > 1 + t^e \geq 1\), it follows from (14) that the slope of the dashed lines in Figure 2 is decreasing in \(t^e\) over this range. For \(1 + t^e \geq \lambda/(1 - \epsilon)\), we have from the lemma that \(\alpha = 1\). In this case, the slope of the dashed lines simplifies to \((1 - \epsilon)\). Therefore, for \(1 + t^e \geq \lambda/(1 - \epsilon)\), the dashed line coincides with the portion \(bc\) of the equilibrium locus \(abc\).

\(^6\)If the expected tariff is greater than or equal to \(\lambda/(1 - \epsilon) - 1\), the pre-shock intersectoral allocation of labor will be maintained (\(\alpha = 1\)), and whether the actual tariff level is anticipated or not has no bearing on its effectiveness in redistributing income between workers in the two sectors. Thus, the incentive to surprise is not present along \(bc\).

\[
\frac{\partial J}{\partial t} = \frac{\partial \alpha}{\partial t} (V^y - V^{yx}) + (1 - \epsilon) \\
\times \left[ V^y_p + \alpha V^y_p + (1 - \alpha) V^{yx} \right] \\
+ V^y_p \left( \frac{\partial \phi^x}{\partial t} I + \phi^x \frac{\partial I}{\partial t} \right) \\
+ \alpha V^y_p \left( \frac{\partial \phi^y}{\partial t} I + \phi^y \frac{\partial I}{\partial t} \right) \\
+ (1 - \alpha) V^{yx} \left( \frac{\partial \phi^{yx}}{\partial t} I + \phi^{yx} \frac{\partial I}{\partial t} \right) = 0.
\]

In equilibrium (and hence with no unanticipated protection), any worker originally in sector \(y\) must be indifferent between staying or moving to sector \(x\). Consequently, \(V^y = V^{yx} \), \(V^y_p = V^{yx} \), and \(\phi^y = \phi^{yx} \). Making use of (11) to eliminate \(V^y_p, V^y, \) and \(V^{yx} \), equation (15) can be rewritten as

\[
\frac{\partial J}{\partial t} = I \left[ V^y_p \frac{\partial \phi^x}{\partial t} + \alpha V^y_p \frac{\partial \phi^y}{\partial t} \right] \\
+ (1 - \alpha) V^y_p \frac{\partial \phi^{yx}}{\partial t} \\
- [\phi^x V^y_p + \phi^y V^y_p] \left[ (1 - \epsilon) C^y - \frac{\partial I}{\partial t} \right] = 0.
\]

The first term on the right-hand side of (16) represents the marginal benefit of the tariff, in the form of income redistribution from high to low income workers. The second term represents the marginal cost of the tariff, net of tariff revenues, coming in the form of distortions in both consumption and production. At the optimum, the marginal cost
and benefit of the tariff must be equated. We can now characterize the optimum tariff policy as follows:

PROPOSITION 1: The optimal tariff policy is either free trade or the imposition of a sufficiently high tariff \( t \) that prevents any sectoral reallocation of labor from taking place.

PROOF:
To prove this proposition, we need only show that \( t = 0 \) is a solution to (16) and that (16) is violated for any \( t \) satisfying \( \lambda/(1-\epsilon) > 1 + t > 1 \), that is, for any positive tariff consistent with \( \alpha < 1 \). For \( \lambda/(1-\epsilon) > 1 + t \geq 1 \) and \( t^* = t \), the terms \( \partial \phi_x/\partial t|_{t^* = t} \), \( \partial \phi_y/\partial t|_{t^* = t} \), and \( \partial \phi_x/\partial t|_{t^* = t} \) are all zero, implying the absence of any marginal redistributive gains and a zero marginal benefit (the first term in (16)) from a tariff over this range. At the same time, (2), (5), and (8) imply that

\[
(17) \quad \frac{\partial I}{\partial t}|_{t^* = t} = - \left[ W^x \lambda - \frac{W^y}{1 + t} \right] \frac{\partial \alpha}{\partial t|_{t^* = t}} + (1-\epsilon) C^y + t(1-\epsilon) \frac{\partial C^y}{\partial t|_{t^* = t}}
\]

so that

\[
\frac{\partial I}{\partial t}|_{t^* = t} = (1-\epsilon) C^y \quad \text{for} \quad t = 0,
\]

and

\[
\frac{\partial I}{\partial t}|_{t^* = t} < (1-\epsilon) C^y \quad \text{for} \quad t > 0.
\]

The marginal cost of the tariff (the second term in (16)) is therefore zero at \( t = 0 \) but strictly positive for \( t > 0 \). As such, (16) is satisfied for \( t = 0 \) but violated for any \( t \) such that \( \lambda/(1-\epsilon) > 1 + t > 1 \).

Consequently, the optimal tariff policy when the government can make a binding commitment will be either one of free trade, or the choice of a tariff \( t \) no smaller than \( \lambda/(1-\epsilon) - 1 \). In the latter case, no workers will choose to relocate from sector \( y \) to \( x \).

Figure 2 depicts the choice of the optimal tariff policy when the government can precommit. Recall that \( abc \) represents the locus of possible equilibrium combinations of relative wage and fully anticipated tariff. Three government indifference curves, defined over the relative wage \( W^y/W^x \) and fully anticipated tariff \((1 + t)\), are labeled \( U_1 \), \( U_2 \), and \( U_3 \). The government’s bliss point is \((1,1)\), where wages are completely equalized and there are no trade distortions. For relative wages below unity, the government’s objective function is strictly increasing in \( W^y/W^x \). As noted above, the marginal cost of a small increment in the tariff is zero at \( t = 0 \) and strictly positive for \( t > 0 \). As such, the slope of any government indifference curve in \((W^y/W^x,1+t)\) space is zero at \( t = 0 \) and strictly positive for \( t > 0 \). Point \( a \) in Figure 2 represents the situation in which free trade is associated with the highest attainable indifference curve on the equilibrium abc locus, and hence is the optimal policy.

Of course, this is not the only possibility. In the case where the optimal policy is the imposition of a tariff that prevents any sectoral reallocation of labor from occurring, the equilibrium will be represented by a tangency point on the bc portion on the abc locus in Figure 2.\(^8\) As noted in the previous section, along bc there are no gains from providing surprise protection, and so the government has no incentive to act unexpectedly. As such, when the optimal policy is one which prevents any reallocation of labor from taking place, the issue of credibility that is the focus of this paper does not arise. Consequently, in the remaining sections we concentrate on the case in which free trade is the optimal policy. It is easily shown that, for any \( 0 < \epsilon < 1 \), free trade must be the optimal policy if the cost of relocating is not “too large,” that is, if \( \lambda \) is close enough to one.

\(^7\)The second-order conditions will be met at \( t = 0 \). For \( 1/(1-\epsilon) > 1 + t > 1 \), we assume that the second-order conditions hold. Relaxing this assumption would complicate but not alter the nature of our results.

\(^8\)If the optimal tariff is strictly positive, it is characterized by the following expression, provided that the second-order conditions are satisfied:

\[
i = \frac{I [\phi_f/\phi_f - 1]}{[1 + (1-\epsilon)(1+i)] [\phi_f/\phi_f + (1-\epsilon)(1+i)] \partial C^y/\partial t|_{t^* = t}}.
\]
IV. The Time Inconsistency of Free Trade

In this section we consider an alternative institutional setup, in which the government is unable to precommit to a specific course of action. The kind of discretion embodied, for example, in the escape clause (section 201 of the Trade Act of 1974) could make it impossible for a government to credibly commit to any trade policy which, \textit{ex post}, was not optimal to pursue. Here, the government cannot influence worker expectations by pre-announcing a tariff policy, since it has no credible mechanism with which to bind itself to the announced intention. Hence, the government must take the expected tariff \( t^e \) as given when it optimizes with respect to the actual tariff \( t \). Since \( \alpha \), the fraction of labor that remains in sector \( y \), depends on \( t^e \) but not on \( t \) (see the lemma in Section II), this is equivalent to saying that the government takes the allocation of labor, and hence the production side of the economy, as given when computing the optimal tariff. The solution to this problem provides the time-consistent equilibrium or, more precisely, the subgame perfect Nash equilibrium of a game between the government and the labor market.

Consider first the case in which the cost of relocating is not "too large," so that the optimal policy considered in the previous section is one of free trade. To determine the time-consistent tariff policy in this case, note that the first-order conditions of the government's problem are still given by equation (16) in Section III. However, the terms \( \partial t / \partial t \) and \( \partial \phi / \partial t \) that appear in (16) are now different, because of the requirement that \( t^e \) and thus \( \alpha \) be taken as given. Specifically, the effect of the tariff on national income with \( t^e \) fixed at \( t_0^e \) can be derived from (8) as

\[
\left. \frac{\partial I}{\partial t} \right|_{t^e = t_0^e} = (1 - \varepsilon) C^y,
\]

and is positive for any \( t = t_0^e > 0 \), since \( \partial I / \partial t \big|_{t^e = t_0^e} < (1 - \varepsilon) C^y \).

The effect of the tariff on the distribution of income, for a fixed \( t^e \), can be derived from (2) and (9). After some algebraic computations we obtain

\[
\frac{\partial \phi^x}{\partial t} \bigg|_{t^e = t_0^e} = \frac{-\alpha(t_0^e) \lambda}{(1 + \lambda)^2(1 + t)} < 0;
\]

\[
\frac{\partial \phi^{yx}}{\partial t} \bigg|_{t^e = t_0^e} = \lambda \frac{\partial \phi^x}{\partial t} \bigg|_{t^e = t_0^e} < 0;
\]

\[
\frac{\partial \phi^y}{\partial t} \bigg|_{t^e = t_0^e} = \lambda \frac{(1 + (1 - \alpha(t_0^e)) \lambda)}{(1 + \lambda)^2(1 + t)} > 0.
\]

Therefore, using (19), the marginal benefit of unexpected protection (the first term in (16)) at \( t = t_0^e = 0 \) is given by \( I[V^x_f - V^y_f \{\alpha(t_0^e) \lambda]/(1 + \lambda)^2 \} \), which is strictly positive: with \( t^e \) held at zero, the marginal benefit of an unexpectedly higher tariff exceeds its marginal cost. Hence, the government has an incentive to surprise the domestic labor force with a strictly positive level of protection. The time-consistent tariff is determined by the dual conditions that the tariff is fully expected and that the marginal gain from unexpected protection is equal to the marginal cost. Plugging (18) and (19) into (16), such a condition simplifies to the following expression, which characterizes the time-consistent tariff \( \hat{t} \) as

\[
\hat{t}(1 + \hat{t}) = \frac{\alpha \lambda I [V^x_f / V^y_f - 1]}{(1 + \lambda)(1 - \varepsilon)(V^x_f / V^y_f + \lambda) \partial C^y / \partial t \big|_{t^e = \hat{t}}} > 0.
\]

The right-hand side of (20) is strictly positive under the assumptions of the model. The left-hand side of (20) must therefore be strictly positive as well, which means that \( 0 < \hat{t} < \lambda/(1 - \varepsilon) - 1 \). Table 1 contains

\footnote{Negative values of \( \hat{t} \) satisfying (20) can be ruled out since the negative tariff would have to be large enough in absolute value to make \( (1 + \hat{t}) \), and thus the domestic}
Table 1 — Tariffs and Subsidies Compared

<table>
<thead>
<tr>
<th>$\lambda$</th>
<th>$i$</th>
<th>$\alpha(i)$</th>
<th>$J(i)$</th>
<th>$\hat{s}$</th>
<th>$J(\hat{s})$</th>
<th>$\alpha(\hat{s})$</th>
<th>$J(\hat{s})$</th>
</tr>
</thead>
<tbody>
<tr>
<td>.75</td>
<td>.3</td>
<td>.92</td>
<td>1.7561</td>
<td>1</td>
<td>1.7835</td>
<td>.78</td>
<td>1.7820</td>
</tr>
<tr>
<td>.9</td>
<td>.08</td>
<td>.74</td>
<td>1.815</td>
<td>1</td>
<td>1.7835</td>
<td>.70</td>
<td>1.818</td>
</tr>
</tbody>
</table>

*The computations are based on the following assumptions. The utility function is $U = \frac{1}{2} \ln x + \frac{1}{2} \ln y$. The production function is $x = \ln N^x$; $y = \ln N^y$. The labor force in each sector prior to the realization of the shock has been normalized to equal 10. Finally, the size of the shock to the world price of $y$ has been taken to be $e = .5$. The symbols in the table are defined as follows: $i = \text{optimal tariff}$; $\hat{i} = \text{time-consistent tariff}$; $\alpha = \text{fraction of the labor force remaining in sector } y, \text{ as a function of the tariff}$; $\hat{s} = \text{time-consistent subsidy}$; $J(\cdot) = \text{value taken in equilibrium by the social welfare function}$, as a function of the various policy instruments; $\lambda = \text{ratio between the marginal product of the labor that has just moved to sector } x \text{ from sector } y, \text{ and the marginal product of the labor originally in sector } x$ that remains there.

numerical values of $\hat{i}$ for some simple utility and production functions. These examples indicate that, for shocks to the world price of imports which are of sufficient magnitude, the time-consistent tariff is quite large, even though, for the same set of parameter values, the optimal policy is one of free trade.

Figure 3 illustrates the time-consistent solution. A family of government indifference curves defined over $W^y/W^x$ and $(1 + t)$ exists for each level of the expected tariff. Consider the indifference curve corresponding to $t^e = 0$ and passing through point $a$ on the equilibrium locus $abc$. Repeating the arguments of the previous section, and making use of (18) and (19), it can be shown that the government indifference curve is flat at $t = 0$ and upward sloping for $t > 0$ in a neighborhood of point $a$. However, with $t^e$ fixed at zero, the locus of feasible points is now given by the upward sloping dashed line labeled as $t^e = 0$: as noted, the government can increase the relative wage above $\lambda$ by imposing an unexpected positive tariff. Hence, the government has an incentive to surprise workers by moving to point $d$ in Figure 3, where a government indifference curve in the $t^e = 0$ family is tangent to the $t^e = 0$ locus.

Of course, since this level of protection is unexpected by the labor force, point $d$ is not an equilibrium. The time-consistent equilibrium will occur at a point such as $z$ on the $abc$ locus in Figure 3, where the tariff is fully expected ($t^e = \hat{t}$) and an indifference curve in the family of curves for $t^e = \hat{t}$ is tangent to the $t^e = \hat{t}$ locus. A policy such as $\hat{t}$ is credible since, given that workers expect this level of protection, the government has no incentive to provide a level of protection other than $\hat{t}$. Since $0 < \hat{t} < \lambda/(1 - \epsilon) - 1$, the time-consistent equilibrium must lie on the horizontal segment $ab$, where $W^y/W^x = \lambda$. Hence, when free trade is optimal, the time-consistent equilibrium will involve a strictly positive level of protection but the same income distribution that would prevail with free trade. As such, social welfare is higher if precommitment to a policy of free trade is possible.
It is also possible to show that the time-consistent tariff increases with the weight assigned by the government to the utility of the workers who remain in the injured sector. Thus, for instance, a more egalitarian government, which assigns a greater importance to the marginal redistributive gains of unexpected protection, will lower the welfare of domestic citizens, since the income distribution remains unaffected but the degree of distortionary protection is higher than with a government that is less motivated by redistributive objectives.\(^{10}\)

Finally, recall that if the optimal policy is not free trade but rather the imposition of a tariff greater than the critical value \(\frac{\lambda}{(1-\varepsilon)} - 1\), then it is represented by a point on the line segment \(bc\). Since there is no incentive to surprise along \(bc\), such a policy is time consistent. Thus, the ability to make commitments becomes relevant in this model when \(\hat{t} < \frac{\lambda}{(1-\varepsilon)} - 1\), that is, precisely when free trade is the optimal policy. We summarize these results in the following:

**PROPOSITION II:** When free trade is the optimal policy, it is not time consistent. The time-consistent policy involves a socially excessive level of protection.

V. Tariffs vs. Production Subsidies

In this section we show that, when a government is constrained to the use of time-consistent policies, a tariff may be preferred to a production subsidy. As such, if the government has some choice concerning the policy instrument over which the game with workers will be played, but is unable to commit to a time-inconsistent strategy for the particular instrument chosen, it may rationally choose to operate in a regime in which only tariffs, and not subsidies, can be used.\(^{11}\)

To demonstrate this result, we first show that the time-consistent subsidy is strictly higher than the time-consistent tariff. This occurs precisely because unexpected tariffs are, on the margin, more distortionary than unexpected subsidies and, as such, more costly to use. We then show that, if the social gains from a marginal redistribution of income are small enough, a time-consistent tariff policy will always be preferred to the imposition of a time-consistent subsidy.

As in the case of a tariff, an increase in the production subsidy imposes no distortionary costs on the production side of the economy as long as it is unexpected. But unlike a tariff, a production subsidy leaves consumption decisions completely undistorted as well. As such, given any expected subsidy level for which \(W^y < W^x\), the marginal cost of providing an unexpectedly higher subsidy is zero while the marginal redistributive benefit is strictly positive. This implies that the time-consistent subsidy, \(\hat{s}\), will be chosen at a level which equates \(W^y\) and \(W^x\), since only then will the marginal costs and benefits of the subsidy be equated. Substituting \(s\) for \(t\) in (2), and setting equal the wage rates in the two sectors, we obtain the time-consistent policy tool over another, even if commitments to the intensity with which the policy tool is used are infeasible. While not modeled explicitly in this paper, a prior stage to our one-stage game could be introduced in which institutions are created to carry out the policies of the second stage. Here the government might consider the creation of an institution capable of carrying out trade policies, thus committing itself to use only trade restricting policies in the second period. Alternatively, it might choose to create an institution to impose domestic subsidies and taxes. Finally, the government may choose not to create any institution, thus committing itself to no intervention whatsoever in the second period. Since the choice of institution must be made prior to the realization of the shock, the possibility of intervention as the optimal response to a future shock will reduce the desirability of precommitting to inaction by following the third option. The result of Section V can be interpreted as a rationale for why a government might wish to pursue the first option and precommit through the prior choice of policy institutions, to react to terms-of-trade shocks with tariffs rather than with domestic subsidies. In practice, international and U.S. trade law provide avenues for the relatively prompt imposition of trade restraints as compared to the imposition of purely domestic subsidies and taxes.

\(^{10}\)This result, that in a time-consistent equilibrium society may be better off by appointing a government that does not reflect its true preferences, is not unique to this model—see for instance Kenneth Rogoff (1985).

\(^{11}\)An important question concerns the mechanism by which a government could commit to the use of one
subsidy

\[ 1 + \hat{s} = \frac{1}{1 - \varepsilon}. \]

The time-consistent tariff, by contrast, will never be set at a level that is so high as to equalize wages in the two sectors. As discussed in the previous section, the marginal cost of an unexpected tariff is positive for \( t > 0 \). Hence, in the time-consistent equilibrium, the marginal benefit of providing an unexpectedly higher tariff must also be positive, which in turn implies that \( W^y < W^x \), and consequently that

\[ 1 + \hat{t} < \frac{1}{1 - \varepsilon} = 1 + \hat{s}. \]

Thus, the time-consistent subsidy is strictly higher than the time-consistent tariff. However, whether the government objective function achieves a higher value with a time-consistent subsidy or tariff depends on the parameters of the model. The subsidy brings about larger production distortions than the tariff, since in equilibrium it is set at a higher level. On the other hand, the tariff introduces consumption distortions that would be absent with the subsidy.

It can be shown for a given shock \( \varepsilon \) that, if the social benefits of income redistribution are small enough, so that the time-consistent tariff is sufficiently low, then the tariff always welfare dominates the subsidy. For instance, consider what happens when the cost of relocating, \( 1 - \lambda \), approaches zero, so that \( \lambda \) approaches one. In the same way that the optimal tariff \( \hat{t} \) was characterized in Section III, it can be shown that the optimal subsidy \( \hat{s} \) will be either zero or sufficiently high to prevent the relocation of labor, and will always be zero if \( \lambda \) is close enough to one, that is, if the cost of relocation is sufficiently small. Therefore, for \( \lambda \) sufficiently close to one, both \( \hat{s} \) and \( \hat{t} \) will be zero. Further, with \( \hat{t} = 0 \), the time-consistent tariff \( \hat{t} \) will be characterized by (20), and also approaches zero as \( \lambda \) approaches one.\(^{13}\) As a result, welfare under the time-consistent tariff can be made arbitrarily close to welfare under the optimal subsidy by bringing \( \lambda \) arbitrarily close to one. But for any \( \lambda \) strictly less than one, the time-consistent subsidy is fixed, and is given by (21) as \( \hat{s} = 1/(1 - \varepsilon) - 1 \). Since welfare under the optimal subsidy \( \hat{s} \) is strictly greater than welfare under the time-consistent subsidy \( \hat{s} \) whenever \( \hat{s} \neq \hat{s} \), choosing \( \lambda \) so that \( \hat{t} \) is arbitrarily close to zero (and thus to \( \hat{s} \)) will ensure that welfare under the time-consistent tariff is strictly greater than that under the time-consistent subsidy.

The numerical example reported in Table 1 illustrates this result. If the world price of imports falls by 50 percent (\( \varepsilon = .5 \)), and if it is very costly to reallocate labor across sectors (\( \lambda = .75 \)), the time-consistent production subsidy is 100 percent, and the time-consistent tariff is 30 percent. For these parameter values, the time-consistent subsidy welfare dominates the time-consistent tariff. However, if the cost of reallocation labor across sectors falls (\( \lambda = .9 \)), so that the equilibrium wage differential falls accordingly, then the marginal gains from income redistribution become smaller. As a result, the time-consistent tariff is reduced to 8 percent, whereas the time-consistent subsidy remains at 100 percent. In this second case, the time-consistent tariff welfare dominates the time-consistent subsidy. Also, note that in both cases the policy of free trade gives a higher social welfare than the time-consistent tariff.

We can summarize the foregoing discussion in the following:\(^{14}\)

\[ ^{12}\text{In fact, } \hat{s} \text{ will either be zero or equal to } 1/(1 - \varepsilon) - 1. \]

\[ ^{13}\text{This can be seen by noting that the imposition of } \hat{t} \text{ will involve some equilibrium labor relocation (} \alpha < 1) \text{ so that } W^y/W^x = \lambda \text{ (see the lemma in Section II). Thus, as } \lambda \text{ goes to one the equilibrium wage differential } W^y/W^x \text{ goes to one as well, which implies that } V^y/V^x \text{ approaches one. From (20), } \hat{t} \text{ therefore approaches zero.} \]

\[ ^{14}\text{In comparing the subsidy and the tariff, we neglected the issue of how to finance the subsidy. An appropriate combination of production tax in sector } x \text{ and subsidy in sector } y \text{ can avoid any problems of how to raise the needed revenue. Alternatively, a lump-sum income tax which is neutral with respect to the distribution of income, as in Mayer and Raymond Riezman} \]
PROPOSITION III: In the time-consistent equilibrium, the production subsidy is strictly higher than the tariff. If the social gains from redistribution are small enough, the tariff welfare dominates the subsidy.

VI. Generalizations and Conclusions

The model presented in the previous sections can be generalized in several directions. None of these extensions would change the nature of the main result, namely that the time-consistent trade policy involves more protection than the optimal policy would dictate; however, the formal details of the argument would be different. This section contains a brief discussion of one of the potentially more interesting extensions.

In particular, the one-shot game between the policymaker and the labor market that was analyzed in the previous sections could be extended to an intertemporal framework. The solution would be identical to the one given above if the same static game were repeated any finite number of times. However, the nature of the game would change if we dropped the assumption that there is no "learning by doing" for the workers that change sectors, that is, if we allowed \( \lambda \) to increase over time. The policymaker would now face a dynamic optimization problem, and this would add further opportunities for time inconsistencies of the optimal policies (see Kydland and Prescott, 1977). If, instead, the same static game were repeated an infinite number of times, or if an element of asymmetric information were incorporated into the finitely repeated game, then the policymaker would face incentives to maintain or establish a reputation. As is well known from the macroeconomic literature, these incentives could reduce the difference between the optimal and time-consistent policies.

Finally, it should be emphasized that while we have modeled a situation in which a policy of free trade is optimal but not time consistent, the result that discretion in trade policy can be costly is not limited to the special assumptions of this model. Much of the recent literature on the theory of international trade has analyzed models with some kind of market imperfection, and a role for activist trade policy commonly emerges. However, the particular nature of the market imperfections motivating the activist policy in many of these models contains a second, more subtle, implication: the activist trade policy must be pursued with discretion and with flexibility, judging each situation on a case-by-case basis. The model explored in the previous sections points out that increasing the discretion and flexibility of the government decision process may be counterproductive. Many of the same market imperfections that motivate trade policy intervention can also generate time inconsistencies in the implementation of the optimal activist policies. Whenever this happens, a government pursuing a discretionary trade policy finds itself trapped in a suboptimal equilibrium. Thus, a commitment to a simple set of trading rules may often be superior to an activist but discretionary trade policy.

REFERENCES


