The Theory and Practice of Second-Best Commercial Policy: Domestic Factor Market Distortions and International Market Power

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Abstract

Established theory of optimal policy intervention prescribes the appropriate policy mix if (1) domestic firms hire labor at a distorted wage and (2) the domestic country wields international market power. Under these conditions, optimal policy generally requires that both a tariff and a subsidy to domestic employment are available policy tools. This paper measures the dependence on domestic and foreign demand and supply conditions of the proportion of first-best domestic welfare which can be achieved when only one of the two requisite policy instruments can be used.

I. Introduction

The theory of optimal policy intervention in the presence of market imperfections is one of the most thoroughly analyzed topics within international economics.[1] As complete and esthetically satisfying as this literature is, the policy mix which is theoretically appropriate to deal with any given set of distortions is often rendered infeasible by the legal and political constraints within which economic policymakers operate.[2] This situation makes it natural to examine the extent to which a country can approach first-best welfare levels utilizing a restricted set of policy tools.

In this paper, I discuss these issues focusing on two distortions which are characteristic of several important industries in the United States. First, the firms which make up the domestic industry are assumed to hire labor at a wage which inaccurately reflects its true social opportunity cost. Second, changes in the country's participation in the world market for this commodity affect its world price.[3] The domestically optimal policy mix in the presence of these market imperfections is[4] to (1) tax or subsidize domestic employment to deal with the divergence of private from social cost, and (2) tax imports or exports to take maximum advantage of the country's influence on

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[1]Two pioneers in this field have each written lucid surveys of this literature. See Bhagwati (1971) and Johnson (1965).

[2]Of course, this is not a new observation. Formal discussion of these constraints dates back at least to Tinbergen (1952). See especially chapter 6 therein.

[3]The auto industry in the United States, for example, appears to satisfy these assumptions.

[4]See Bhagwati (1971).

the world price of this traded good. However, the General Agreement on Tariffs and Trade restricts tariff use, and political pressures complicate passage of subsidy legislation.

This paper suggests answers to two questions which arise if the policy menu is restricted to one of the two instruments required to achieve the first-best optimum. First, how does the welfare gap (the percentage difference between first-best welfare and that level of welfare which can be achieved using only one of the required instruments) depend on domestic and foreign demand and supply conditions? Second, how should the available policy tool respond to different values of the structural parameters?

In general, the answers to these questions are complementary. If only one instrument can be used to deal with two market imperfections, that instrument will play two roles. The first is the function it would perform if both tools were available. The second is an adopted role, adjusting the instrument from its first best level to satisfy partially the objective which the missing tool would normally perform. Though exceptions exist, a general finding of the analysis which follows is that changes in parameter values which emphasize the adopted role of the available policy instrument widen the welfare gap.

In the following section, I present a linear, partial equilibrium model of a market which is characterized by the two imperfections discussed above. The system is solved under three policy regimes: a first-best program in which both the tariff and subsidy instruments are available, and second-best regimes in which only one of the instruments can be used. Some preliminary observations on the solutions in these regimes appear in Section III. The dependence of the welfare gaps and second-best policies on demand and supply parameters is discussed in Section IV. The paper concludes with a summary of policy implications.

II. The Model

The objective is to study domestically optimal policy intervention when an industry operates in the presence of two market imperfections. First, domestic firms in this industry produce a commodity using labor which is hired at a market wage which diverges from that input's true social opportunity cost. Second, changes in domestic excess demand for this commodity affect its world price.

The following assumptions regarding domestic production simplify the analysis. Producers employ a single variable factor (labor). In addition, each firm utilizes a production technology which implies a marginal cost schedule that is linear in output and in the wage paid to labor.[5] Under these circumstances, if each firm takes output price as given, the domestic industry supply schedule is:

$$(1) \quad p^d = \beta q_p^{ds}, \qquad \text{(domestic private supply)}$$

where p^d is the commodity price domestic producers receive, q_p^{ds} is domestic industry output, and

$$(2) \quad \beta \equiv wf(\bar{k}),$$

where w is the wage per unit of labor input and $\bar{k}$ is a vector of the other (fixed) inputs to the production process.

Suppose now that the social opportunity cost of employing labor (w_σ) differs from the market wage. The socially efficient industry supply schedule is then:

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[5] If, for example, the production function is Cobb-Douglas, with labor's share of total factor income equal to fifty percent, marginal cost schedules satisfy these conditions. While labor's share of U.S. income seems to exceed one-half, the U.S. auto industry, with its more capital intensive production process, probably conforms more closely to the fifty percent figure. It is consistent with Cobb-Douglas technology for the intercept in equation (1) to be constrained at zero.

(3) $p^d = \beta\theta q_\sigma^{ds}$ (domestic social supply)

where q_σ^{ds} is domestic output along the socially efficient supply schedule and

(4) $\theta \equiv \frac{w_\sigma}{w}$.

The domestic demand and foreign excess supply functions are also assumed to be linear. They are, respectively:

(5) $p^c = a - bq^{dd}$ $\quad a > 0,\ b \geq 0$ (domestic demand)

(6) $p^w = \gamma + \delta q^{fxs}$ $\quad \gamma > 0,\ \delta \geq 0$ (foreign excess supply)

where $p^c \equiv$ per unit price domestic consumers pay,

$p^w \equiv$ per unit world market price,

$q^{dd} \equiv$ quantity demanded by domestic citizens,

$q^{fxs} \equiv$ amount of excess supply available in the foreign market.

Changes in domestic excess demand affect the commodity's world price if δ is positive.

Finally, to lend perspective to the results that follow, it is useful to assume that with no trade policy intervention the domestic country imports the commodity. This is equivalent to imposing the condition that domestic private excess demand is zero at a price above that at which foreign excess supply is zero:

(7) $\beta(a - \gamma) - b\gamma > 0$.

A well known result of the literature on optimal policy intervention is that, given the above economic structure, a country maximizes domestic welfare by (1) imposing a tariff or export tax to restrict trade (unless $\delta = 0$) and (2) subsidizing or taxing use of labor in domestic production (unless $\theta = 1$). However, as argued above, legal or political constraints may proscribe use of one of these policy instruments. To get a sense of how close a country can come to its first-best welfare level when only one of the two required policy tools is available, the model described above can be solved under three policy

regimes. In the "T/S" regime, the policy authorities have access to both an ad valorem tariff and an ad valorem subsidy. In the "T" regime, only the ad valorem tariff is available; in the "S" regime, only the ad valorem subsidy.

The solutions for the endogenous variables under each of the regimes are presented in Table 1 (the variables are defined immediately below the table). They were obtained by computing the values for prices, domestic consumption, and the policy variables as functions of the structural parameters and an arbitrary domestic output target. The production level was then chosen to maximize domestic welfare.[6] The following section contains a brief comparison of the price and quantity results in the three regimes.

[6]Domestic welfare is defined as the sum of consumers' surplus, producers' surplus (using the social opportunity cost of labor use), and tariff revenue less subsidy cost. This standard, of course, assumes (1) the validity of consumer's and producer's surplus as appropriate welfare measures and (2) the comparability of surpluses accruing to each consumer, producer and taxpayer. See Willig (1976) and Helpman (1978).

Table 1: Solutions for Endogenous Variables Under Three Policy Regimes

Variable	Regime		
	T/S	T	S
c	$\frac{2a\delta + \beta(a - \gamma)\theta}{D_{ts}}$	$\frac{(2a\delta - \beta\gamma)(b + \beta) + a\beta(\beta + b\theta)}{D_t}$	$\frac{\delta(a\delta + 2ab - b\gamma) + \beta(a - \gamma)(b + \delta)\theta}{D_s}$
q^{ds}	$\frac{b\gamma + 2a\delta}{D_{ts}}$	$\frac{(b + \beta)(b\gamma + 2a\delta)}{D_t}$	$\frac{(2b + \delta)a\delta + b^2\gamma}{D_s}$
m	$\frac{\beta(a - \gamma)\theta - b\gamma}{D_{ts}}$	$\frac{-\gamma(b + \beta)^2 + a\beta^2 - ab\beta\theta}{D_t}$	$\frac{(b + \delta)[\beta(a - \gamma)\theta - b\gamma]}{D_s}$
p^d	$\frac{\beta(b\gamma + 2a\delta)}{D_{ts}}$	$\frac{\beta(b + \beta)(b\gamma + 2a\delta)}{D_t}$	$\frac{\beta[(2b + \delta)a\delta + b^2\gamma]}{D_s}$
p^c	$\frac{\beta(b\gamma + 2a\delta)\theta}{D_{ts}}$		$\frac{b^2\gamma\delta + \beta(a\delta + b\gamma)(b + \delta)\theta}{D_s}$
p^w	$\frac{b\gamma\delta + (a\delta + b\gamma + \gamma\delta)\beta\theta}{D_{ts}}$	$\frac{\gamma\delta(b + \beta)^2 + \beta(\beta + b\theta)(a\delta + b\gamma)}{D_t}$	
t	$\frac{\delta[\beta(a - \gamma)\theta - b\gamma]}{\beta(b\gamma + 2a\delta)\theta}$	$\frac{-\gamma\delta(b + \beta)^2 + a\beta\delta(b + \beta) + b\beta(b\gamma + a\delta)(1 - \theta)}{\beta(b + \beta)(b\gamma + 2a\delta)}$	----
s	$1 - \theta$	----	$\frac{(2ab\beta\delta + a\beta\delta^2 + b^2\beta\gamma - b^2\gamma\delta) - (b + \delta)(b\gamma + a\delta)\beta\theta}{\beta(2ab\delta + a\delta^2 + b^2\gamma)}$
W	$\frac{b\gamma^2 + 2a^2\delta + \beta(a - \gamma)^2\theta}{2D_{ts}}$	$\frac{[\gamma^2(b + \beta)^2 + 2a^2b\delta + 4a^2\beta\delta + a^2\beta^2 - 2a\beta^2\gamma + a\beta\theta(ab - 2a\delta - 2b\gamma)]}{2D_t}$	$\frac{[b\beta(a - \gamma)^2\theta + (a^2\delta^2 + b^2\gamma^2 + 2a^2b\delta)]}{2D_s}$

Definitions:

c	domestic consumption
q^{ds}	domestic production
m	domestic imports ($c - q^{ds}$)
p^d	per unit price domestic producers receive $\left(= \frac{p^w}{(1-t)(1-s)} = \frac{p^c}{(1-s)} \right)$
p^c	per unit price domestic consumers pay $\left(= \frac{p^w}{1-t} \right)$
p^w	per unit world price
t	ad valorem tariff rate
s	ad valorem subsidy rate
W	domestic welfare (see footnote 4)

$$D_{ts} \equiv 2b\delta + \beta(b + 2\delta)\theta$$

$$D_t \equiv 2\delta(b + \beta)^2 + b\beta(\beta + b\theta)$$

$$D_s \equiv (2b + \delta)b\delta + \beta(b + \delta)^2\theta$$

III. A Comparison of Policy Regimes

A. The Tariff/Subsidy and Subsidy Regimes

A logical starting point for comparing the T/S and S regimes is to recognize that these regimes are equivalent if the tariff is a redundant policy instrument in the first-best system. If the domestic country wields market power ($\delta > 0$), this occurs only when optimal application of the subsidy implies that the commodity is not traded. From Table 1, the quantity of imports in the T/S regime is:

$$m_{ts} = \frac{I}{D_{ts}}, \quad [7]$$

where $I \equiv (a - \gamma)\theta - b\gamma$.

Thus, if the ratio of the social opportunity cost of labor to the market wage is:

$$(8) \quad \theta_s = \frac{b\gamma}{\beta(a - \gamma)},$$

the subsidy to labor use in the T/S regime, s_{ts}, raises domestic production exactly enough to cause imports to cease.[8] In this case, the tariff in the first-best regime, t_{ts}, is zero (see Table 1) and the T/S and S regimes are equivalent.

The following inequalities describe what occurs in the general case when θ differs from the critical value given in (8):

$$(9) \quad m_{ts} - m_s = \frac{-\delta[\beta(b + \delta)\theta + b\delta]I}{D_{ts}D_s} \quad \lessgtr 0 \text{ as } \theta \gtrless \theta_s$$

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[7] Variable subscripts indicate the policy regime.

[8] The condition that the good is imported if no policy intervention is undertaken (see (7) above) implies that θ_s is between zero and unity. That is, the tariff is redundant in the T/S regime if the social opportunity cost of labor use is some specific value less than the market wage.

$$(10)\quad s_{ts} - s_s = \frac{-b\delta I}{\beta(a\delta^2 + 2ab\delta + b^2\gamma)} \qquad \lessgtr 0 \text{ as } \theta \gtrless \theta_s$$

$$(11)\quad p^d_{ts} - p^d_s = \frac{-b\delta^2 I}{D_{ts} D_s} \qquad \lessgtr 0 \text{ as } \theta \gtrless \theta_s$$

$$(12)\quad p^c_{ts} - p^c_s = \frac{b\delta[\beta(b + \delta)\theta + 2b\delta]I}{D_{ts} D_s} \qquad \gtrless 0 \text{ as } \theta \gtrless \theta_s$$

$$(13)\quad p^w_{ts} - p^w_s = \frac{-\delta^2[\beta(b + \delta)\theta + b\delta]I}{D_{ts} D_s} \qquad \lessgtr 0 \text{ as } \theta \gtrless \theta_s$$

$$(14)\quad W_{ts} - W_s = \frac{\delta^2 I^2}{2D_{ts} D_s} \qquad > 0 \text{ as } \theta \neq \theta_s .$$

Suppose the ratio of the social opportunity cost of labor to the market wage rose slightly from θ_s, the value at which the good is not traded. The subsidy to domestic labor use would be reduced, domestic production would fall, and the country would begin to import the commodity. If δ is positive, this spillover of domestic demand into the international market raises the world price. In the T/S regime, it is then in the interest of the domestic country to impose a tariff to ease the price increase by restricting excess demand (in Table 1, $\theta > \theta_s$ and $\delta > 0$ imply $t_{ts} > 0$).

In the S regime, the tariff instrument cannot be used. Yet maximization of domestic welfare still requires that domestic excess demand be restrained to limit the world price rise. Thus the available policy tool, the subsidy (s_s), is pushed above its first-best level ($s_{ts} = 1 - \theta$) to give an added incentive to domestic production and thereby reduce import demand. The adopted role s_s must perform leads to oversubsidization of domestic labor use

if the good is imported, i.e., $s_s > s_{ts}$ if $\theta > \theta_s$.[9]

The ramifications of this second-best intervention are evident in the price structure (11)-(13). The tariff instrument is specifically designed to reduce import demand. Hence the goal of exacting a low world price will be less satisfactorily achieved in the S regime ($p^w_{ts} < p^w_s$ if $\theta > \theta_s$). The tariff is successful at choking off imports because it raises the price consumers face, in spite of the world price concession won ($p^c_{ts} > p^c_s$ if $\theta > \theta_s$). Finally, the overuse of the subsidy instrument in the S regime leads to a higher price for producers (and therefore greater domestic production) than in the first-best policy system.

If $\theta < \theta_s$, the social cost of labor use is so low as to make it appropriate to subsidize domestic employment (in both the T/S and S regimes) to the point where the good is exported. In this case, an export tax ($t_{ts} < 0$) is instituted in the T/S regime. In the S regime, domestic production will be undersubsidized ($s_s < s_{ts}$) in an effort to restrict exports and extract a high price in world markets by lowering domestic production.

As long as $\theta \neq \theta_s$, trade occurs once the available policy instruments are optimally applied, and the second-best nature of the S regime becomes apparent (see (14) above). If the good is traded, the regimes are equivalent only if the domestic country exerts no influence on the world price ($\delta = 0$).[10]

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[9]Kemp and Nagishi (1969) also show that the available policy instrument will generally deviate from the first-best value. See their discussion on page 1012.

[10]The fact that the subsidy-only regime is first-best if the domestic country exerts no market power is, of course, well known. See, for example, Lindert and Kindleberger (1982), Chapter 6.

B. The Tariff/Subsidy and Tariff Regimes

Following the logic of Part A, it is reasonable to begin comparing the T/S and T regimes by looking at the case in which the subsidy is redundant and the two systems are equivalent. Of course, this occurs if the social opportunity cost of labor use is equal to the market wage. The focal role of the value $\theta = 1$ is indicated by the following relationships:

$$(15)\quad m_{ts} - m_t = \frac{-b\beta^2(b\gamma + 2a\delta)(1-\theta)^2}{D_{ts}D_t} \qquad \lessgtr 0 \text{ as } \theta \gtrless 1,$$

$$(16)\quad t_{ts} - t_t = \frac{-b[\beta(b\gamma + a\delta)\theta + \gamma\delta(b+\beta)][1-\theta]}{(b+\beta)(b\gamma + 2a\delta)\beta\theta} \qquad \lessgtr 0 \text{ as } \theta \lessgtr 1,$$

$$(17)\quad p^d_{ts} - p^d_t = \frac{[\beta^2(b\gamma + 2a\delta)][b\beta + 2\delta(b+\beta)][1-\theta]}{D_{ts}D_t} \qquad \gtrless 0 \text{ as } \theta \lessgtr 1,$$

$$(18)\quad p^c_{ts} - p^c_t = \frac{-[b\beta(b\gamma + 2a\delta)][b\beta\theta + 2\delta(b+\beta)][1-\theta]}{D_{ts}D_t} \qquad \lessgtr 0 \text{ as } \theta \lessgtr 1,$$

$$(19)\quad p^w_{ts} - p^w_t = \frac{-b\beta^2\delta(b\gamma + 2a\delta)(1-\theta)^2}{D_{ts}D_t} \qquad \lessgtr 0 \text{ as } \theta \gtrless 1,$$

$$(20)\quad W_{ts} - W_t = \frac{[\beta(b\gamma + 2a\delta)(1-\theta)]^2}{2D_{ts}D_t} \qquad > 0 \text{ as } \theta \gtrless 1.$$

If $\theta = 1$, domestic labor use is not subsidized in the first-best regime. Imports are positive and equal in the T/S and T regimes, and therefore the tariff rates implemented are positive and identical:

$$t_{ts} = t_t = \frac{\delta[\beta(a-\gamma) - b\gamma]}{\beta(b\gamma + 2a\delta)}.$$ [11]

However, if the opportunity cost of labor use is less than the market

[11] That these tariff rates are positive follows from the condition (7) that the good is imported when no policy intervention is undertaken.

wage, employment is subsidized in the T/S regime. In the T system, with no direct subsidy instrument, the available policy tool, t_t, will be pushed beyond its first-best level to overprotect the domestic industry and thereby encourage employment at home. The subsidy instrument more successfully achieves the domestic employment objective ($p^d_{ts} > p^d_t$). In addition, the overuse of the tariff in the T regime has the undesirable side effect of raising the price consumers must pay ($p^c_{ts} < p^c_t$). Finally the extent to which t_t is adjusted to carry out its adopted role means a higher world price in the t regime ($p^w_{ts} < p^w_t$).

If θ exceeds unity, domestic labor use is taxed ($s_{ts} = 1 - \theta < 0$) in the first-best regime. When no direct labor market policy is available, t_t is kept below its first-best value to reduce the protection offered domestic firms. The price structure relationships (17)-(19) are appropriately modified. As long as the factor market distortion exists, the absence of the subsidy induces a welfare loss, as described by (20).

IV. Comparative Statics

A sensible measure of the ineffectiveness of the second-best policy regimes is the percentage of first-best welfare which the second-best systems cannot achieve:

$$(21) \quad w_s \equiv \frac{W_{ts} - W_s}{W_{ts}} = \frac{(\delta I)^2}{D_s D_w} \qquad \gtrless 0 \text{ as } \theta \gtrless \theta_s,$$

$$(22) \quad w_t = \frac{W_{ts} - W_t}{W_{ts}} = \frac{[\beta(b\gamma + 2a\delta)(1 - \theta)]^2}{D_t D_w} \qquad \gtrless 0 \text{ as } \theta \gtrless 1,$$

where $D_w \equiv [b\gamma^2 + 2a^2\delta + \beta(a - \gamma)^2\theta]$. [12] In this section, I study the way in which these measures, and the optimal values for the second-best policy instruments, depend on domestic and foreign demand and supply conditions. The sometimes complicated relationship between the importance of the adopted role played by the available policy instrument and the welfare gap is also described.

A. The Tariff/Subsidy and Subsidy Regimes

The first results show that the impact on the welfare gap, w_s, of shifts in the domestic demand or foreign excess supply schedule critically depends on the initial trade pattern:

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[12] To get a sense of the magnitudes involved, consider the U.S. auto industry. Monthly sales of domestic and imported cars in the U.S. during 1981 averaged approximately 550,000 and 200,000, respectively. Assuming an average price per car of $6500, a demand elasticity of 3/4, and reasonable estimates for foreign excess supply parameters, (21) and (22) imply that 99.7% of first-best welfare could be achieved by a subsidy-only regime, while 97.5% could be achieved by a tariff-only policy response. Other calculations, using the formulae of Table 1, suggest that, with no subsidy to labor use in the U.S. labor market, the optimal (second-best) tariff rate on imported autos is approximately 25%, as compared to the 2.9% rate actually levied. For an interesting discussion of the U.S. auto industry and foreign competition, see Gomez-Ibanez and Harrison (1982).

$$\frac{\partial w_s}{\partial a} = \frac{2a\gamma\delta^2[\beta(b + 2\delta)\theta + 2b\delta]I}{D_s D_w^2} \gtrless 0 \text{ as } \theta \gtrless \theta_s,$$

$$\frac{\partial w_s}{\partial \gamma} = \frac{-2a^2\delta^2[\beta(b + 2\delta)\theta + 2b\delta]I}{D_s D_w^2} \lessgtr 0 \text{ as } \theta \gtrless \theta_s.$$

An increase in domestic demand or reduction in foreign excess supply leads to more imports (if θ initially exceeds θ_s) or less exports (θ initially below θ_s). If the good is initially imported, domestic production is being oversubsidized in a second-best attempt to keep the price of imports low.[13] The heightened attractiveness of imports means an increase in this over-subsidization:

$$\frac{\delta(s_s - s_{ts})}{\delta a} = \frac{b\gamma\delta[\beta(b + \delta)^2\theta + b\delta(2b + \delta)]}{\beta(b^2\gamma + 2ab\delta + a\delta^2)^2} > 0 ,$$

$$\frac{\delta(s_s - s_{ts})}{\delta \gamma} = \frac{-ab\delta[\beta(b + \delta)^2\theta + b\delta(2b + \delta)]}{\beta(b^2\gamma + 2ab\delta + a\delta^2)^2} < 0 .$$

The secondary role of s_s is enhanced and therefore the welfare gap widens.

If instead the good is exported ($\theta < \theta_s$), s_s is kept below the first-best subsidy level. An increase in $(a-\gamma)$ diminishes exports and the need to under-subsidize domestic production to restrict sales abroad. Hence the second-best welfare level moves closer to that which can be achieved by the T/S regime.

Similarly, the initial trade pattern determines the impact of a rise in the market wage (holding the proportional wedge between w and w_σ fixed):

$$\frac{\partial w_s}{\partial \beta} = \frac{\delta\theta[A_s\theta + B_s]I}{D_s^2 D_w^2} \gtrless 0 \text{ as } \theta \gtrless \theta_s,$$

and the effect of an increase in the social opportunity cost of labor use

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[13] See the discussion in section III.A. above.

relative to the market wage (w fixed):

$$\frac{\partial w_s}{\partial \theta} = \frac{\beta\delta[A_s\theta + B_s]I}{D_s^2 D_w^2} \quad \gtrless 0 \text{ as } \theta \gtrless \theta_s,$$

where

$$A_s \equiv [\beta\delta(a-\gamma)][b\delta(2b+\delta)(a-\gamma)^2 + 2b\gamma(b+\delta)^2(a-\gamma) + (b\gamma^2+2a^2\delta)(b+\delta)^2] > 0 ,$$

$$B_s \equiv b\delta[b\gamma\delta(2b+\delta)(a-\gamma)^2 + 2\delta(b\gamma^2+2a^2\delta)(2b+\delta)(a-\gamma) + \gamma(b\gamma^2+2a^2\delta)(b+\delta)^2] > 0 .$$

These results again follow intuitively from the relative adjustments of the policy instruments:

$$\frac{\partial(s_s - s_{ts})}{\partial\beta} = \frac{b^2\gamma\delta}{\beta^2(a\delta^2 + 2ab\delta + b^2\gamma)} > 0 ,$$

$$\frac{\partial(s_s - s_{ts})}{\partial\theta} = \frac{b\delta(a-\gamma)}{(a\delta^2 + 2ab\delta + b^2\gamma)} > 0 .$$

Both of these parameter changes imply an increase in the social marginal cost of domestic production.[14] This leads to a rise in the demand for imports ($\theta > \theta_s$), or a fall in the volume of goods sold abroad ($\theta < \theta_s$). In the former case, oversubsidization in the second-best regime is exacerbated as the need to choke off imports grows. The welfare gap therefore widens. If, however, the good is initially exported, the reduction in sales abroad which results from the domestic marginal cost hike limits the need to under-

[14]This is obvious when θ rises. When β increases with θ fixed, w_σ is implicitly increasing to maintain $\theta = \frac{w_\sigma}{w}$.

subsidize in the S regime. Hence the welfare gap shrinks.[15]

Changes in the two remaining parameters, b and δ, have an ambiguous effect on the percentage of first-best welfare the S regime achieves. If, for example, the degree of market power which the domestic country exerts increases,

$$(23) \quad \frac{\partial w_s}{\partial \delta} = \frac{2\delta I^2 C}{D_s^2} \gtrless 0 \ ,$$

since

$$C \equiv \{[b\beta^2(b+\delta)(a-\gamma)^2]\theta^2+\beta[b^3\gamma^2+2b^2\gamma^2\delta+2a^2b^2\delta-2ab^2\gamma\delta-a^2\delta^3]\theta-b\delta(b\gamma+a\delta)\ (a\delta-b\gamma)\}$$

is ambiguous in sign. The counterpart result for the relative adjustment of policy instruments is:

$$(24) \quad \frac{\partial(s_s - s_{ts})}{\partial \delta} = \frac{b(b^2\gamma - a\delta^2)I}{\beta(a\delta^2 + 2ab\delta + b^2\gamma)^2} \ .$$

The relative policy adjustment and the change in the welfare gap are no longer determined exclusively by the initial trade pattern. The complication arises because conflicting forces affect the secondary role s_s performs. Consider the case in which the good is initially imported ($\theta > \theta_s$). The steeper slope of the foreign excess supply schedule encourages an increase in s_s, since the power to reduce the world price of imports by increasing domestic output is enhanced. However, the increase in δ (with γ fixed) implies a natural reduction in imports, and therefore less need to restrict purchases from abroad. This effect argues for a reduction in s_s.

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[15]When β rises, only the secondary role of s_s is affected: the need to restrict imports is heightened or to restrict exports, relaxed. When θ rises, this impact on the secondary role s_s performs is again present. But there is also an effect on the subsidy's primary function: the need to subsidize domestic labor use declines. In this context, the impact on the secondary role is dominant. See section IV.B. for further discussion of this issue.

Certain restrictions on relative parameter values are sufficient to resolve this ambiguity. If, for example,

(25) $b\gamma > a\delta$,

C is positive, and the welfare gap widens as δ increases. Inequality (25) is also sufficient to guarantee $b^2\gamma - a\delta^2 > 0$,[16] so that it follows from (24) that $\frac{\partial(s_s - s_{ts})}{\partial\delta} \gtrless 0$ as $\theta \gtrless \theta_s$. It can also be shown that if b is small enough relative to δ, the opposite results for the changes in w_s and $(s_s - s_{ts})$ occur. In either case, the relationship between these changes is exactly what one would expect given the findings earlier in this section.

Why does b, a measure of the domestic elasticity of demand, play so crucial a role in resolving this ambiguity? Consider the conflicting impacts on welfare in the S regime if the subsidy rate rises in response to the increase in δ. While the resulting reduction in the world price is a boon to consumers (consumers pay the world price in the S regime), the cost is the growth in the socially wasteful use of domestic labor (since $s_s > s_{ts} = 1 - \theta$). The less responsive consumers are to changes in the commodity's price (b large), the more the world price falls and consumers' surplus expands following the subsidy hike. On the cost side, given the large drop in world price, the price to producers, and domestic production, increase less for a given increase in the subsidy. Thus if b is large, the consumers' surplus gain is more likely to outweigh the increase in socially inefficient production due to oversubsidization.

In summary, if b is large relative to δ, the net effect is to enhance the secondary role performed by s_s. The deviation between the first- and second-

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[16] If $b\gamma > a\delta$, it must be true that $b > \delta$, since a precondition of inequality (7) is that $a > \gamma$. (25) and $b > \delta$ together imply $b^2\gamma > a\delta^2$.

best subsidy rates grows, and the welfare gap consequently widens. If instead b is small relative to δ, the tendency is to reduce the overuse of s_s and the welfare gap.[17]

B. The Tariff/Subsidy and Tariff Regimes[18]

An increase in domestic demand or reduction in foreign excess supply increases the percentage of first-best welfare achieved by the T regime:

$$\frac{\partial w_t}{\partial a} = \frac{-[2\beta^2 (a - \gamma)(b\gamma + 2a\delta)][\beta(b + 2\delta)\theta + 2b\delta](1 - \theta)^2}{D_t D_w^2} \lessgtr 0 \text{ as } \theta \neq 1,$$

$$\frac{\partial w_t}{\partial \gamma} = \frac{[2a\beta^2(a - \gamma)(b\gamma + 2a\delta)][\beta(b + 2\delta)\theta + 2b\delta](1 - \theta)^2}{D_t D_w^2} \gtrless 0 \text{ as } \theta \neq 1.$$

When imports become more attractive (a rises or γ falls), the primary role of the second-best tariff rate of restricting imports is enhanced relative to its secondary objective of overcoming the domestic factor market distortion. As a result, the absolute value of the deviation between the first- and second-best tariff values falls:[19]

$$\frac{\partial(t_t - t_{ts})}{\partial a} = \frac{-b\gamma\delta[b\beta\theta + 2\delta(b + \beta)](1 - \theta)}{\beta(b + \beta)(b\gamma + 2a\delta)^2\theta} \gtrless 0 \text{ as } \theta \gtrless 1$$

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[17]The argument is the same in the case in which the good is initially exported ($\theta < \theta_s$). If, in that situation, b is large relative to δ, a rise in δ again has the net effect of bolstering the secondary role s_s must play. Thus, undersubsidization increases (from (24) $\frac{\partial(s_s - s_{ts})}{\partial \delta} < 0$) and the welfare gap widens ($C > 0$ in (23)).

[18]The arguments of this section are analogous to those in section IV.A. above and are therefore abbreviated.

[19]Recall from section III.B. that $t_t \gtrless t_{ts}$ as $\theta \lessgtr 1$.

$$\frac{\partial(t_t - t_{ts})}{\partial\gamma} = \frac{ab\delta[b\beta\theta + 2\delta(b + \beta)](1 - \theta)}{\beta(b + \beta)(b\gamma + 2a\delta)^2\theta} \gtrless 0 \text{ as } \theta \lessgtr 1.$$

This relative policy adjustment implies a reduction in the welfare gap.

An increase in the social opportunity cost of labor use relative to the market wage affects both the primary and secondary functions performed by the tariff rate in the T regime. The rise in the social marginal cost of production makes foreign goods relatively more attractive and therefore highlights the tariff's role of restricting imports. But the increase in w_σ relative to w also directly affects the magnitude of the factor market distortion. If initially $\theta < 1$, the distortion subsides, and the wedge between the first- and second-best tariff levels will tend to fall. If $\theta > 1$, the increase in θ aggravates the distortion, forcing t_t and t_{ts} further apart. This impact on the tariff's adopted role is dominant.[20]

$$\frac{\partial(t_t - t_{ts})}{\partial\theta} = \frac{-b[\beta(b\gamma + a\delta)\theta^2 + \gamma\delta(b + \beta)]}{\beta(b + \beta)(b\gamma + 2a\delta)\theta^2} < 0.$$

It follows that the welfare gap shrinks or widens as the social opportunity cost of labor is initially below or above the market wage:

$$\frac{\partial w_t}{\partial\theta} = \frac{-[\beta^2(b\gamma + 2a\delta)^2][A_t\theta + B_t](1 - \theta)}{D_t^2 D_w^2} \lessgtr 0 \text{ as } \theta \lessgtr 1,$$

where

$$A_t \equiv \beta\{[2\delta(b + \beta)^2 + b\beta^2 + 2b^2\beta](a - \gamma)^2 + b^2(b\gamma^2 + 2a^2\delta)\} > 0,$$

$$B_t \equiv \{\beta[2\delta(b + \beta)^2 + b\beta^2](a - \gamma)^2 + [4\delta(b + \beta)^2 + 2b\beta^2 + b^2\beta](b\gamma^2 + 2a^2\delta)\} > 0.$$

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[20]This is also the case netting out the impacts on the dual roles played by s_s in the subsidy-only regime. See footnote 14 above.

If the market wage rises, holding the proportional wedge between w_σ and w constant, domestic marginal cost increases generating greater demand for foreign goods. The first-best subsidy level is unaffected since the proportional distortion θ is unchanged, but the heightened attractiveness of imports raises the first-best tariff level:

$$(26)\quad \frac{\partial t_{ts}}{\partial \beta} = \frac{b\gamma\delta}{\beta^2(b\gamma + 2a\delta)\theta} > 0 .$$

If $\theta > 1$, the second-best tariff rate also rises; but if w_σ is less than w, t_t may fall as β increases:

$$(27)\quad \frac{\partial t_t}{\partial \beta} = \frac{b[\gamma\delta(b + \beta)^2 - \beta^2(b\gamma + a\delta)(1 - \theta)]}{\beta^2(b + \beta)^2(b\gamma + 2a\delta)} .$$

This expression is unambiguously positive and identical to (26) if the market wage accurately reflects the social opportunity cost of labor use. But if θ is not unity, the second term within brackets in the numerator of (27) is non-zero and represents a readjustment in $(t_t - t_{ts})$ necessitated by the change in β. If, for example, $\theta < 1$, t_t exceeds t_{ts} so that domestic employment is encouraged in the second-best regime. The degree of overprotection the domestic industry receives is a function of the first-best subsidy level, which depends in turn on the amount by which θ is less than unity. If β rises with θ held constant, the absolute gap between the market wage and the opportunity cost of labor use widens. Therefore if $(t_t - t_{ts})$ is unchanged, the absolute overprotection offered the domestic industry is automatically amplified. t_t must therefore fall (relative to t_{ts}) to maintain the same degree of overprotection dictated by the unaltered value of θ. Thus when β rises, this need to adjust t_t downward operates against the natural inclination to raise the tariff to restrain import demand. The net impact on t_t is ambiguous.

If $\theta > 1$, this required readjustment reinforces the natural tendency for t_t

to rise in response to the increase in import demand. In this case $t_t < t_{ts}$, so that the rise in β amplifies the absolute underprotection to the domestic industry. t_t must therefore be adjusted upward (relative to t_{ts}), and the overall effect is an unambiguous increase in the second-best tariff.

The earlier findings indicate that an increase in domestic marginal cost, emphasizing the tariff's primary function, would reduce the deviation between the first- and second-best tariff rates. The readjustment effect just described reinforces the movement of t_t toward t_{ts}:

$$\frac{\partial(t_t - t_{ts})}{\partial\beta} = \frac{-b[\beta^2(b\gamma + a\delta)\theta + \gamma\delta(b+\beta)^2](1-\theta)}{\beta^2(b+\beta)^2(b\gamma + 2a\delta)\theta} \gtreqless 0 \text{ as } \theta \gtreqless 1 .$$

In contrast to earlier results, however, this reduction in the absolute deviation between first- and second-best policy values does not guarantee a reduction in the welfare gap:

$$(28)\quad \frac{\partial w_t}{\partial\beta} = \frac{\{\beta(b\gamma+2a\delta)^2(1-\theta)^2\}\{[(a-\gamma)^2(2b^2\delta-2\beta^2\delta-b\beta^2)+b^2(b\gamma^2+2a^2\delta)]\beta\theta+4b\delta(b+\beta)(b\gamma^2+2a^2\delta)\}}{D_t^2 D_w^2} .$$

The deviation between first- and second-best welfare levels declines if β is large. In that case, the readjustment effect outlined above is more significant,[20] forcing a greater reduction in the absolute policy deviation $(t_t - t_{ts})$.

Finally, an increase in the slope of the foreign excess supply schedule has an ambiguous impact on the relative effectiveness of the tariff-only regime. When δ increases, the responses in the tariff rates and welfare levels in the respective regimes are predictable:

$$(29)\quad \frac{\partial t_{ts}}{\partial\delta} = \frac{b\gamma[\beta(a-\gamma)\theta - b\gamma]}{\beta(b\gamma + 2a\delta)^2\theta} \qquad \gtreqless 0 \text{ as } \theta \gtreqless \theta_s ,$$

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[21] Again see the second term within brackets in the numerator of (27).

$$(30)\quad \frac{\partial W_{ts}}{\partial \delta} = \frac{-[\beta(a-\gamma)\theta - b\gamma]^2}{D_{ts}^2} \qquad \lessgtr 0 \text{ as } \theta \gtrless \theta_s,$$

$$(31)\quad \frac{\partial t_t}{\partial \delta} = \frac{b\gamma[ab\beta\theta - \gamma(b+\beta)^2 + a\beta^2]}{\beta(b+\beta)(b\gamma + 2a\delta)^2} \qquad \gtrless 0 \text{ as } \theta \gtrless \theta_t,$$

$$(32)\quad \frac{\partial W_t}{\partial \delta} = \frac{-[ab\beta\theta - \gamma(b+\beta)^2 + a\beta^2]^2}{D_t^2} \qquad \lessgtr 0 \text{ as } \theta \gtrless \theta_t,$$

where $\theta_t \equiv \frac{\gamma(b+\beta)^2 - a\beta^2}{ab\beta}$.

As the expression for m_t in Table 1 indicates, θ_t is that value of the factor market distortion at which the good is non-traded in the T regime ($m_t(\theta_t) = 0$).[22] In either regime, a hardening of the terms of trade at which the good can be bought or sold abroad induces a firmer effort to restrict trade ($\frac{\partial |t|}{\partial \delta} > 0$). Also, as long as the good is traded, the inferior exchange opportunities reduce welfare.

When the slope of the foreign excess supply schedule changes, the adjustment in $|t_t - t_{ts}|$ cannot be linked with the change in the welfare gap because $\theta_t < \theta_s$.[23] Suppose, for example, that $\frac{w_\sigma}{w}$ lies between θ_t and θ_s. If δ increases, t_t rises ($m_t > 0$) while t_{ts} falls ($m_{ts} < 0$). Both policies respond according to the primary role for the tariff: to restrict trade and

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[22] Recall from section III.A. above that $m_{ts}(\theta s) = 0$.

[23] Consider a reduction in $\theta \equiv \frac{w_\sigma}{w}$ from the starting point $\theta = 1$, at which $m_t = m_{ts}$ (recall that the regimes are equivalent if $\theta = 1$). In the t/s regime, when θ falls, s_{ts} becomes positive to encourage domestic employment. In the T regime, t_t rises (relative to t_{ts}) to raise domestic production and employment. These policy responses cause c_{ts} to rise above c_t (since the rise in t_t chokes off consumption) and q_{ts} to rise above q_t (since s_{ts} is used less tentatively to foster domestic labor use). The specificity with which s_{ts} achieves its objective implies that the subsidy increase encourages output relatively more than it raises consumption. Therefore, m_{ts} falls to zero more quickly than does m_t.

thereby extract the lowest (if $m > 0$) or highest (if $m < 0$) world price. However if $\theta_t < \theta < \theta_s$, the objectives of the tariffs in the respective regimes conflict. Furthermore, (30) and (32) clearly indicate that $W_{ts} - W_t$ may rise or fall, depending on the proximity of θ to θ_t or θ_s. The only definite results are

$$\frac{\partial w_t}{\partial \delta} > 0 \qquad \text{for } \theta \text{ near } \theta_s,$$

while

$$\frac{\partial w_t}{\partial \delta} < 0 \qquad \text{for } \theta \text{ near } \theta_t.$$

If an economy operates under a policy regime which eliminates trade, it is hedged against a deterioration in exchange opportunities abroad.

V. Conclusion

This paper assesses the relative effectiveness of second-best trade policies which protect domestic industries characterized by two market imperfections. First, the market wage at which domestic firms hire labor is allowed to differ from the social opportunity cost of employing this factor. Second, changes in the domestic country's purchases or sales abroad affect the world price. The policy mix which maximizes domestic welfare under these conditions is tariff imposition (with a positive or negative tariff as the good is imported or exported) combined with subsidization of domestic employment (with the subsidy positive or negative as the social opportunity cost of labor use is less than or greater than the market wage). The purpose of this paper is to measure the dependence on domestic and foreign demand and supply conditions of the proportion of first-best domestic welfare which can be achieved when one of the two requisite policy instruments cannot be used.

The results for this specific situation suggest implications for the general class of policy problems in which two policy instruments are required for a first-best solution but only one of the necessary instruments can be used. The findings are that, in this setting, the available instrument performs a primary and an adopted role. The primary role is the one this instrument would perform if both policies could be used. The adopted role is the function that would normally be carried out by the missing policy instrument. The analysis of this paper suggests that the second-best policy regime will achieve a higher proportion of first-best welfare if demand and supply conditions emphasize the primary relative to the adopted role of the available policy instrument. If instead the economic structure stresses the available policy's adopted role, the second-best regime will be relatively less effective. The rule has its exceptions, which are evident in the

following specific findings for the particular application considered in this paper.

Suppose only the subsidy instrument can be used. The relationship between the percentage of first-best welfare achieved and market conditions critically depends on the initial trade pattern. If the social opportunity cost of labor is sufficiently low relative to the market wage, it is optimal to subsidize domestic employment and production so much that the domestic country exports the commodity. Suppose, however, that the magnitude of the distortion implies that the good is imported. In that case, stronger domestic demand, cheaper foreign supply, or a higher domestic market wage leads to a lower percentage of first-best welfare achieved by the subsidy-only regime. Each of these conditions makes foreign goods more attractive and therefore enhances the subsidy's adopted role: to restrict imports and thereby minimize the world price. A higher value for the social opportunity cost of labor relative to the market wage affects both the labor market distortion (and therefore the primary function of the subsidy) and the attractiveness of foreign goods. The impact on the adopted role of the subsidy is dominant: the excess demand generated by the higher social marginal cost of domestic production increases the need for the subsidy to be used to restrict imports. The gap between first- and second-best welfare widens. Finally, if the foreign excess supply schedule becomes steeper, the impact on the relative effectiveness of the subsidy-only regime is ambiguous. Conflicting forces affect the relative importance of the subsidy's adopted function. The implied increase in the domestic country's market power argues for an increase in the subsidy to increase production to take advantage of the greater influence on world price. But imports naturally fall as the exchange opportunities deteriorate, reducing the need to restrict trade through policy. If domestic

demand is elastic, the optimal second-best subsidy will fall, its adopted role will have been de-emphasized, and the percentage of first-best welfare achieved is more likely to rise.

If subsidy use is proscribed and only a tariff policy is available, stronger domestic demand or cheaper foreign supply increases the percentage of first-best welfare achieved by the second-best regime. These conditions enhance the primary function of the tariff: to restrict imports. The impact of a rise in the social opportunity cost of labor use relative to the market wage depends on the initial labor market distortion. If the social cost initially exceeds the wage, the distortion grows, the adopted role of the tariff is highlighted, and a smaller proportion of first-best welfare is achieved. If the social cost is initially below the market wage, the tariff-only regime becomes relatively more effective.

If the value of the social cost of labor use relative to the market wage is fixed, an increase in the market wage necessitates a readjustment in the second-best tariff rate to maintain the degree of absolute over- or underprotection offered the domestic industry. A rise in the market wage has the expected effect of enhancing the primary role of the tariff, but increases the percentage of first-best welfare achieved only if the tariff readjustment required is large enough. The size of the required readjustment is directly related to the slope of the domestic market-supply function, which is greater if the market-wage is higher.[24]

Finally, an increase in the slope of the foreign excess supply schedule again has an ambiguous impact on the relative effectiveness of the second-best

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[24]Exact conditions under which an increase in the market wage raises the relative effectiveness of the tariff-only regime appear in section IV.B. above.

regime. In contrast to the subsidy-only system, the optimal adjustment in the available policy instrument is certain. A deterioration in exchange opportunities implies a greater effort to restrict trade, and the tariff rate therefore increases in absolute value (rising if the good is imported, falling if it is exported). The ambiguity in welfare implications arises because two identical economies, one with access to a tariff and a subsidy and the other able to use only the tariff, achieve autarky under different degrees of distortion in the labor market. Autarky obviously insulates domestic welfare with respect to changes in the slope of the trading partner's supply schedule. It follows that, if the economy operating with both policy instruments happens to be insulated, the country under the second-best system is harmed by the deterioration in trading terms and vice versa. Therefore, we can conclude only that if the labor market distortion is such that the first (second)-best economy is not trading, the tariff-only regime will be relatively less (more) effective the steeper the foreign excess supply schedule.

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