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Industrial Organization Implications of QR Trade Regimes

Evidence and Welfare Costs

Timothy Condon
and
Jaime de Melo

A three-sector calibrated simulation model is used to examine the welfare effects of an increase in quantitative trade restrictions when production in some sectors is characterized by increasing returns to scale.

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This paper — a product of the Trade Policy Division, Country Economics Department — is part of a larger effort in PRE to help developing countries design more effective trade policy. Specifically it is part of a PRE research project on "Industrial Competition, Productive Efficiency, and Their Relation to Trade Regimes." An earlier version of the paper was presented at the meeting of the "Applied Econometric Association" in Istanbul in December 1986. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Rebecca Sugui, room N10-031, extension 37951 (23 pages, including tables).

The empirical evidence reviewed by Condon and de Melo suggests that in developing countries that protect trade with quantitative restrictions (QRs), too many domestic manufacturing firms tend to operate on too small a scale, often making above-average profits.

Cross-section econometric evidence — considering factors that influence profitability in three sectors — supports the view that imports impose a discipline on the behavior of domestic firms. That is, firms in sectors with heavy imports tend to adopt pricing rules that resemble competitive behavior.

On the basis of this evidence, Condon and de Melo built a three-sector simulation model to examine the welfare effects of an increase in QRs in sectors that have increasing returns to scale. They introduced several model variants to ascertain the effects of industrial organization considerations: firm exits/entries, departures from competitive pricing, interactions between entry and pricing rules, and economies of scale.

They performed numerical simulations on a representative three-sector semi-industrial economy (the sectors being agriculture, manufacturing, and services). The simulations involved progressively tighter QRs, starting from a regime with no QRs.

These simulations suggest that the traditional welfare costs for moderate rationing could be tripled if the manufacturing sector had increasing returns to scale.

A 20-percent rationing of intermediate and consumption goods could result in a welfare loss of about 2 percent of national income if economies of scale and industrial organization are not considered. When industrial organization considerations are considered, the welfare loss could quadruple.

Simulations conducted for alternatives — the entry of enough firms to eliminate profits or oligopolistic pricing with no new firms entering the sector — suggest a trade-off between excessive firm entries and collusive behavior. Collusive behavior causes welfare losses because of anti-competitive pricing but facilitates the exploitation of economies of scale. The welfare gains of moving to competitive pricing through the entry of new firms are mitigated because firms operate on a smaller than optimal scale.

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Industrial Organization Implications of QR Trade Regimes: Evidence and Welfare Costs*

by

Timothy Condon
and
Jaime de Melo

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Industrial Organization Implications of QR Trade Regimes: Evidence and Welfare Costs

1. Introduction

Quantitative restrictions (QRs) are the most common form of protection in many developing countries. Often this type of protection emerges during balance of payments crises but, once in place, is not removed. Students of developing countries' foreign exchange regimes have long noted that QRs have deleterious effects beyond those that would emerge from calculations relying strictly on the "tariff equivalent" of quotas. So far most analysis has concentrated on quantifying the cost of rent-seeking activities which allegedly accompany QRs. 1/ The purpose of this paper is to extend this analysis by parametrizing two stylized observations that have often been noted about the manufacturing sector of QR-ridden foreign trade regimes: (1) unrealized economies of scale; (2) lack of competition among domestic firms. The first arises because of the small size of the domestic market; the second arises because of the made-to-measure protection of QR trade regimes. In sum, the paper builds on the stylized observation that in most QR regimes too many firms operate at too small a scale and often make above normal profits.

The interaction between trade policies and industrial organization has received theoretical and empirical attention in industrial organization studies of structure-conduct-performance in developed countries where it is known as the "import-discipline" hypothesis: the threat of entry by foreign competitors constrains domestic firms to adopt entry-forestalling prices that more closely approximate competitive prices. In addition to receiving empirical support in cross-section econometric analyses of structure-performance relationships, the import-discipline hypothesis has also been recently included in general equilibrium calculations of the costs of protection in Canada (Harris 1985, Cox and Harris 1985). 2/ The analysis here is also in a general equilibrium setting

where the interactions between trade policies and industrial organization issues give rise to welfare costs not recognized in the more traditional applied general equilibrium trade models where constant returns to scale prevail. The mechanisms incorporated in the model are in the spirit of Harris, though because of QRs, the modelling of trade policies and of the linkages between pricing behavior and barriers to entry are different.

The remainder of the paper is organized as follows. Section 2 reviews evidence on linkages between firm behavior, firm size and restrictiveness of the trade regime in semi-industrial developing countries that lend support to our stylized modelling strategy. Section 3 outlines the model. Section 4 reports on simulations from a three sector model that explores the sensitivity of numerical estimates to the parameters describing foreign trade and firm behavior under increasing returns of scale.

2. Profitability, and Firm Behavior in Manufacturing Under Different Trade Regimes: Evidence and Modelling Issues

Evidence about the extent to which restrictive foreign trade regimes in developing countries give rise to oligopolistic behavior and suboptimal scale is scant. This is so because few countries have drastically liberalized QRs. One exception is Chile where evidence on firm profitability and concentration during a regime ridden by tariff and non-tariff barriers (1967) can be compared with firm profitability and concentration during a quasi-free-trade regime (1979). Another example is Korea where many observers agree that conglomerates exercised market power on domestic sales (see World Bank 1987). The evidence from the manufacturing sectors in these two countries is summarized in table 1.

Table 1

Profitability and Exposure to Foreign Trade

(1a) Chilean Manufacturing

Year	Mean Tariff	Mean Price-Cost Margin	4-Firm Concentration Ratio	Exports Output	Import Share in apparent Consumption
1967	74%	48%	49.0	4.0%	20.0%
1979	11%	32%	61.6	13.0%	29.0%

(1b) Korean Manufacturing

Performance of Different Market Structures
(Average of 1978 and 1983)

	Monopoly/ Oligopoly	Competitive	More Protected	Less Protected	High Export Share	Low Export Share
Mean Price Cost Margin	29%	26%	34%	24%	25%	29%

Sources:
(1a) de Melo and Urata (1986, table 1).
(1b) Lee, Urata, and Choi (1988, tables 3 and 8).

Table 1a compares summary statistics from the Chilean manufacturing censuses of 1967 and 1979. The figures indicate that during the restrictive quota-ridden (QR) trade regime of 1967, price-cost margins were large compared with the liberalized trade regime of 1979. The increase in concentration (and decline in the number of firms not shown here) between the two census years is dramatic given that the manufacturing sector was of roughly the same size in 1967 and in 1979. Full adjustment to the new trade regime was not complete, however, since the uniform tariff structure of 10% with no QRs had just been achieved in June 1979 when census data were gathered. It is noteworthy that increased concentration was accompanied by lower price cost margins (PCMs), which is consistent with the removal of protection forcing more competitive pricing because firms face a more elastic demand.

In Korea, the legacy of Korea's development strategy between 1973 and 1979 focussing on heavy and chemical industries has been an extremely concentrated industrial structure by international standards. For example, in 1982, the top 50 Korean firms accounted for 37 percent of total sales while in Japan the top 100 firms accounted for 27 percent of total sales. The figures in table 1b show higher PCMs in the more concentrated sectors. Furthermore, mean PCMs are higher in the highly protected sectors. Also PCMs are lower for sectors with higher export shares. Both results suggest that sectors that compete in international markets price more competitively.

Further evidence taking into account factors other than protection (e.g. differences in capital/labor intensity across sectors) support the conclusions drawn from table 1. For Chile, structural change tests by de Melo and Urata, (1986) based on a cross-sectoral simultaneous equations model of structure and performance applied to the two census years for 41 industrial sectors confirmed

these observations and provided further support for the import discipline hypothesis after controlling for other factors. Likewise, in Korea, after controlling for other factors, results from a cross-sectoral simultaneous equations model of structure and performance (similar to the one fitted for Chile) indicated lower profitability for sectors with higher import penetration shares. But statistical tests revealed no significant structural change in the way the import share affected profitability in different years, a result that is not surprising since trade liberalization was much less in Korea than in Chile. 3/

In sum, these comparisons provide support for the import-discipline hypothesis, namely that protection, by creating barriers to entry, allows existing firms to collude and earn above normal profits. Unfortunately the evidence does not provide direct support for Bhagwati's (1965) insight that QRs create more domestic power than tariffs. 'owever, the Chilean evidence can be viewed as indirect support for his proposition since QRs were very high in 1967 (See Behrman 1976) and average manufacturing-wide profitability was almost 50 percent higher than in 1979.

The Chilean trade liberalization was also accompanied by an increase in intra-industry trade and a reduction in the number of firms (see de Melo and Urata 1986, table 1). This outcome is consistent with recent models of international trade featuring economies of scale with free-entry and a noncooperative equilibrium among firms in Chamberlinian monopolistic competition. A prediction of these models is that a reduction in protection leads to intra-industry specialization and more intra-industry trade. 4/ And the exit of firms in response to a major trade liberalization is consistent with the proposition that protection creates excessive entry. This observation, known as the inefficient entry problem, implies that the number of firms

permitted by economies of scale is small enough to allow effective collusive behavior that raises profits which in turn attracts new firms into the industry until sufficient entry eliminates profits by driving scale down and average costs up. 5/

In the absence of information about foreign firm behavior during trade liberalization, in the simulations reported below, we assume perfectly competitive behavior on the part of foreign suppliers. 6/ Then the question is whether protection, which raises profitability even in the absence of collusion, will not reduce the penalty for cheating on a collusive agreement This suggests that a variable price-fixing agreement should set prices low enough to make cheating unappealing (see Rotemberg and Saloner (1988)). Below we recognize this possibility by allowing for collusive behavior to diminish via entry.

A final issue not recognized in the trade and industrial organization literature but common to many foreign trade regimes in developing countries is that, in foreign-exchange-scarce economies, nearly all imports are essential, that is they are intermediates not produced domestically. One would then expect that the proliferation of inefficient firms engendered by the QR regime would eventually cease when quotas become very binding. In our modeling, we explore this possibility by analyzing a case where firm entry depends negatively on how binding QRs are.

We approach the modelling of the welfare costs of QR regimes in a sequential manner to isolate the effects of changes in scale efficiency, entry/exit and departure from average cost pricing. The pricing rules for the most part are ad-hoc, since they are intended to represent situations where firms can coexist while earning above normal profits. The next section presents the different variants of a model which includes economies of scale with

variable collusive behavior, and firm entry/exit in response to changes in the degree of restrictiveness of QRs.

3. A Stylized CGE Model with QR and Industrial Organization Focus

The model developed here is a static one-period CGE model. (For the illustrative welfare calculation reported in section 4, the representative semi-industrial economy is aggregated into three sectors: agriculture, manufacturing, and services.) In addition to its focus on industrial organization issues, the model differs from companion formulations (e.g. Devarajan and Rodrik (1989) and de Melo and Roland-Holst (forthcoming)) because of its treatment of oligopolistic behavior. Here we focus on exploring the effect of alternative oligopolistic pricing rules. The model has a simple structure. There is no government sector and one single consumer to simplify the disposition of rents under binding QRs. Final demand excludes investment demand, and thus consists of intermediate demand, consumption demand, and imports and exports.

The specification of foreign trade combines the small country assumption with symmetric national product differentiation for imports and exports. 7/ For private consumption, we specify an LES demand system. For intermediate demand, domestic and imported intermediate imports of a same category are imperfect substitutes in use. For example, technology does not allow for substitution between steel and chemicals as inputs, but substitution is allowed between domestic and imported steel, and domestic and imported steel need not combine in use in the same proportions across users. 8/ Two primary factors, capital and labor, mobile across sectors, combine to produce value-added.

Our treatment of firm pricing behavior relies on the observation that domestic industrial policy coupled with import rationing usually provides an

environment in which there are barriers to entry. This allows firms to depart from average cost pricing and to maintain above normal profits in long-run equilibrium under QRs. Barriers to entry come from the presence of QRs, and domestic barriers to entry come from various incentives (investment, credit, etc.), which are appropriated by incumbent firms (for evidence see Frischtak et al. 1989).

Since the model only includes barriers to entry from imports, we start with our modelling assumptions about QRs. We model QR-ridden trade regimes by rationing (separately or jointly) intermediates and consumer goods. Since there is only one representative consumer, rents from consumption and intermediate demand rationing are returned in lump-sum to the representative consumer. For future reference denote by RC_i and RV_i the rents arising from rationing import consumption and intermediate goods. Our proxy for the extent of barriers to entry in sector i will be $B_i = (RC_i+RV_i)/X_i$, i.e. the value of rents per unit of domestic output. The proxy is coarse, but it is the most natural one in this kind of model, and it captures the idea that barriers to entry increase as quotas become more binding.

So far we have said nothing about firm entry-exit, and firm behavior. We will consider five model variants, ranging from constant returns to scale (CRTS) to increasing returns to scale (IRTS) with collusive behavior.

Start with the traditional case where all firms have CRTS production functions (i.e. no fixed costs). This is the base case (variant 1) and the typical firm pricing rule is:

$$(1) \quad PX_i = TC_i/X_i$$

In equation (1), PX_i is unit price (a weighted some of export sale price and domestic sale price); TC_i is total costs; VC_i is variable costs; and; X_i is firm output. Under CRTS, $TC_i = VC_i$ so that firms price at marginal costs. Therefore, in variant 1, the welfare costs of rationing are the traditional production and consumption costs emphasized in the literature on the costs of protection.

Next consider the introduction of fixed costs. Denote the number of firms in the industry by $\bar{N}_i$ where a bar denotes that the number of firms is fixed for now. As in Harris (1985) we have:

$$(2) \quad TC_i = VC_i + FC_i$$

where FC_i is fixed costs defined by:

$$(3) \quad FC_i = (W\,\overline{FL}_i + R\,\overline{FK}_i)\,\bar{N}_i$$

and $\overline{FL}_i$ and $\overline{FK}_i$ are the labor and machines necessary to keep the plant open. Throughout, we maintain the assumption that variable costs, VC_i, are independent of scale. However, variable costs will shift up with a QR because firms have to pay the premium-inclusive price for imported intermediates. The parameter we use to calibrate economies of scale is the cost-disadvantage-ratio (CDR), defined as $CDR_i \equiv FC_i/TC_i$. This is <u>variant</u> 2. In this variant, firms use the pricing rule described in equation (1) so that there are zero profits. With this variant, we assess the impact of IRTS on scale efficiency. The calibration of the model to the representative data set assumes that economies of scale are only operative when QRs are binding.

Next come several variants which we discuss together since they involve the treatment of entry and pricing and the interaction between the two. From Section 2, we assume that firm entry is an increasing function of profits, π_i, that result from collusive behavior. By choice of units, assume one firm prior to rationing. Then firm entry is given by:

$$(4) \quad N_i = 1 + S_i \, (\pi_i)^{\gamma_i} \qquad S_i = 1 \text{ if } FC_i > 0 \\ = 0 \text{ otherwise}$$

where $\gamma_i \geq 0$ is a parameter.

To examine the problem of inefficient entry separately from collusive pricing, we combine the average cost pricing rule of equation (1) with equation (3) in which π_i is replaced by B_i, the rents accruing from QRs in sector i. This is variant 3 (inefficient entry, no collusive pricing). Because there is only one representative consumer, and no government behavior, rents are returned to the consumer in a lump-sum manner.

Now consider collusive behavior. For firm pricing, we assume that departure from competitive pricing is greater the more quotas are binding but that firm entry may dampen collusive behavior. Firm pricing is given by:

$$(5) \quad PX_i = TC_i/X_i + a_i \, B_i^{\alpha_i}/N_i^{\beta_i}$$

where a_i, α_i, $\beta_i \geq 0$ are again parameters.

As mentioned earlier, this representation of pricing behavior has no specific theoretical foundation and is essentially ad-hoc, but it is convenient to explore parametrically a wide range of interactions. In the experiments of Section 4 we report two combinations. In variant 4, we consider collusive pricing but no entry ($\alpha_i > 0$, $\beta_i = \gamma_i = 0$). This is the polar case to Cox and Harris

and de Melo and Roland-Holst where collusive pricing is the cause of entry which continues until $\pi_i = 0$ in the new long-run equilibrium. In variant 5 we introduce simultaneously entry and the negative effect that entry has on collusive behavior ($\alpha_i, \beta_i, \gamma_i > 0$). Other variants are possible, including the case in which entry leads again to zero long-run profits, but we do not report experiments with these variants here since evidence seems to suggest that QR trade regimes are accompanied by higher long-run equilibrium profits than other foreign trade regimes.

Even though the options included here allow us to consider a fairly broad set of interactions between trade policy and industrial organization, the range is still limited. For example, it is quite possible that the excessive entry problem that appears to characterize QR trade regimes in developing countries would be better modelled by having two groups of firms: large and small with a leader-follower model where entry would be restricted to small (and perhaps less efficient) firms.

4. Illustrative Simulations of the Welfare Costs of Protection under QR Trade Regimes

We now report results from simulations with a three-sector representative model of a semi-industrial economy. The sectors are agriculture, manufacturing and services. Economies of scale, when operative, are restricted to manufacturing. Services are nontradable. The equilibrium values resulting from calibrating the model are given in the Appendix. Initial national income (against which welfare losses are measured) is 594 and, by choice of units: Exports = imports = 250 (in domestic currency units) with the following breakdown for imports: intermediates (177) and consumer goods (73). This initial situation thus depicts an open semi-industrialized economy like Korea

in the middle seventies (see Kubo, et. al. 1986). Consequently the welfare costs reported below may be viewed as an upper bound, and one may accordingly wish to scale down the estimates to have a more representative initial starting point. However, we would argue that the alternative to which a QR-ridden trade regime should be evaluated is precisely a relatively undistorted economy, i.e., the case chosen here.

We start by reporting results of sensitivity analysis. In table 2, we vary the price elasticities of import demand and export supply in a CRTS model. We show that the welfare costs of imposing QRs are higher, the less price responsive are import demands and export supplies. In table 3, we vary the extent of economies of scale in the version of the model with zero profits. We show that across-the-board rationing of imports results in a welfare loss and that the welfare loss is greater, the more there are unexploited economies of scale.

Table 2 measures the costs (expressed as percentage of national income) of increasingly binding quotas. All welfare results are obtained from the equivalent variation measure applied to the indirect utility function associated with the Cobb-Douglas utility function describing consumer choice. Column 2 shows that restricting consumer goods imports alone has a relatively small cost, reaching only 2.7 percent of base national income when they are restricted to 50 percent of their initial level. This is so both because of the calibrated price elasticities of final demand (unitary price elasticities) and because consumer goods are typically a small fraction of total imports. When intermediates are included, welfare costs reach 13 percent. Usually, rationing of imported intermediates will not exceed 20 percent in restrictive QR regimes. If consumer rationing comes first and is carried out to 50 percent, welfare costs could still be in the range of 7 to 13 percent, depending on the extent

Table 2

Welfare Costs of Rationing (Variant 1)

Rationing Rate a/	Consumer Imports	Consumer and Intermediate Imports	
		High Trade b/ Elasticities (1.5)	Low Trade b/ Elasticities (0.5)
Column	1	2	3
.9	0.0	0.4	1.0
.8	0.4	1.7	4.9
.7	0.8	4.1	11.9
.6	1.6	7.7	NS
.5	2.7	13.0	NS

Notes: Variant 1 assumes CRTS across all sectors. Welfare costs measured by the equivalent variation expressed as a percentage of pre-rationing national income (e.g. 1.0 is one percent of national income).

NS: No solution (the algorithm failed to converge).

a/ Expresses constrained imports as proportion of unrationed import levels.
b/ High (low) trade elasticities assume across-the-board price elasticities of import demand and export supply of 1.5 (0.5).

of elasticity optimism. From now on, we consider only high trade elasticities, which may be more representative of a semi-industrial economy where substitution possibilities are greater than in a less industrialized economy.

Table 3 introduces economies of scale (variant 2). Results from Table 3 should be compared with the results in Table 2, Column 2. Calibration for scale economies in manufacturing was done to take into account that, even in a medium-size developing country, only a fraction of manufacturing sectors have economies of scale. Somewhat arbitrarily, the cost disadvantage ratio (CDR) parameter is set a value that produces a scale elasticity and about one-half the average used by Cox and Harris for Canada (CDR=0.07). If anything, we would argue that this estimate of unexploited economies of scale is on the low side because we have not included the costs of idle capacity that is said to be prevalent among manufacturing firms in highly restricted QR trade regimes.

When compared with the results in table 2, the welfare costs of rationing are higher under IRTS than under CRTS. This is so, even though increasing rationing (where lower imports are accompanied by lower exports through the balance of trade constraint) leads to a slight increase in scale efficiency reflected in higher values of the scale elasticity as the rationing rate increases. The reason is similar to the results in table 2. With fixed costs, the economy is less able to adjust to rationing. Therefore the flexibility to adjust is lower, the higher is the share of fixed costs in total costs. The results in table 3 suggest that this latter effect dominates the scale effect. Cutting in half the value of CDR only has an impact on the computed value of the local economies of scale when rationing is small. When rationing is severe, the upward shift in variable costs dominates, and the computed welfare costs are quite insensitive to variations in CDR. From now on, we set CDR = 0.07.

Table 3

Welfare Costs of Rationing (Variant 2)
to Scale in Manufacturing a/

Rationing Rate a/	.9	.8	.7	.6	.5
CDR = 0.07	5.3	6.1	8.1	11.2	16.0
Scale elasticity b/	(.925)				(.956)
CDR = 0.035	2.7	3.8	5.9	9.4	14.4
Scale elasticity b/	(.965)				(.979)

a/ See table 2 for definition. Rationing is for both consumer and intermediate goods.

b/ The scale elasticity for solutions with rationing rates of .9 and .5 respectively are reported in parentheses. Scale elasticities are computed as the ratio of marginal to average costs at the solution values.

Notes: CDR, the cost disadvantage ratio, is defined s the ratio of fixed costs to total costs.

We now come to the more controversial aspects of the links between QR regimes and industrial organization as we introduce excessive entry (variant 3), collusive behavior (variant 4), and excessive entry cum collusive behavior variant 5). The results of these alternative formulations are reported in Table 4 for across-the-board rationing rates of 20 percent and 50 percent. Because parametrizing is even more difficult in these cases, we opted to approximate the Chilean firm exit rate when we introduce excessive entry (variant 3) and the rationing rate is 50 percent. The same procedure is adopted when we parametrize collusive behavior (variant 4): we approximate the decline in PCM observed in Chile between 1967 and 1979. The parameters for variants 3 and 4 remain unchanged in variant 5.

Under this parametrization, the welfare costs of a 50 percent rationing rate continue to be dominated by the upward shift in variable costs caused by the higher costs of imported intermediate inputs. Therefore, we concentrate on the results for a 20 percent rationing rate of consumer and intermediate imports. The major difference in estimates is accounted for by the introduction of scale economies. Across-the-board rationing has a welfare cost that is three times higher under IRTS than under CRTS. Clearly, a less costly alternative would be to constrain rationing to sectors with IRTS so that resources would be drawn into these sectors and scale efficiency would be raised.

Contrasting the welfare costs of collusive behavior with no entry (variant 4) with excessive entry and no collusive behavior (variant 3), one finds that welfare costs are the same for this parametrization. When the two variants interact (variant 5), welfare costs of rationing are marginally higher. The results from these simulations suggest that there is a trade-off between excessive entry and collusive behavior. Collusive behavior facilitates the

Table 4
A Comparison of the Welfare Costs of Rationing
Alternative Market Structures

	Rationing Rate a/	Variant 1 CRTS	Variant 2 IRTS; no entry, no collusive behavior	Variant 3 IRTS entry, no collusive behavior	Variant 4 IRTS; no entry, collusive behavior	Variant 5 IRTS; entry, collusive behavior
Welfare Costs: (% of base national income)	.8	1.7	6.1	6.5	6.5	6.7
	.5	13.0	16.0	16.7	17.1	17.3
Price Cost Margin (π_i)	.8	0	0	0	6.0	6.3
	.5	0	0	0	25.7	21.3
Number of firms (Ratio to base)	.8	1	1	1.07	1	1.06
	.5	1	1	1.24	1	1.18

Notes: Model variants refer to variants described in Section 3. Parameter values for all results are: High trade elasticities (1.5), and CDR = 0.07.

a/ See table 2 for definition. Rationing is for both intermediates and consumption goods.
b/ The price cost margin is measured by the profit rate.

exploitation of scale economies but adds a welfare cost because pricing exceeds average costs. Entry to eliminate above normal profits leads to scale inefficiency.

5. Conclusions

The empirical evidence reviewed in this paper suggests that QR trade regimes in developing countries are characterized by above normal profits and excessive entry (in the sense of too many firms operating at suboptimal scale) in manufacturing. Cross-sectional econometric evidence, in which factors contributing to differences in profitability across sectors are taken into account, further support the view that imports create a discipline on the behavior of domestic firms in the sense that firms in sectors with high import shares adopt pricing rules that more closely approximate competitive behavior.

This evidence serves as a basis for building a three sector calibrated simulation model to examine the welfare effects of an increase in QRs where some sectors have increasing returns to scale. Several model variants are introduced separately to ascertain the effects of introducing economies of scale, firm entry/exit, departure from competitive pricing, and interactions between entry and pricing rules.

Numerical simulations are then performed on a representative three-sector semi-industrial economy with the simulations consisting of progressively tightening QRs starting from a regime with no QRs. Numerical simulations suggest as a rough order of magnitude that the traditional welfare cost calculations for moderate rationing could be tripled if the manufacturing sector has increasing returns to scale. Further experimentation with alternative formulations including entry until profits are eliminated and oligopolistic pricing with no entry indicate a trade-off between scale efficiency loss caused by firm entry

to eliminate profits, and departures from average cost pricing under collusive arrangements.

Notes

1/ Krueger (1974) first drew attention to the potential costs of rent-seeking activities in restrictive trade regimes. For illustrative quantitative estimates of the costs of rent-seeking see Mohammad and Whalley (1984), and Grais, de Melo and Urata (1986).

2/ Theoretical and empirical studies of the import discipline hypothesis for develop countries are covered in two symposia edited Caves (1980) and Geroski and Jacquemin (1981). For developing countries see de Melo and Urata (1986), Rodrik (1988), Frischtak et al. (1989), Roberts and Tybout (forthcoming), and citations therein.

3/ See Lee, Urata and Choi (1986). Further tests for Korea provide support for the "structuralist view" (rather than the "efficiency view") interpretation of a positive correlation between concentration and profitability. The two views are contrasted in Clarke, Davies and Waterson (1984).

4/ Increased intra-industry specialization was also accomplished by a reduction in the number of products at the plant level. See Corbo and de Melo (1985, chp. 1) for a summary of firm-level interviews that indicate product rationalization, and Harris (1985) for modelling of this effect in the Canadian context.

5/ Note however that inefficient entry may also occur in the Cournot model with free entry. See Eastman and Stykolt (1960) and Dixit and Norman (1980).

6/ Corbo and de Melo (1985) note the effect of barriers to entry in the commerce sector during the trade liberalizations in the Southern Cone. Several cases of "indirect" cooperation between domestic producers and foreign firms were revealed by interviews: producers turned themselves into importers and entered a profit sharing agreement with foreign firms and maintained high retail prices. This suggests that the assumption of perfectly competitive behavior on the part of foreign suppliers may not be appropriate.

7/ This treatment differs from Harris (1985) and is viewed as more appropriate since it controls for trade-reform-induced terms-of-trade effects which may influence heavily welfare calculations. The offer curve implications of this formulation are treated qualitatively in de Melo and Robinson (1989).

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Appendix

The simulations reported in the text are derived from a three sector representative semi-industrial economy. The initial solution was calibrated to reproduce the following initial equilibrium values (with all prices set equal to one by choice of units):

	Agriculture	Manufacturing	Services
Gross output (XO)	300	400	500
Exports	100	150	
Domestic Consumption	65	111	345
Imported Consumption	28	45	
Imported Intermediates	46	115	16
Domestic Intermediates	135	139	155
National income 594			

The model also includes tariffs and subsidies which are not altered. Production functions are Cobb-Douglas and the parameters of the LES system are such that all subsistence minima are set to zero.

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