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An Evaluation of Neutral Trade Policy Incentives Under Increasing Returns to Scale

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Under the most plausible scenarios about the entry and exit of firms, a policy of export promotion is likely to be more beneficial than a policy of trade protection for sectors with increasing returns to scale.

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Observing the limitations of small domestic markets, Bela Balassa has advocated low, uniform, across-the-board tariffs and export subsidies — that is, tariffs of X percent balanced by export subsidies of X percent — to overcome the disadvantages of small domestic markets and to permit the exploitation of economies of scale through specialization according to comparative advantage.

De Melo and Roland-Holst show analytically and empirically that economies of scale complicate analysis of the welfare effects of trade policy, especially when some sectors have domestic market power.

In particular, the standard distortionary costs of protection under constant returns to scale must be amended to accommodate the welfare effects of changes in scale efficiency.

Calculations comparing trade policies that achieve neutrality of incentives between sales to domestic and foreign markets suggest that — under the most plausible scenarios about the entry and exit of firms — export promotion is likely to be more beneficial than protection for sectors with increasing returns to scale.

Illustrative calculations of optimal trade policy packages suggest that the benefits of departing from the principle of nondiscrimination between domestic and export sales may be insufficient to justify their higher administrative costs.

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...in developing countries where protective barriers are high and there is bias against the exports of manufactured goods, the limitations of domestic markets generally permit only the construction of plants that are below optimum size. By contrast, the disadvantages of small national markets are surmounted in countries where low protective barriers and the lack of bias against exports permit efficient-scale operations through specialization according to comparative advantage...

Balassa (1971, 78-79)

New developments in the theory of international trade often suggest, implicitly or explicitly, that in an imperfectly competitive environment, government intervention may be needed to achieve optimality. The most celebrated example in this new literature is the profit-shifting argument of Brander and Spencer (1984). Another example, perhaps more widely applicable, is the argument developed by Krugman (1985) showing that protection can serve as an export promotion policy under certain circumstances. These arguments have fostered a literature on strategic trade theory, which deals with conditions of imperfect competition between international trading partners.[1] The trade and development literature, on the other hand, concentrates on the implications of imperfectly competitive domestic markets.

In the first of Balassa's (1971) comparative studies on trade policies in developing countries, he argued (in the passage quoted above) that the small size of domestic markets in developing countries was a hindrance to the exploitation of scale economies. He recommended policies to promote exports as a way to break this bottleneck. In his second comparative study of trade policies in semi-industrial countries (Balassa 1982), he ascribed the superior performance of the outward-oriented development strategies in East Asia to the provision of equal incentives to sales on the home and export markets (that is, to the avoidance of home-market bias). Further, in recognition of the learning effects and externalities that accompany the establishment of new industries, Balassa (1975) recommended temporary protection to new activities, which would be gradually scaled down to an across-the-board protection level of about 10 percent. In favoring market neutrality, Balassa is not only applying the principle of nondiscrimination, but he is also emphasizing trade policy rules, or rules of thumb, that have low administrative costs and do not depend on econometric evidence for their administration.

In this paper, we explore the robustness of these strategies in a setting that is representative of semi-industrial market structures and conduct. We recognize that production in some industrial sectors takes place under increasing returns to scale and that pricing in tradable sectors distinguishes between domestic and export markets. The home country is assumed to be a price-taker in both import and export markets. Thus terms of trade are fixed, and we rule out the possibility of strategic trade policy to exploit monopoly power in international trade (the possibility of using trade policy to shift profits to domestic firms). (By contrast, the strategic trade literature assumes that oligopolistic interactions occur in international markets, so that trade policy affects the home country's terms of trade—circumstances that are more representative of developed countries than semi-industrial ones.) The purpose of the paper is then to reexamine the merits of protection, with and without neutrality of domestic and foreign sales incentives, when some manufacturing sectors operate under increasing returns to scale and domestic firms behave oligopolistically.

We first derive analytically the comparative statics of tariff and subsidy policy in the setting described above, and then we derive criteria for optimal tariff-subsidy policies. Because of intermediate linkages, the welfare effects of trade policy changes are not generally determinate in this multisectoral, general equilibrium setting. This provides the motivation for our simulation analysis, which is prefaced by a summary of the model and a discussion of alternative specifications of oligopoly behavior. Next, we explore systematically the effects of tariffs and export subsidies on welfare with a computable general equilibrium (CGE) model of a representative semi-industrial country with increasing returns and oligopoly behavior in selected manufacturing activities. Finally, we return to the issues of neutrality and optimal protection, comparing the welfare effects of trade policies that provide only import protection for sectors with scale economies with those of policies that combine tariffs and export subsidies.

Welfare Determinants of Trade Policy Under Increasing Returns

This section presents basic analytical results on the welfare effects of import tariffs and export subsidies. It extends the work of Dixit (1984) and Rodrik (1988) by encompassing export subsidies, the selling of sectoral output on different markets (domestic and export), and imperfect substitution between domestic and imported goods. These features are reproduced in the model structure of the empirical application in later sections. In this setting, we show that both import tariffs and export subsidies contribute to distortions in domestic demand. On the supply side, our results indicate that tariff protection alone may induce producers to divert output from exports to the domestic market rather than expanding production and realizing scale economics. When protection and export incentives are neutral, however, we show that scale economies can be realized that will offset or even outweigh the welfare costs of distortions in demand. We conclude the section with the derivation of a general expression for the optimal tariff-subsidy combination. The expression takes explicit account of the linkages and cost externalities that arise under increasing returns in a general equilibrium context. The expression also shows how optimal trade policy necessitates a mixture of domestic market protection and export incentives to balance the relative profitability of sales in the two markets.

Notational conventions follow Dixit (1984). The economy has k sectors, each consisting of n_i identical firms ($i = 1,...,k$) producing output (z_i) for domestic use (y_i) and export (x_i). As in the numerical application below, firm output and sales allocation decisions are separable. Hence the allocation decision along a continuous transformation surface, $z_i = F_i(x_i,y_i)$, depends only on relative prices in the producer's domestic and export markets for output.[2] Each identical firm has a representative cost function $c_i(x_i,y_i)$. Domestic and world prices are k-vectors p and P, respectively, as are ad valorem import tariffs t and export subsidies s. Sectoral domestic prices are an inverse function $p(q)$ of domestic demands, $q_i = M_i + n_iY_i$, themselves an aggregate of imports and domestic output for domestic use.

To evaluate the welfare effect of import and export distortions, we consider all sectors simultaneously in a general equilibrium framework. In a situation in which the government makes only lump-sum transfers and commodity preferences are those of a single representative consumer, aggregate welfare can be decomposed into three components. The first of these is consumer surplus,

(1) $$g(q) = \int_0^q p(u)du - p(q)q,$$

or the area under sectoral demand curves, net of domestic sales revenues. The second component of domestic welfare is the sum of firm profits across sectors:

(2) $$n'\pi = n'[\hat{p}y + \hat{P}(I+\hat{s})x - c(x,y)],$$

where a caret expands the vector in question into a diagonal matrix and a prime denotes a transposition. This expression accounts for revenues from domestic and export sales (which may be subsidized) and total cost. The third component of domestic welfare is tariff revenue net of export subsidy outlays, $[t'\hat{P}M - s'\hat{P}\hat{n}x]$. It reflects the direct change in domestic income due to the imposition of trade-distorting measures when world prices are fixed.

The resulting domestic welfare function is then given by

(3) $$\begin{aligned} W &= g(q) + n'\pi + t'\hat{P}M - s'\hat{P}\hat{n}x \\ &= g(q) + n'[\hat{p}y + \hat{P}x - c(x,y)] + t'\hat{P}M. \end{aligned}$$

We are interested primarily in the welfare effects of trade policies in the form of tariffs and export subsidies. Total differentiation of expression 3 gives a decomposition of the welfare effects of trade policy changes:

(4) $$\begin{aligned} dW = t'q_p(p_t dt + p_s ds) + n'(I - c_z)\,[(y_p + x_p)p_t dt \\ + (x_s + y_s)ds] - n'(\hat{a} - c_z)\hat{z}\hat{n}^{-1}dn. \end{aligned}$$

Subscripts denote partial differentiation. So q_p is the Jacobian matrix of price derivatives for domestic demand, and y_p and x_s are matrices of direct supply responses in domestic and export markets. The Jacobian c_z is the marginal cost matrix for domestic production, including (off the diagonal) cost externalities that may be conferred by increasing returns sectors. The vector $a = \hat{z}^{-1}c(x,y)$ contains sectoral average costs.

The first term on the right side of expression 4 measures the distortionary cost in consumption and is negative when the domestic demand curve slopes downward. We have assumed that imports and domestic goods are imperfect substitutes in use and that domestic goods are imperfect substitutes in domestic and export sales. These assumptions of product differentiation imply that domestic prices are endogenous and can be affected by either tariffs or export subsidies. So, under the assumption that the aggregate demand curve is downward sloping, the first term on the right side of expression 4 indicates welfare losses from consumption distortions due to a tariff (dt), an export subsidy (ds), or a combination of the two. This term corresponds to the standard welfare costs of protection in the case of constant returns to scale.

Scale efficiency effects, which are summarized in the second term on the right side of equation 4, are slightly more complex. Note first tha , with normal demand behavior, benefits from protection can arise from expansion of total output in sectors with scale economies. Domestic supply can be expected to rise with domestic prices ($y_p>0$) and exports with the subsidy rate ($x_s>0$). However, the net effect of each of these direct supply responses on total sectoral output depends on the extent of intermarket diversion. Rising domestic prices may induce a diversion from exports to an increasingly lucrative domestic market ($x_p<0$), while subsidies might induce diversion in the opposite direction ($y_s>0$). The ultimate effect on output depends on the relative magnitudes of the supply and diversion effects ($z_p = y_p + x_p$ and $z_s = x_s + y_s$) and is ultimately an empirical question. What is clear from expression 4, however, is that tariffs and export subsidies can be beneficial if domestic firms' marginal costs are below world prices. Thus, with no firm entry or exit, tariffs and subsidies can be beneficial if the efficiency gains from scale expansion exceed the distortionary costs of protection.

The third term in expression 4 represents the effects on welfare of changes in the number of firms. The negative sign indicates that, where there are scale economies, firm entry is detrimental to welfare and that the magnitude of the welfare loss increases with the degree of unexploi ed scale economies.

We now pose the question: What would be an optimal choice of tariff and subsidy levels with respect to our domestic welfare function? Given the qualitative symmetry of tariff and subsidy effects, it is unlikely that any policy that implements one without the other could be optimal, but their interplay may be more subtle than simple rules of thumb such as neutrality (equal rates) would imply.

We now derive optimal tariff and subsidy rates in the context of the model already presented. To simplify discussion, we assume that there is no firm entry or exit.

To maximize domestic welfare, we form the Lagrangian expression

$$L(t,s) = W(t,s) + \lambda[z - F(x,y)] \,, \tag{5}$$

which leads to first-order conditions of the form

$$W_t = t'q_p + n'(I - c_z)(y_p + x_p) = \lambda(Z_p - F_x x_p - F_y y_p) \tag{6}$$

and

$$W_s = t'q_p p_s + n'(\mathrm{I} - c_z)(x_s + y_s) = \lambda(Z_s - F_x x_s - F_y y_s) \,. \tag{7}$$

The last two equations can be solved for the vector of optimal tariffs:

$$t = -n'(I - c_z) y_p q_p^{1} \,. \tag{8}$$

This expression shows that the optimal tariff depends on the extent of unexploited scale economies and on the elasticities of supply and demand. Conditions for a nonzero optimal tariff are initial marginal costs below world prices or falling from that level, nonzero elasticity of domestic supply, and finite elasticity of domestic demand. Expression 8 also takes account of interactions across the economy and thus derives consistent optimal policy instruments for all sectors simultaneously.

An optimal tariff-subsidy combination will be one that equates the marginal rate of transformation between domestic and export markets with their respective relative prices, that is, one where $MRT = F_x / F_y = p/(1+s)$ in the one-sector case. More generally, the optimal tariff-subsidy combination will be given by

(9) $$(I + \hat{s})F_x = \hat{p}F_y .$$

Assuming that the Jacobians F_x and F_y are diagonal, then the optimal export subsidy would be that which exactly equalizes the value of marginal domestic product between the two markets. In the numerical exercises below, we compute the vector of optimal export subsidies for a selected vector of uniform import tariffs.

Modeling Oligopolistic Domestic Markets

Since the analytical results presented above are ambiguous with respect to the effects of trade policy on welfare, we use numerical analysis to reveal the relative importance of factors affecting overall welfare. First, we describe briefly the structure of the CGE model used for the simulation exercises in the remainder of the paper.

As was the case in the analytics of the previous section, the model specifies product differentiation between exports and domestic sales and between imports and domestically produced goods in domestic demand. Again, the country is small in international markets. A Leontief technology is specified for intermediate technology. Within sectors, however, domestic and imported inputs are imperfect substitutes. This assumption of product differentiation is also maintained for sectors with scale economies. In those sectors, goods are produced by n_i identical firms. Thus all goods produced for domestic sale in the same sector are perfect substitutes, allowing us to aggr[illegible]e sectoral supply across firms. Consumption demand across sectors is described by a linear expenditure system with nonunitary income elasticities of demand. Finally, value-added is produced by a constant elasticity of substitution technology for two primary factors of production, capital and labor (mobile across sectors), and there is a Leontief technology between aggregate value-added and aggregate intermediates. All final demands arise from a representative consumer, who also receives net tax revenues as a lump-sum income transfer. As in Harris (1984), fixed costs include capital and labor (equal weight on each).

We contrast the case of constant returns to scale (where marginal cost pricing prevails) with two pricing hypotheses in sectors with increasing returns to scale.

In the first alternative, we specify an analogue to the case of perfect competition under constant returns to scale. We assume costless entry / exit, so that the threat of entry forces incumbent firms to price at average cost. In this contestable-market scenario (omitting sectoral subscripts),

(10) $$p_z = a ,$$

for each sector with increasing returns to scale, where p_z is the unit price from the constant elasticity of transformation cost function associated with the transformation function describing sales allocation to the domestic and export markets. Here p_z is the weighted sum of unit sales prices on the domestic (p) and export $(1+s)$ markets and a is average costs.

In the second alternative, we assume that each (identical) firm behaves in the domestic market as a monopolist facing a downward-sloping demand curve. In equilibrium, each firms equates marginal revenue with marginal costs (c_z), that is,

(11) $$\frac{p - c_z}{p} = \frac{\tilde{\Omega}}{n\epsilon},$$

where ϵ is the endogenous elasticity of demand on domestic sales given by

(12) $$\epsilon = \epsilon^F S^F + \epsilon^v S^v,$$

where $F(v)$ denotes final (intermediate) demand and ϵ^F and ϵ^v are functions of the parameters describing substitution effects in intermediate and final demand. Because equation 12 is part of the system of equations that must be satisfied in equilibrium, ϵ is endogenous. The variable Ω is the representative firm's conjecture about the response of competitors to its output decision with respect to firm j. That is, if z_{-j} denotes the aggregate output of the remaining firms in its sectors, then $\Omega \equiv \Delta z_{-j} / \Delta z_j$. The value of Ω is obtained as follows. By choice of units, n is set equal to unity in expression 11. Since the value of ϵ is determined by the parameters and quantities in the model, if one takes p and c_z as data, then the value of Ω is determined by solving equation 11. We denote by $\tilde{\Omega}$ the value of the calibrated representative firm's conjecture.

We contrast two rules for determining firm entry / exit. Define

(13) $$\pi \equiv \pi_y + \pi_x,$$

where π is profit per unit of sales and subscripts y and x denote sales to the domestic and export markets, respectively. In the first alternative, firm entry is determined to ensure that profit per unit of total sales is zero. This assumes that export subsidies allow firms to make a profit on export sales. However, since export subsidies are often justified as a way of defraying the cost of opening new markets, it is reasonable to consider the alternative case in which subsidies to export sales do not give rise to above normal profits. In that second alternative, firm entry is determined to give zero profit on domestic sales.

One would expect that the degree of firm collusion would vary with the number of firms. The fewer the number of firms, the more collusive is behavior likely to be. To capture this effect, we add the following equation to determine conjectures:

(14) $$\tilde{\Omega} = n^{-1},$$

which completes the description of the model.

A Comparison of Trade Policies Under Constant and Increasing Returns to Scale

We now turn to illustrative numerical calculations based on the model outlined above. All simulations refer to the effects of a departure from free trade in an archetypal semi-industrial economy.[3]

The structure of the economy in the hypothetical free trade solution is described in table 1. Of the seven sectors, one is nontradable. The data on sectoral structure indicate an open economy with high trade shares in GDP. Sectoral value-added ratios are quite low, indicating the strong interindustry linkages observed in a semi-industrial economy. The three sectors with increasing returns to scale account for 42 percent of gross output, 73 percent of export sales, and 51 percent of import expenses. For the simulations in this section, we assume a low and uniform cost-disadvantage ratio of 10 percent in sectors with economies of scale.[4]

Table 2 gives the results of simulations comparing the effects of tariff protection and export subsidization. All simulations refer to 10-percent tariff rates and 10-percent export subsidy rates. We contrast four scenarios: constant returns to scale (CRTS) across all sectors, contestable-market pricing for the three sectors with increasing returns to scale, and Cournot competition with total profit or domestic profit determining firm entry. The results presented in table 2 are for protection or export subsidization of (1) sectors with constant returns to scale only (primary, food processing, and traded services); (2) sectors with increasing returns to scale only (consumer goods, producer goods, and heavy industry); or (3) all traded sectors.

Two measures of the welfare effects of changes in trade policy are reported in table 2. The equivalent variation measure is derived from the indirect utility function associated with the Stone-Geary utility function assumed for final demand. It is an aggregate measure of efficiency gains and losses in production and of efficiency losses in consumption. Equivalent variation measures how much the representative consumer would have to be compensated at the new set of prices to be indifferent to the bundle of goods now available at the initial set of prices. The second measure is the scale efficiency gain or loss from moving along average cost curves.[5] Like equivalent variation, scale efficiency evaluates the new output level at old prices, so that the measure controls for shifts in the average cost curve induced by changes in factor and product prices.

Now let us examine the results presented in table 2. Consider first the results under constant returns to scale in the first three columns. In the case of tariff protection, there is a welfare loss from protection regardless of which group of sectors is protected. As expected, the welfare cost of protection increases with the number of sectors being protected. Note that the corresponding welfare loss estimates for export subsidization yield very similar orders of magnitude, with the differences depending on trade volumes and substitution elasticities.

Turn now to the case of contestable-market pricing, which assumes increasing returns to scale for the consumer goods, producer goods, and heavy industry sectors. Now protection of sectors with constant returns to scale is much more costly because a scale efficiency loss results when resources are pulled out of sectors with scale economies. The loss of scale efficiency occurs because firms are forced to produce higher up on their average cost curves. By contrast, protection of sectors with increasing returns to scale is much less costly because of the scale efficiency gain. Note, however, that even though protection is provided across the board for sectors with increasing returns to scale, there is a scale efficiency loss in one

Table 1. Sectoral Features of the Semi-Industrial Economy

Sector	Share in gross output (%)	Exports/ output (%)	Imports/ domestic sales (%)	Elasticity of substitution in production	Export supply elasticity[a]	Import elasticity of demand[a]	Cost dis-advantage ratio[b]	Domestic price elasticity of demand
Primary	8.9	4.9	40.4	2.5	0.75	1.8	--	--
Food products	9.6	2.5	6.5	1.5	1.5	2.5	--	--
Consumer goods	14.4	32.5	14.2	1.0	1.5	2.4	0.1	1.6
Producer goods	20.1	16.6	19.2	0.9	1.5	2.2	0.1	1.3
Heavy industry	7.7	31.9	41.0	0.9	1.5	1.9	0.1	1.4
Traded services	13.2	24.4	7.5	1.5	1.5	2.0	--	--
Nontraded services	26.1	--	--	0.9	--	--	--	--

a. Expenditure-compensated price elasticities. For imports (exports), expenditures (sales) on constant elasticity of substitution (transformation) aggregate of domestic and import (export) goods held constant.

b. The cost disadvantage ratio (difference between average and marginal costs divided by average cost) is a measure of unrealized economies of scale.

Table 2. A Comparison of the Welfare Effects of Tariffs and Export Subsidies under Different Pricing Conditions

Sector	CRTS			Contestable[a]			Cournot (total profit)[b]			Cournot (domestic profit)[c]		
	CRTS	IRTS	All	CRTS	IRTS	All	CRTS	IRTS	All	CRTS	IRTS	All
Ten-percent tariff												
Equivalent variation	-7	-9	-12	-50	-2	-46	12	60	78	-33	-30	-57
Scale efficiency (total)				-42	6	-34	19	69	88	-27	-22	-47
Producer goods				-14	-8	-21	9	33	42	-7	-8	-14
Consumer goods				-24	15	-8	8	15	23	-3	-6	-8
Heavy industry				-4	-1	-5	2	21	23	-3	-6	-8
Firm entry (+)/exit (-)												
Producer goods							-5	-9	-14	-1	2	1
Consumer goods							-5	-1	-5	-1	4	4
Heavy industry							-2	-1	-12	0	4	4
Ten-percent export subsidy												
Equivalent variation	-6	-19	-13	-45	52	27	52	-168	-108	18	15	36
Scale efficiency (total)				-39	74	42	57	-155	-97	24	25	46
Producer goods				-14	38	26	23	-69	-46	8	7	14
Consumer goods				-15	22	10	21	-48	-27	12	14	24
Heavy industry				-10	14	6	13	-38	-24	4	4	8
Firm entry(+)/exit (-)												
Producer goods							-8	23	15	-4	2	-1
Consumer goods							-6	11	6	-4	0	-4
Heavy industry							-9	22	13	-5	1	-4

CRTS = constant returns to scale; IRTS = increasing returns to scale;

Note: All figures are basis points. Figures for equivalent variation and scale efficiency are basis points of GDP (e.g., -168 is 1.68% of GDP); figures for entry/exit are basis points of initial number of firms.

a. Pricing according to equation 10.
b. Pricing according to equation 11, with firm entry/exit determined by total profits, so that $\pi = 0$.
c. Same as note b but with firm entry determined by profits on domestic sales, so that $\pi_y = 0$.

sector. Finally, protecting all sectors results in a larger welfare loss than under the scenario of constant returns to scale in all sectors because of scale efficiency losses.

Now, compare these results with those for export subsidization in the bottom half of the table. The subsidization results corroborate Balassa's assertion that specialization according to comparative enables the disadvantages of small national markets to be surmounted in sectors with unexploited economies of scale. As before, the benefits are greatest when trade policy is confined to sectors with increasing returns to scale. The export subsidization effects dominate the tariff protection effects because of the difficulty of substituting away from imports when incentives are provided to domestic producers, and the ease of expanding sales in international markets when market share is small.

When contestable market pricing is replaced by Cournot competition, the welfare effects of trade policy are affected by three additional adjustment mechanisms: firm entry / exit (the mechanism that achieves zero profits in long-run equilibrium), the endogeneity of firm collusion, and—generally less significant—the anti-competitive effect of protection, which lowers the elasticity of domestic demand, ϵ.[6]

The most important of these mechanisms in influencing the welfare effects of trade policy under Cournot competition is the pattern of firm entry or exit. Take the case of tariff protection, which raises the profitability of domestic sales and lowers the profitability of export sales because of induced appreciation in the real exchange rate. If firm entry or exit depends on the joint profitability of sales in both markets, then there is firm exit because sectors with increasing returns to scale happen to have high export shares in our numerical example. Firm exit allows the remaining firms to move down their average cost curves, thereby reaping the benefits of more efficient scale. If, however, one assumes that firm entry is governed by profits from sales in the domestic market alone, then there is firm entry and protection results in a welfare loss because of the loss in scale efficiency.

By symmetry, a policy of subsidizing exports has opposite effects. Export subsidization leads to crowding-in if the decision to enter depends on total profits because export subsidies lead to large profits on export sales. For the case of export subsidization of sectors with increasing returns to scale, the welfare loss amounts to 1.7 percent of GDP. If, on the other hand, one assumes that export subsidies do not give rise to abnormal profits but rather contribute to defraying the costs (and risks) of selling in new markets, there is a small welfare gain. Interestingly, in the case of export subsidization in sectors with scale economies there is a scale efficiency gain despite some firm entry.

The results presented in table 2 clearly show that if Cournot competition is a reasonable representation of behavior in sectors with increasing returns to scale, firm entry and exit are crucial in determining the sign and magnitude of the effects of trade policy interventions. For the illustrative trade policy interventions reported in table 2, one could argue that entry behavior based on total profits is the more reasonable assumption. However, one can interpret a policy of protection more broadly as one that produces home-market bias because it usually involves quotas and nontariff barriers that create barriers to entry as competition from abroad is suppressed. Then a sheltered domestic market is likely to lead to excessive firm entry because of high profits.[7]

On the other hand, the experience of successful East Asian exporters suggests that it was the provision of export incentives that put domestic producers on an equal footing with their foreign competitors. As argued by Frischtak et al. (1989, 10-11), exporters need support to make the commitment to riskier activities that have a long lead time and sunk costs for identifying suitable markets and setting up distribution channels. Under this interpretation of the costs of establishing successful export activities, subsidies (or incentives that increase the relative profitability of exports) are not likely to give rise to abnormally high profits and hence to induce excessive entry.

An alternative interpretation would emphasize that the appropriate policy in a setting of increasing returns to scale is to promote competition in domestic markets. This logic recognizes that imperfect competition in domestic markets can act as an export barrier by increasing the relative profitability of domestic operations. Ideally, industrial policy would be coordinated with trade policy to encourage the exploitation of efficient scale, promoting exports while avoiding excessive entry.[8]

Evaluation of Protection in Sectors with Scale Economies

We return to the issues raised in the introduction: are there welfare gains from protecting sectors with increasing returns to scale and how does import protection compare with neutral incentives (for example, with tariffs and export subsidies at equal rates)? To answer these questions, we report on simulations in which we contrast across-the-board tariffs of 15 percent with across-the-board export subsidies of 15 percent, both in sectors with scale economies. Protection and export subsidies are confined to the consumer, producer, and capital goods sectors. Now we assume a cost disadvantage ratio of 20 percent, a value more in line with the unexploited economies of scale in the manufacturing sector of a typical semi-industrial country.

The results of these simulations appear in table 3. In the constant-returns-to-scale benchmark case, there is, as before, a welfare loss from protection alone or from export subsidization alone. Neutrality, however, is less costly because the distortion introduced by the export subsidy partly offsets the distortion introduced by the tariff.

Table 3. Protection and Subsidization of Sectors with Increasing Returns to Scale
(cost-disadvantage ratio of 20 percent)

Protection/subsidy	*CRTS*	*Contestable*[a]	*Cournot*[b] *(domestic profit)*
15-percent tariff			
Equivalent variation	-18	12	-106
Scale efficiency	0	31	-88
15-percent export subsidy			
Equivalent variation	-42	274	86
Scale efficiency	0	336	110
15-percent tariff and export subsidy			
Equivalent variation	-31	281	4
Scale efficiency	0	322	27

CRTS is constant returns to scale.

Note: All figures are basis points of GDP (e.g., -106 is -1.06 percent of GDP).

a. Pricing according to equation 10.

b. Pricing according to equation 11, with firm entry and exit determined by profits on domestic sales, so that $\pi_x = 0$

The same pattern of welfare estimates emerges under the assumption of contestable markets. However, because we have assumed a greater degree of unexploited economies of scale, the magnitudes are larger than in table 2. There is a welfare gain of 2.7 percent of base year GDP to be reaped from subsidizing export sales of sectors with increasing returns to scale. Note the superiority of export subsidization over import protection, which springs from our assumption that exporters face a perfectly elastic foreign demand whereas domestically produced goods face a downward sloping domestic demand curve. Hence the incentives created by export subsidization are more direct than those created by protection for domestic sales. While the export demand specification deserves further scrutiny, it appears to correspond to the experience of countries that have followed an export-led development strategy.

In the contestable-market scenario, neutrality produces the largest welfare gains from trade incentives to sectors with increasing returns to scale and sustains the recommendations of Balassa (1975, 1989). In the case of Cournot competition, under the assumptions about firm entry, subsidization of exports dominates the alternative of providing equal incentives to domestic and export sales. This occurs because we have assumed that subsidies to exports do not give rise to profits (and hence do not induce firm entry) whereas protection on the domestic market gives rise to profits and induces firm entry. As we saw above, firm entry results in scale efficiency losses, an effect that comes out clearly in the case of protection to domestic sales. In that case, tariff protection results in a welfare loss that exceeds 1 percent of GDP.

It is obvious that the results under Cournot competition are quite sensitive to the determinants of the number of firms – about which little is known. In the simulations reported here, we have attempted to portray the stylized facts suggested by the comparative studies of foreign trade regimes in developing countries. These studies reveal that countries that have followed import-substitution industrialization strategies have often tended to provide made-to-measure protection for all domestic activities. This protection has, in turn, tended to create excess profit opportunities from domestic sales. When pushed to the extreme, excessive across-the-board protection of industrial activities has been shown to result in excessive firm entry.

We conclude by comparing neutrality of incentives with optimal trade policy. The "optimal" trade policy package is obtained by maximizing the value of the utility function for the representative consumer, taking tariffs as given and export subsidies as endogenous policy instruments. To facilitate the comparison with the results in table 2, we fix all import tariffs at 10 percent for all sectors.

The results of the calculation of these "optimal" trade policy packages appear in table 4. Note first that under the assumption of constant returns to scale in all sectors, the numerical calculations confirm the well-known results predicted by Lerner (1936), namely that across-the-board tariff and export subsidies at the same rates are equivalent to free trade.[9] Note also that the equivalent variation measure achieves a maximum of zero in this case because departure from free trade cannot be beneficial under constant returns to scale.

Under increasing returns to scale, Lerner symmetry still holds: across-the-board tariffs and export subsidies at the same rate are equivalent to free trade. But, as the pattern of export subsidy figures shows, neutrality is no longer optimal. Two results stand out in the contestable-market case. First, as expected, optimality requires that greater incentives be provided to sectors with increasing returns to scale. Second, the difference in welfare benefits is small between optimal trade policy and the rules of thumb advocated by Balassa (1975, 1989) – across-the-board protection (with equal incentives to exports) for manufacturing activities. Here, optimality dominates the rule of thumb of incentive neutrality by less than 10 basis points.

Given the notorious lack of the precise elasticity estimates needed to calculate optimal incentives, the illustrative calculations here do not support a departure from the rule of thumb advocated by Balassa.

Table 4. Optimal Export Subsidies for a Given Ten-Percent Import Tariff on All Tradeables
(cost-disadvantage ratio of 10 percent)

	CTRS	*Contestable*	*Cournot (domestic profit)*[a]
Equivalent variation	0	66 (58)[b]	55 (-6)[b]
Scale efficiency (total)		128	102
Producer goods		54	32
Consumer goods		49	52
Heavy industry		24	18
Firm entry			
Producer goods			-4
Consumer goods			-12
Heavy industry			-11
Export subsidy			
Primary products	10	-6	62
Food processing	10	-1	36
Producer goods	10	24	33
Consumer goods	10	27	25
Heavy industry	10	25	41
Traded services	10	-1	41

Note: The subsidy is in percentage points. Other figures are in basis points.

a. Pricing according to equations 11, with firm entry determined by profits on domestic sales, so that $\pi_y = 0$.

b. Corresponding equivalent variation figure under neutrality, that is, from combining a 10-percent import tariff with a 10-percent export subsidy in sectors with increasing returns to scale.

In the case of Cournot competition, however, the optimal pattern of export subsidies departs further from neutrality. Under this scenario, an optimal policy would encourage firm exit to reap scale economies. As the figures in the last column of table 4 indicate, firm exit would be achieved by providing higher export subsidies to sectors with constant returns to scale.[10] Now departure from a simple rule of thumb yields larger welfare benefits. However, the discussion of table 2 suggested that the results under Cournot competition are very sensitive to the determinants of firm entry, so these results should be interpreted with care.

Conclusion

This paper set out to test the robustness of Balassa's recommendation of neutral incentives to domestic and export sales in a setting where some sectors have domestic market power. We have shown analytically that the welfare effects of trade policy are more complex than they are in a setting of across-the-board constant returns to scale. In particular, we have shown, analytically and numerically, that the standard distortionary costs of protection emphasized under conditions of constant returns to scale must be amended to accommodate, among other things, the welfare effects of changes in scale efficiency.

be amended to accommodate, among other things, the welfare effects of changes in scale efficiency. Illustrative numerical calculations also show that the magnitude of the welfare gains or losses from trade policy intervention are sensitive to the determinants of firm entry and exit.

Calculations comparing trade policies that achieve neutrality of incentives between sales to domestic and those to foreign markets found such policies to be generally superior to policies creating non-neutral incentives. Numerical results also suggest that export promotion is likely to be more beneficial than protection for sectors with increasing returns to scale. Finally, illustrative calculations of optimal trade policy packages suggest that the benefits of departing from the principle of neutrality, or nondiscrimination between domestic and export sales, may be insufficient to justify their higher administrative costs.

Notes

The research reported here is part of the World Bank research project "Industrial Competition, Productive Efficiency and Their Relation to Trade Regimes," RPO 674-46. The numerical work is based on a model developed in de Melo and Tarr (forthcoming). The views expressed here are those of the authors and should not be attributed to their affiliated institutions.

1. See Harris (1989) and Helpman and Krugman (1989) for surveys of this work.
2. Imperfect substitutability in the allocation of sales implies that F_{xi} / F_{yi} varies along a convex transformation frontier. Lower case letters indicate partial derivatives.
3. The archetypal economy was obtained from the free trade solution of a seven-sector CGE model calibrated to the Korean economy for the year 1982. For a description of the data set and parameters values, see de Melo and Roland-Holst (forthcoming).
4. The cost disadvantage ratio is the difference between average and marginal costs, divided by average costs. It is a measure of unrealized economies of scale.
5. The aggregate scale efficiency measure is calculated by using current outputs as weights. For further discussion, see de Melo and Roland-Holst (forthcoming).
6. The magnitude of this effect is small for the functional forms specified here and is not reported. For a discussion of its magnitude, see de Melo and Roland-Holst (forthcoming). Also, see Devarajan and Rodrik (1989).
7. Frischtak et al. (1989) document the pervasive barriers to competition in the manufacturing sectors of developing countries. Eastman and Stykolt (1962) is an early example of a model in which protection leads to firm entry. The typical example is the automobile industry in Latin America (see Baranson 1968).
8. In this regard, the Korean experience during the 1970s is instructive. An activist industrial policy was successful in promoting the growth of large conglomerates and reaping the benefits of scale economies. While exports benefited from this policy, oligopolistic markets developed, and a vigorous antitrust policy was established in the early 1980s to promote greater competition in domestic markets. For further discussion, see Lee, Urata, and Choi (1988) and World Bank (1987).
9. Since there is no guarantee that the optimal vector of subsidies is unique, numerical verification of Lerner symmetry is a useful computational check.
10. While the results of these optimal calculations appear reasonable, there is no guarantee that the computed optima are global optima rather than local optima. Hence these results should be viewed as suggestive and subject to further scrutiny.

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