The Developing Economies, XXXIII-1 (March 1995)

MEASURING THE EFFECTS OF ECONOMIC INTEGRATION FOR THE SOUTHERN CONE COUNTRIES: INDUSTRY SIMULATIONS OF TRADE LIBERALIZATION

JAIME BEHAR

I. INTRODUCTION

THE main purpose of this article is to investigate the effects of reciprocal tariff reductions for three of the four Latin American countries which form the Southern Cone Common Market (Mercado Común del Sur, MERCOSUR), namely, Argentina, Brazil, and Uruguay. The study is conducted within the framework of the partial equilibrium model developed by Smith and Venables [10]. The model, which allows for economies of scale and trade in differentiated products, has previously been used to analyze the effects of the completion of the European Community (EC) [10], the resource and welfare implications of Spain's access to the EC [5], and the likely effects of EFTA (European Free Trade Association) countries' joining the community [7]. It has also been applied to the study of optimal tariffs and subsidies for industrialized countries [4]. As far as we know, the present study is the first attempt to apply the Smith-Venables model to data on developing countries. Section II of the paper provides some background on the Latin American Integration Association (LAIA) and the MERCOSUR agreement, while Section III examines the provisions for the reduction of tariff and nontariff barriers which are relevant for the objectives of this article. Section IV describes the model and the calibration procedure and makes some short comments on data-related problems. Section V examines some basic

I am very grateful to Jordi Gual (Universidad de Navarra) for providing me with the calibration and simulation programs used in this paper and to Lluis Torres (Universidat Autònoma de Barcelona) for program training. The programs were originally developed by Alasdair Smith and Anthony Venables in connection with the application of their model to EC industries. Helpful comments by referees and an editor are gratefully acknowledged in improving the presentation of the article. The collection of the data used in this paper was performed during my stay as guest researcher, at the Department of Economics, Facultad de Ciencias Sociales, Universidad de la República, Montevideo. The data collection work was made possible thanks to the cooperation of several institutions and individuals. At the risk of failing to mention all of these, I wish to acknowledge my indebtedness to the following: in Montevideo—I. Terra, M. Vaillant, and M. Stein (Universidad de la República); G. Rodríguez Gigena and R. Oliveira (LAIA); R. Grosskoff and M. D. Fernández (DGEC); and W. Alpuin (DGCE); in Buenos Aires—L. Botti (INDEG) and M. Blanco (Banco Central); and in Rio de Janeiro—N. de Castro Senra and S. Bezerra (IBGE). Financial support has been provided by the Swedish Agency for Research Cooperation with Developing Countries and the Swedish Institute for Social Research.

issues of the simulations. Simulation results in terms of welfare and output changes are reported and analyzed in Section VI. They relate to two integration scenarios: one with a 50 per cent reduction in intra-MERCOSUR tariffs and the other with a 100 per cent reduction. A comparison of the results from simulating Bertrand and Cournot firm behavior is also presented in that section. Section VII, finally, focuses on the problem of policy harmonization between MERCOSUR countries. Two central issues here are inter-country disparities in tariffs on imports from third countries and inter-country disparities in exchange policy.

II. BACKGROUND TO THE AGREEMENT

Studies on Latin American economic integration usually report that little effort was made to liberalize intra-regional trade in the sixties and the seventies. This was particularly true in the case of LAFTA (Latin American Free Trade Association), the largest and most ambitious integration scheme, encompassing all of the South American countries and Mexico. The failure of LAFTA to attain its main objective, namely, the complete elimination of trade barriers among the eleven member countries, led to its reorganization into a more flexible scheme, the LAIA, in 1980. The LAIA agreements included provisions for negotiating reductions in tariffs on intra-regional trade on a global basis (the regional preferential tariff), but at the same time, they allowed the liberalization of tariff barriers among members on a bilateral basis. In other words, two or more countries could negotiate larger reciprocal tariff cuts without this implying any obligation to grant a similar preference to other countries. Paradoxically, this reinforced the movement towards a Latin American free trade area during the eighties.

On the one hand, the proliferation of partial trade agreements did accentuate the trend towards the Balkanization of the region, a problem which LAFTA had failed to solve in the past. But, on the other hand, the LAIA agreements greatly encouraged trade negotiations among members. The main reason for this was that the risk for collisions between national interests was diminished as the countries become free to associate according to geographical and cultural proximity or according to affinities in economic policy and weaker disparities in levels of development. This risk reached its highest level in the sixties and the seventies when all of the country members of the LAFTA engaged in intricate and very often sterile tariff negotiations. Ultimately, it undermined the effectiveness of LAFTA's trade liberalization efforts and created a generalized integration pessimism in the region. In this context, the prevailing opinion was that consensus about the degree and the extent of reciprocal tariff reductions could only be attained by separate negotiations between countries which shared some common problem and/or implemented a similar development policy. Moreover, it might also provide a way of strengthening the attractiveness of economic integration for the more reluctant countries.

An example of this is provided by the 1988 economic cooperation agreement between the two largest South American countries, Argentina and Brazil, which stipulated the elimination of all barriers to reciprocal trade over a ten-year period.

Successive negotiations brought the deadline for achieving zero tariffs on bilateral trade forward by five years.[1] The advancements in economic integration made by these two countries, as well as the importance they have for the entire region, compelled Uruguay and Paraguay to join the Argentine-Brazilian trade agreement in March 1991. A new cooperation treaty, the Treaty of Asunción, was signed by the four countries, and the time schedule for achieving tariff-free trade established by Brazil and Argentina was maintained. At the same time, the countries committed themselves to initiating a process of tariff alignment. The objective was to converge toward a low common external tariff (CET) as compared with the members' pre-union tariffs. More recently (in August 1994), the presidents of the four countries agreed to establish a (imperfect) customs union from January 1, 1995. In practice, this means the elimination of tariff and nontariff barriers on trade among member countries and a CET between zero and 20 per cent for third-country imports with some exceptions.[2]

The Southern Cone Common Market, MERCOSUR, comprises nearly 200 million people, who generated a GDP of U.S.$750,000 million and accounted for about 50 per cent of Latin American industrial output and total exports in 1993. It is the second largest trading block in the western hemisphere[3] and one of the most promising attempts at Latin American integration as the rapid growth in trade within the group illustrates. In 1991, intra-MERCOSUR exports amounted to U.S.$5.2 billion and represented 14 per cent of total exports. Corresponding values for 1993 were U.S.$10 billion and 19 per cent. Preliminary estimates indicate that intra-MERCOSUR trade would reach U.S.$12 billion in 1994.

III. PROVISIONS FOR THE ELIMINATION OF TARIFF AND NONTARIFF BARRIERS

A number of partial trade agreements among MERCOSUR countries and between them and the other members of the LAIA were in force in 1985, the base year of this study. They provided for reciprocal tariff reductions on a commodity-by-commodity basis. The most important of these agreements were the complementarity agreements from the seventies between Uruguay and its two neighbors, Argentina and Brazil, and the trade agreement between Argentina and Brazil which maintained the mutual tariff reductions granted during the LAFTA period. In addition, there was the already mentioned agreement on a regional preferential tariff which in principle applied to trade on all intra-LAIA goods.[4] On the whole, they produced a complex system of tariff reductions.

The Treaty of Asunción which established the MERCOSUR simplified the structure of preferential tariffs on imports from members, but not completely.

[1] For an analysis of the Argentine-Brazilian agreement, see Behar [1].

[2] MERCOSUR countries are allowed a list of 1,019 products on which they can set their own external tariffs. Out of these, 300 are included in Argentina's and Brazil's lists.

[3] After the North American Free Trade Area which comprises Canada, Mexico, and the United States.

[4] Excluding the products listed in the schedule of exceptions presented by each country.

The first tariff cut was performed in June of 1991. It set a minimum margin of preference of 47 per cent and augmented the margins of preference which already exceeded this minimum by an additional 7 per cent. A 7 per cent cut every six months would follow until the zero-tariff objective was fulfilled. There were also provisions for gradually reducing the number of items on the exclusion list. These were to be eliminated during a five-year period for Argentina and Brazil and during a six-year period for Paraguay and Uruguay. Finally, there was a strict obligation to maintain previous bilateral margins of preferences during the transitional period.

Another important provision of the agreement relates to the progressive elimination of nontariff barriers to intra-MERCOSUR trade. These consist not only of quotas but also of differential exchange rates, customs valuation with fixed prices, and so on. It is worth noting here that the use of these instruments is common practice in many Latin American countries. They are extensively applied to both intra- and extra-regional trade, not only to protect home production but also to manage balance-of-payments problems. Conversely, there is a large variety of import regimes by means of which selected goods can be temporarily exempted from controls, quotas, as well as tariffs. In some countries, such as Brazil, these administrative controls are pervasive, so that the real structure of industrial protection deviates greatly from the structure of legal tariffs. All of these restrictions are to be removed from intra-MERCOSUR trade by 1995.

Finally, the LAIA agreement for a regional preferential tariff stems from 1982. It established a general basic reduction of 5 per cent which then was to be increased to 10 and 20 per cent in successive years.

IV. DESCRIPTION OF THE MODEL AND THE CALIBRATION PROCEDURE

As stated in the introduction, the effect of integration is to be simulated within the framework of the partial equilibrium model developed by Smith and Venables [10]. Partial equilibrium in an individual industry refers to the partition of the world into a number of "countries" and the emerging pattern of production and consumption observed in 1985. The countries in this case are: Argentina, Brazil, Uruguay, the rest of the LAIA (ROL), and the rest of the world (ROW). Paraguay, the least industrialized among the four MERCOSUR countries, was included in the ROL, as no industrial statistics for this country at the level of aggregation required by the present study were available.

The main differences here compared to former applications of this model are related to the structure of real trade costs which prevailed in the base year. In the cases of the studies on the EC- and EFTA-countries mentioned above, trade costs could be equated with transport costs or with the costs of customs formalities. Accordingly, the authors of the two studies assumed that market share differences across countries were explained by a uniform trade cost of 10 per cent in addition to consumer preferences. The authors of the study on Spain's entry into the EC, however, had to specify four additional costs, namely, Spain's pre-integration EC

tariff and the EC's tariff on Spanish goods, as well as Spain's and the EC's tariffs on imports from third countries. In the present case, we had to estimate a 5×5 matrix of tariff levels for each of the seven industries under study.

In the Smith-Venables model, actual data on consumption, production, and exports for an individual industry are combined with exogenous parameters to compute a number of endogenous variables and parameters. This is the process of calibration. It consists of solving the equations system derived from the demand, supply, and equilibrium conditions specified by the model.

A. *The Model*

There are assumed to be I markets and firms located in one market or another. There are n_i identical firms in each market which produce m_i types of a differentiated product under economies of scale and scope. The firms are able to ship to the other markets by incurring a transport cost in addition to tariffs. Accordingly, observed consumption in country j of products produced in country i can be denoted by $n_i m_i x_{ij} p_{ij}$, observed production in country i by $n_i m_i \sum x_{ij} p_{ij}$, and firms' net receipts by $n_i m_i \sum x_{ij} p_{ij}(1-t_{ij})$, where x, p, and t stand respectively for quantities, prices, and trade costs inclusive of tariffs.

As firms in each individual country are assumed to be perfectly symmetric in models and thus in quantities and prices, the analysis can be carried out in terms of one "representative firm" for each country. Here follows a short description of the model. For more details see the Appendix, and Smith and Venables [10].

The supply side of the model is represented by the profit equation:

$$\prod_i = m_i \sum_j [x_{ij} p_{ij}(1-t_{ij})] - C_i(x_i, m_i), \qquad i=1,\ldots,I \tag{1}$$

where C_i is the firm's production cost function. The profit function is increasing in both output per model ($x_i = \sum x_{ij}$) and in the number of model varieties produced (m_i). The form of the cost function is a weighted average of a linear and a log-linear function.

Demand for individual product varieties is given by

$$x_{ij} = p_{ij}^{-\varepsilon} a_{ij} b_j q_j^{\varepsilon-\mu}, \qquad i, j=1,\ldots,I \tag{2}$$

where a_{ij} is the parameters describing consumer preferences, b_j is the parameters measuring the size of the markets, ε is the elasticity of demand for a single differentiated product, and μ the constant elasticity of demand for the entire industry. q_j is the aggregate price levels of the product in country j; they are derived from the sub-utility function according to the following formula

$$q_j = (\sum a_{ij} n_i m_i p_{ij}^{1-\varepsilon})^{1/(1-\varepsilon)}. \tag{3}$$

Maximization of profit function (1) with respect to x_{ij} and m_i give first order conditions (4) and (5), respectively

$$p_{ij}(1-t_{ij})(1-1/e_{ij}) = (1/m_i)\partial C_i/\partial x_i, \qquad i, j=1,\ldots,I \tag{4}$$

$$\sum_j [x_{ij} p_{ij}(1-t_{ij})(1-\theta_{ij})] = \partial C_i/\partial m_i, \qquad i=1,\ldots,I \tag{5}$$

where $e_{ij} = e(v_i, \varepsilon, \mu, s_{ij})$ is the perceived elasticities of demand and $\theta_{ij} = \theta(w_i, \varepsilon, \mu, s_{ij})$ summarizes the reactions of the firm when the number of models changes. s_{ij} denotes the share of a single representative firm from country i in country j. v_i is the firms' conjectures about the response of other firms to a change in output (Cournot behavior) or in prices (Bertrand behavior), and they are assumed to be zero.[5] w_i is the firm's conjectures about the response of other firms to a change in the number of models they produce, and they are assumed to take on non-zero values. The functional form of e and θ depends on the choice of the output game: Cournot or Bertrand, as shown in the Appendix.

B. *Calibration*

The system of nonlinear equations represented by (2) to (5) characterizes the equilibrium of the segmented market with a fixed number of firms. A number of endogenous variables and parameters are to be calculated: quantities (x) and prices (p) by selling and buying country; levels of costs (c), number of models (m), and conjectures (w) by selling country; and the model elasticity (ε). In order to close the model, additional equations need to be specified. This is done by means of the following normalizing assumptions:

The quantity produced by each representative firm is normalized to one:

$$\sum_j x_{ij} = 1, \qquad i = 1, \ldots, I. \tag{6}$$

Overall profits at the LAIA level are zero:

$$\sum_{i=1..4} \prod_i = 0. \tag{7}$$

The number of models produced in country 1 (Argentina) is equal to observed sales

$$m_1 = \sum (p_{1j} x_{1j} m_1 n_1 / n_1). \tag{8}$$

Firms are assumed to have the same cost function in all the countries

$$C_i = C_1, \quad i = 2, \ldots, I\text{-}1. \tag{9}$$

Note that (6) implies that the number of models is a proxy for firm size while (7) implies that equilibrium profits are in fact deviations from average LAIA profitability.

Demand parameters a_{ij} and b_j are calibrated as follows. a_{ij} is calculated as the differences between the magnitudes that Smith and Venables called tariff equivalents and real trade costs. The former are defined as the hypothetical tariff rates which would make the firm's shares of different national markets consistent with observed shares when demand functions are assumed to be uniform across markets. b_j, in turn, is calibrated to equate total sales in each market with corresponding observed values. Finally, cost function parameters are calibrated

[5] Smith and Venables set $v_i = 0$. They argued that since product differentiation was a characteristic of the industries under study, price-cost margins may be supported by zero conjectures.

using information on the minimum efficient scale (MES), and the percentage increases in average cost at 1/2 of the MES scale.

In accordance to this, calibration demanded the compilation of the following data by industry: the 5×5 matrix of sales in country i of goods produced in country j, the number of firms in each country, the elasticity of aggregate demand, the parameters of the cost function, the 5×5 matrix of tariffs, and the transport costs. Table I reports MERCOSUR averages of calibration results for all seven industries. The table also provides a summary description of each industry.[6]

Indexes in the table include the percentage index of preferences for foreign products and the Herfindahl index of concentration. The former has been derived from the parameters a_{ij} according to formula (10),

$$\sum_{j=i} a_{ij} / \sum_{j} a_{ij}. \tag{10}$$

Note that in principle, a_{ij} would describe the propensity of consumers in country j to acquire the products from country i. In practice, however, the index computed according to (10) could be inconsistent with actual consumers' preferences because of the action of exogenous variables. An example of this is provided by pharmaceutical products. The extremely low magnitude of the index computed for this industry does not mean that MERCOSUR consumers tend to buy domestic products, but simply that imports are constrained by extensive administrative controls.

The Herfindahl index, in turn, provides a measure of market concentration, including sales by foreign firms. Hence, the higher the index the less competitive the industry. It is evident from the formal structure of the model that variations in this index alter the elasticity of substitution and therefore the order of magnitude of welfare and output changes.

Note, finally, that elasticities resulting from Bertrand elasticities are systematically lower than those resulting from Cournot calibration. This is explained by the fact that strategic interactions due to product differentiation are stronger when firms compete on prices. The smallest differences between the two elasticities are recorded for industries in which the Herfindahl index is low. Examples of this are provided by bricks and clay products and electrical machinery.

C. *Sources of Data and Exogenous Parameters*

Data on exports for MERCOSUR countries by industrial origin and country of destination were obtained from published national trade statistics and miscellaneous sources. The value of ROL exports to MERCOSUR countries was derived from import data provided by the same sources, after adjustments were made for differences between f.o.b. and c.i.f. prices. The value of ROL exports to the ROW was calculated by deducting MERCOSUR exports to the ROW as well as intra-LAIA trade from LAIA's overall exports. A similar procedure was used when estimating the value of ROL imports from the ROW.

[6] The entire set of data and parameters as well as the results of calibration for all of the selected industries will be supplied by the author on request.

TABLE I

CALIBRATION RESULTS, BASIC DATA, AND PARAMETERS: ALL INDUSTRIES, 1985

(U.S.$ million, %)

MERCOSUR Aggregates and Averages	Synthetic Fibers	Pharmaceutical Products	Bricks and Clay Products	Office Machinery	Electrical Machinery	Electrical Household App.	Motor Vehicles
Data and parameters							
Market elasticity	0.50	0.80	0.60	0.90	1.10	1.75	1.63
Number of sub-industries	1.00	5.00	1.00	2.00	2.00	3.00	1.00
Number of firms	32.00	141.00	86.00	59.00	132.00	36.00	16.00
Average firms[a]	48.09	25.32	19.97	30.28	16.42	44.62	784.24
Domestic sales[b]	93.76	98.24	97.40	87.37	96.72	98.46	93.46
Imports[c]	5.41	4.59	1.44	12.65	9.44	0.46	1.83
Herfindahl index	0.06	0.08	0.03	0.04	0.02	0.18	0.15
ROW tariff[a]	37.00	19.00	42.00	26.00	29.00	38.00	45.00
Minimum optimal size[d]	68.63	31.51	20.25	44.90	25.46	62.76	1,220.39
Economies of scale[e]	10.00	22.00	15.00	10.00	15.00	10.00	−10.00
Bertrand calibration							
Product group elasticity	8.74	4.77	5.77	9.53	6.33	9.48	6.25
Model number[a]	49.00	25.00	20.00	31.00	17.00	48.00	1,039.00
Model conjectures[a]	25.31	16.82	−2.21	47.79	32.35	48.91	50.49
Preference foreign products[a]	55.98	1.71	35.63	52.48	32.50	45.60	42.76
Price index[a]	1.37	2.17	1.80	1.44	1.84	1.37	1.77
Profitability[f]	4.21	24.46	3.72	2.60	5.15	14.35	63.89
Government tariff revenue[d]	122.38	65.60	25.80	202.21	245.94	12.56	548.83
Tariff equivalents[g]	41.21	85.59	63.46	43.77	49.89	49.75	63.28

TABLE I (Continued)

MERCOSUR Aggregates and Averages	Synthetic Fibres	Pharmaceutical Products	Bricks and Clay Products	Office Machinery	Electrical Machinery	Electrical Household App.	Motor Vehicles
Cournot calibration							
Product group elasticity	23.22	6.29	6.95	12.48	6.74	19.63	8.53
Model number[a]	50.00	77.00	59.00	30.00	17.00	49.00	1,056.00
Model conjectures[a]	−2.20	−1.81	−2.19	2.17	4.41	−2.71	4.26
Preference foreign products[a]	70.96	1.86	41.19	54.15	33.13	53.46	47.89
Price index[a]	1.22	1.79	1.66	1.34	1.74	1.19	1.46
Profitability[f]	66.55	138.28	34.99	23.88	25.35	66.33	218.39
Government tariff revenue[d]	122.38	65.60	25.80	202.21	245.94	12.56	548.23
Tariff equivalents[g]	31.61	78.16	58.75	38.19	48.55	36.53	54.03

[a] Unweighted average.
[b] As % of production.
[c] As % of apparent consumption.
[d] Millions of dollars.
[e] Increase in average costs at 1/2 output per model; motor vehicles: 2 output per model.
[f] Unweighted average from deviations from LAIA average.
[g] Intra-MERCOSUR.

Values of production expressed in national currencies were obtained from industrial censuses and annual surveys for MERCOSUR countries. These were converted to dollars by using real exchange rates, i.e., official exchange rates adjusted by changes in relative price indices around 1985. The number of representative firms in each MERCOSUR country was computed as the inverse of the Herfindhal index of concentration. The indexes were derived from census data on employment by size of establishment.[7] Some adjustments were made so that these figures corresponded to the unknown size distribution of firms.[8] Data on production and on the number of firms for both the ROL and the ROW were not available. Hence, we had to make some gross estimations of these magnitudes. As a norm, we estimated the value of production and the number of firms for the ROL as equal to corresponding magnitudes for the total of MERCOSUR countries.[9] We further assumed a value of production for the ROW that made the ratio of its output to its exports to LAIA-countries the same as the ratio of these countires' output to their exports. Firm size was assumed to be equal to the MERCOSUR average for both the ROL and the ROW.[10]

The computation of 1985 tariffs was rather complex. For each individual industry and MERCOSUR country, we first estimated the ad valorem tariff which the country charged on its imports from the ROW. The information was provided by the statistical office of the LAIA at Montevideo, and from customs publications by each country. The estimation was made by averaging the legal ad valorem tariffs which applied to the main products imported by each country in 1985. In some cases, we weighted the ad valorem tariffs by corresponding import values. Intra-MERCOSUR tariffs were then computed by adjusting basic ROW tariffs according to the preferential reductions stipulated by relevant agreements. Finally, we computed tariffs on trade between MERCOSUR countries and the ROL by adjusting their respective ROW tariffs according to the 10 per cent reduction granted by the LAIA agreement mentioned above.[11] As can be observed in Table I, ROW tariffs are high for MERCOSUR countries. The unweighted average tariff for the selected industries is 34 per cent. Note, however, that there are considerable variations in tariff levels among industries. Inter-country differences (not displayed in the table) are also of importance. The tariffs range from a high of 39 per cent for Brazil to 19 per cent for Argentina. Uruguay's average tariff is 27 per cent.

As already mentioned, basic trade costs include transport and costs for customs formalities. These are likely to vary according to distance and membership in

[7] They thus differ from the indices stated in the tables.

[8] Census data on the number of firms were available for Brazil but not for Argentina or Uruguay. For these two countries the adjustment was made on the data provided by miscellaneous sources.

[9] The exception was motor vehicles. The ROL value of production for this industry was estimated on the basis of data for Mexico, the other large producer in the region.

[10] A similar approach was adopted by Smith and Venables [10] and Gual, Martinez-Giralt, and Vives [5] when estimating the same magnitudes for the ROW and for the rest of the EC. We have to remark, as these authors did, on the artificial nature of these figures and the need for caution when interpreting results for the ROL and the ROW.

[11] The ROL's ROW tariff was estimated as the average of corresponding MERCOSUR tariffs.

the integration schemes. Hence, we assumed differential trade costs by export market: 15 per cent for all trade with the ROW, 11.25 per cent for MERCOSUR trade with the ROL, and 7.5 per cent for intra-MERCOSUR trade.

Six of the seven industries included in this paper make up a subset of the industries considered by Smith and Venables [10]. For these industries, the market elasticity of demand and cost parameters other than the MES were taken from the mentioned study. For bricks and clay products, the seventh industry, an elasticity identical to the one used by Smith and Venables when calibrating the cement industry was assumed. Cost parameters in turn were taken from Pratten [8]. It was finally assumed that the average MERCOSUR firm was a proxy for the MES for all of the selected industries.[12]

A final remark should be made about the division of the selected industries into a number of symmetric sub-industries. Smith and Venables justified this procedure by referring to the heterogeneous product composition of the output of statistically aggregate industries. The authors argued that this would in many cases preclude the model from capturing "the competitive interaction between firms at a disaggregate product level." The argument also applies to the industries selected for analysis by the present study. Note, however, that the number of sub-industries stipulated in the tables may differ from those in the Smith-Venables study due to divergencies in the definition of an individual industry.[13]

V. SIMULATING TRADE LIBERALIZATION

Preferential tariff-reductions are incorporated into the model quite simply: they diminish trade costs within the MERCOSUR and the LAIA, thereby altering relative prices. The economic effects of these variations in terms of welfare and output can then be estimated by simulating various competition frameworks (Bertrand or Cournot), diverse market conditions (the number of firms is allowed to vary or not to vary), and different degrees of market integration (markets are segmented or completely integrated).[14]

Clearly, the scenario characterized by fully integrated markets is not relevant for this study. It corresponds to the objective that EC countries are presently close to achieving, that is, the integration of national markets into an economic union. By contrast, the integration process of MERCOSUR countries is in its earliest phase, namely, the building of a customs union. Consequently, the policy experiments undertaken in this study are exclusively related to an integration scenario where firms are still able to price discriminate between different national markets.

Adjustment costs produced by trade liberalization and/or economic integration are likely to be strongest for highly protected economies. Firms and workers, for

[12] Two reasons for making this assumption were the shortage of scale-efficiency measures for Latin American countries and the fact that the engineering estimates which appear in the Smith-Venables study relate to industrialized economies.

[13] This in turn depends on discrepancies between the industry classifications used in the studies: the NACE in the Smith-Venables study and the ISIC in the present one.

[14] The model also allows for simulating a fixed or variable number of models.

instance, may be substantially injured by the elimination of trade barriers and irreparable damage may be caused to domestic production by import competition. This would be particularly true for countries carrying production at levels below the MES because of insufficient domestic market size. In such cases, the ultimate market outcome of integration for an individual country may be not only the exit of the marginal domestic firms but of all firms, with a subsequent falling off of employment and consumption levels. Actually, such negative effects are often mitigated by state interventions, by acquisition of local firms by foreign competitors or simply by direct investment by foreign firms interested in producing for the enlarged market.[15] These dynamics of the integration process are omitted from the comparative statics our simulations depict. Hence, the collapse of individual industries as forecasted by some of our policy experiments should be interpreted with caution, as being indicative of the increasing efforts to coordinate industrial and foreign investment legislation that governments should make when integration gains momentum. Subject to these qualifications, we carry out simulations which allow for both a fixed and variable number of firms. For the latter case, an additional condition for equilibrium is that profits will be zero for all firms in the industry, that is,

$$\prod_i = 0, \qquad i = i, \ldots, I. \tag{11}$$

Two standard models for dealing with imperfect competition are proposed in the literature: the Cournot and the Bertrand models which assume quantities and prices, respectively, as the firms' strategical variables. Research has shown that the appropriateness of one model or the other for the purposes of empirical analysis cannot be decided on a priori grounds [9]. It is rather a matter of the characteristics of the industries under study, mainly their technologies of production and their market structures [9]. In any case, it is now the usual practice to report the results of both Cournot and Bertrand simulations. We follow this practice in the present study although we think that there is reason for presupposing that modelling competition on Bertrand assumptions fits actual firm behavior in MERCOSUR countries better.

A central argument in this connection is related to the widespread use of import quotas as protection devices by MERCOSUR countries. Bhagwati's conclusion about the lack of equivalence between tariffs and quotas raises doubts about the relevancy of Cournot assumptions in the present context. Note indeed that firms behaving according to Cournot assumptions take quantities and thus imports as given. Since quotas and tariffs do not normally lead to the same level of imports, it is unlikely that domestic firms envisaging important changes in trade policy would react according to Cournot assumptions. Domestic firms would most probably expect the supply shocks from abroad to be larger when the quota is eliminated than when the tariff is abolished. Moreover, with differentiated products protected by both import quotas and high tariffs, the risk for a serious loss in

[15] These investments may be stimulated by cost advantages related to the individual country's endowments of skills, management capacity, raw materials, and energy sources as well as by its geographical location.

domestic market share can persist for local firms even when tariffs are eliminated but quotas are maintained. This is the case when domestic firms gain knowledge that consumer preferences do not allow for demanding the quantity of foreign goods specified by the quota at the pre-tariff-reduction price but do so at the post-tariff-reduction price. Thus, it seems reasonable to assume that, in both situations, the domestic firm's response function is one based on prices rather than on quantities which is equivalent to adopting the Bertrand approach (cf. [6]). Hence, we choose Bertrand behavior as our central case and then analyze the differences which emerge when replacing Cournot behavior with that of Bertrand in the simulations.

VI. REDUCING TRADE BARRIERS

A. *Reductions in Tariffs*

In this section, we discuss the results of two policy experiments which incorporate the program of tariff reductions described in Section III. We first simulate a 50 per cent reduction in intra-MERCOSUR tariffs and a 50 per cent increase in LAIA preferential tariff reductions, and then scale up both magnitudes to 100 per cent. The latter experiment is reported in Table II. These scenarios correspond approximately to the extent of preferential tariff reductions to be achieved in 1993 and 1995, respectively. Simulations are carried for both a fixed and variable number of firms, assuming Bertrand behavior.[16]

Direct observation of the table reveals a number of interesting features in the simulation results:

1. *Welfare gains*

Changes in welfare are defined as the sum of changes in consumer surplus, profits, and government tariff revenues. Changes in MERCOSUR aggregate welfare are in columns 4 and 8 of Table II. As emerges from these figures, aggregate welfare improves in all industries. A comparison of the four simulations (the two depicted in the table and those corresponding to the 50 per cent experiment) shows that the strongest differential impact is the one associated with changes in the level of tariff reduction. When the number of firms is assumed to be fixed, the average increase in aggregate welfare as per cent of consumption is 0.17 per cent for a 50 per cent reduction in tariffs. Letting the number of firms vary does not alter this figure.

The increase in welfare is notably amplified when the countries build a free trade area as in Table II, augmenting up to 0.32 and 0.33 per cent on the average for a fixed and variable number of firms, respectively. This is mainly due to the fact that the loss of tariff revenues tends to be compensated by larger increases in consumer surplus when trade liberalization goes further. The removal of all reciprocal tariff barriers, on the other hand, may place MERCOSUR countries

[16] The entire set of results relating to both Bertrand and Cournot assumptions will be supplied by the author on request.

TABLE II

REDUCTION OF TRADE BARRIERS: ALL INDUSTRIES (COMPETITION: BERTRAND)

(Experiment: 100% Reduction in Intra-MERCOSUR Tariffs and 100% Increase in LAIA Preferential Tariff Reductions)

	Fixed Number of Firms				Variable Number of Firms			
	Argentina	Brazil	Uruguay	MERCOSUR	Argentina	Brazil	Uruguay	MERCOSUR
Synthetic fibers								
Δ % in production	3.74	0.89	23.55	1.55	3.19	0.88	33.15	1.60
Δ % in average cost	−0.44	−0.11	−2.59	−0.16	−0.57	−0.08	−1.51	−0.13
Δ in welfare as % consumption	1.02	0.21	0.71	0.33	1.02	0.21	0.47	0.32
Pharmaceutical products								
Δ % in production	0.07	0.09	−1.11	0.05	0.08	0.09	−1.49	0.05
Δ % in average cost	−0.02	−0.02	0.27	−0.01	−0.01	−0.00	−0.02	−0.01
Δ in welfare as % consumption	0.02	0.03	−0.18	0.02	0.02	0.03	−0.23	0.02
Bricks & clay products								
Δ % in production	−1.99	0.51	56.43	0.43	−1.48	0.78	−100.00	0.24
Δ % in average cost	0.36	−0.09	−7.10	−0.08	−0.01	−0.02	−0.00	−0.02
Δ in welfare as % consumption	−0.14	0.12	26.62	0.14	−0.14	0.13	15.14	0.12
Office machinery								
Δ % in production	7.72	1.05	4.19	1.46	113.48	0.45	−63.07	7.36
Δ % in average cost	−0.78	−0.12	−0.44	−0.15	−0.14	−0.01	−0.16	0.01
Δ in welfare as % consumption	0.04	0.13	−3.41	0.11	0.40	0.07	−3.53	0.08

TABLE II (Continued)

	Fixed Number of Firms				Variable Number of Firms			
	Argentina	Brazil	Uruguay	MERCOSUR	Argentina	Brazil	Uruguay	MERCOSUR
Electrical machinery								
Δ % in production	11.18	0.04	−26.51	0.62	19.33	0.05	−100.00	0.92
Δ % in average cost	−1.65	−0.01	5.54	−0.09	−0.15	−0.01	−0.00	−0.01
Δ in welfare as % consumption	1.24	0.05	−0.42	0.13	1.50	0.05	−0.55	0.15
Electrical household app.								
Δ % in production	22.80	−2.62	−32.53	0.88	26.05	−2.60	−80.11	0.84
Δ % in average cost	−2.56	0.32	6.85	−0.05	−1.71	−0.08	−1.06	−0.34
Δ in welfare as % consumption	2.22	0.08	−0.57	0.42	2.29	0.13	−0.78	0.47
Motor vehicles								
Δ % in production	26.54	−2.45	−71.88	1.80	35.10	−3.98	−100.00	1.74
Δ % in average cost	−4.01	0.44	35.91	−0.24	−1.84	−0.12	−0.00	−0.26
Δ in welfare as % consumption	3.88	0.50	2.53	1.10	4.55	0.44	4.03	1.18

in a dilemma because of the loss of the large proportion of government revenues that comes from customs duties. The dilemma is particularly serious for those industries which enjoyed high levels of tariff protection during the base year. In these cases, trade liberalization will cretainly reduce prices and increase consumer surplus, thus improving overall welfare. Yet, the extent of the loss of tariff revenues could eventually lead to undesirable tax pressures on domestic consumption. The risk is considerably augmented when the share of intra-regional imports in consumption was large at the base year or when integration causes imports from partners to increase at the expense of imports from non-partners. Examples of this are electrical household appliances and motor vehicles, where the loss of tariff revenues due to a 100 per cent tariff cut is about 20 per cent of base values.

The ranking of industries according to the size of aggregate welfare changes remains almost stable when we move from the 50 per cent to the 100 per cent tariff reduction scenario or when the assumption of a fixed number of firms is relaxed. The largest gains in welfare are achieved in electrical household appliances, motor vehicles, and synthetic fibers. Again, the explanation is that these industries had relatively large ratios of intra-regional imports to consumption in 1985. Additionally, they have significant returns to scale. The gains, however, are very modest, even for the zero-tariff equilibrium. Welfare gains greater than 1 per cent of base consumption are observed only in the case of motor vehicles.

At the national level of analysis, the magnitude of the welfare index tends to be inversely correlated with the size of the country. For the zero tariff with fixed-number-of-firms scenario, the index is 3.6, 1.2, and 0.16 on the average for Uruguay, Argentina, and Brazil, in this order. Uruguay also records the largest differences in welfare change across industries. The changes range from −3.4 per cent in office machinery to 26.6 per cent in bricks and clay products for the reference equilibrium. Welfare effects for Brazil and Argentina are positive almost throughout while they are negative for Uruguay in four of the seven industries. Evidently, these observations lend some support to the argument in favor of lengthening the transitional period for attaining a zero tariff for Uruguay as well as for Paraguay. Note, however, that in two cases, namely, synthetic fibers and bricks and clay products, welfare considerably improves when the reduction in tariffs is scaled up from 50 to 100 per cent.

The analysis above again raises the controversial question of the advantages and disadvantages of integrating countries which differ widely in size and levels of industrialization. As we shall see immediately, further insight into this question is provided by the rationalization process caused by integration and by the national distribution of changes in output.

2. *Changes in output and average costs*

As previously noted, a matter of concern for MERCOSUR countries is the extent of the inter-industry adjustment which would follow the abolition of reciprocal tariffs. Indeed, policy makers are concerned by the costs of managing this adjustment more than by some hypothetical change in national income. In addition, the desire for a higher level of industrialization or, conversely, the fear

of deindustrialization are likely to shift the subject of public concern from the extent of welfare gains to less esoteric questions. One of these is about the ability of local firms to meet foreign competition in both the domestic and regional markets. We approach the issue by focusing on changes in trade patterns, production, and average costs.

The first effect of a preferential trade agreement is to reduce tariff-adjusted prices of imports from members in relation to the prices of imports from outsiders. This shifts expenditures, reshapes trade flows, and affects output levels. In the present case, the tariff-adjusted prices of intra-MERCOSUR imports fall in relation to the prices of imports from both the rest of LAIA and the rest of the world. As a consequence, expenditures are shifted away from extra-MERCOSUR produced goods, thereby increasing profits for and encouraging production by MERCOSUR firms. When equilibrium is restored, the emerging trade pattern is one of expanding intra-MERCOSUR and intra-LAIA trade and, often, of contracting trade with the ROW. As shown in Table III, the former effect is rather small for pharmaceutical products, moderate for bricks and clay products, office machinery, and electrical power machinery, and quite dramatic for artificial fibers, electrical household appliances, and motor vehicles. Intra-MERCOSUR trade grows by 130 and 500 per cent on the average for a 50 per cent and a 100 per cent tariff cut respectively. Evidently, a longer period of time would be needed to see how wrong these estimates might be, considering that the former level of preferential tariff reductions was to be reached by 1993 and the latter by 1995. Some evidence may, however, be provided on this issue by considering current trends in two-way trade among MERCOSUR countries. Between 1988 (the year prior to the Argentine-Brazilian agreement) and 1993, the increment in intra-MERCOSUR overall exports was 300 per cent, larger than the increment produced by the 50 per cent simulation but smaller than the increment produced by the 100 per cent simulation. Evidently, this comparison is of limited practical relevance for evaluating the accuracy of our estimates. They are based on data for seven manufacturing industries while actual figures refer to all economic sectors, including agriculture. The comparison, however, is useful in the sense that it indicates that the order of magnitude of estimated trade effects does not differ extremely from that suggested by actual growth trends.

As already stated, changes in output tend to be symmetrical to changes in the trade pattern. Table II shows that the removal of tariff barriers on intra-MERCOSUR trade leads to the growth of MERCOSUR output in all industries. Assuming a fixed number of firms, the average output increment is 0.3 per cent for a 50 per cent tariff reduction and 0.9 per cent for a 100 per cent tariff reduction. Larger figures are obtained when the assumption is relaxed: 0.5 per cent and 1.8 per cent, respectively. The national distribution of the production increases, however, ultimately depends on the effects of both gaining access to a broader market and greater competition from partner countries for domestic firms. The expansion of intra-MERCOSUR trade, indeed, raises competition in each market and consequently tends to produce losses in domestic shares in all markets. Overall, the dimension of these market losses (non-expelled in the tables) is inversely

TABLE
CHANGES IN TRADE PATTERNS: MERCOSUR

% Tariff Reduction	Fixed Number of Firms				
	Intra-MERCOSUR Trade	Trade with ROL		Trade with ROW	
		Imports	Exports	Imports	Exports
50	130.5	20.0	32.6	−2.4	0.3
100	502.5	32.5	76.0	−7.5	0.6
50	24.9	9.4	6.5	−0.1	0.0
100	55.0	19.5	13.2	−0.2	0.0
50	102.8	10.0	25.6	−0.4	−0.1
100	296.1	26.3	56.8	−1.0	1.7
50	59.2	7.5	20.5	−1.8	0.2
100	162.3	15.0	45.0	−4.2	0.8
50	74.8	19.7	15.8	−0.6	0.1
100	212.1	42.5	33.8	−1.5	0.2
50	262.3	19.5	38.7	−5.0	−0.1
100	1,263.3	34.2	90.0	−14.7	−1.1
50	253.8	45.7	31.9	−2.6	−0.1
100	1,006.9	105.8	71.6	−8.3	−0.7

correlated to the size of the country. For Brazil, the loss of domestic share ranges from zero to 4.9 per cent, whereas it ranges from 1.4 to 55 per cent for Uruguay and from 0.1 to 12.5 for Argentina. This suggests that integration would reinforce market power for firms located in Brazil. The main factor behind this is the high likelihood for Argentine and Uruguayan firms to incur inefficiency costs in the form of suboptimal production scale. As shown by Cline [3] and Behar [1], the Brazilian market is large enough to reach MES for most products while the converse is true for both Argentina and Uruguay.[17] Integration, however, provides new trade opportunities and this may mitigate the detrimental effect of insufficient market size on the competitiveness of Argentine and Uruguayan firms.[18] Additionally, there is the fact that trade liberalization has a differential impact on the position of firms in the domestic market because of inter-country differences in pre-integration tariffs. In fact, the higher the tariff, the larger the reduction in domestic market price and thus the greater the drop in marginal cost price.

[17] Even when the MES are approached from engineering estimates.

[18] See Behar [2] for an analysis of the effects of trade on cost efficiency related to plant size in MERCOSUR countries.

III

AGGREGATES (BERTRAND CALIBRATION)

	Intra-MERCOSUR Trade	Variable Number of Firms			
		Trade with ROL		Trade with ROW	
		Imports	Exports	Imports	Exports
Artificial fibers					
	133.0	20.1	32.9	−2.4	0.3
	509.9	30.0	78.4	−7.8	0.6
Pharmaceutical products					
	25.3	9.4	6.5	−0.1	0.0
	56.0	19.4	13.2	−0.2	0.0
Bricks & clay products					
	85.7	13.1	25.4	−0.2	−3.5
	172.6	27.7	56.3	−0.5	−5.8
Office machinery					
	58.5	3.2	28.4	−3.4	8.4
	186.4	−2.8	87.7	−10.2	38.6
Electrical machinery					
	70.6	18.8	16.4	−1.1	0.3
	219.9	39.3	36.1	−3.1	1.4
Electrical household					
	269.2	20.7	38.8	−2.1	−0.3
	1,410.3	34.7	89.6	−8.1	−2.2
Motor vehicles					
	273.5	43.3	32.7	−3.0	−0.5
	1,148.9	97.9	72.3	−12.4	−3.6

Accordingly, the relative cost disadvantage of Argentine and Uruguayan firms may be partially offset by stronger price shocks on the Brazilian market.[19]

The final outcome of these factors in terms of output changes and associated changes in average costs is given in Table II. Note that without adjustment in the number of firms, average costs and output necessarily move in opposite directions. This is a consequence of the assumption of decreasing marginal costs. When the number of firms is allowed to vary, a fall in production can be accompanied by a fall in average costs. This is the case when many firms exit, thus reducing aggregate output, but at the same time, remaining firms are able to expand production and to reap unexploited economies of scale.

Major output reductions are recorded for Uruguay. This, of course, is a consequence of the fact that most of Uruguay's industries operate at sub-optimal levels of production. The decline in production is sharpest when tariffs are completely removed and firms are allowed free entry and exit. For bricks and clay

[19] Inter-country differences in the costs of labor, raw materials and electric power may also mitigate the effect of trade liberalization. See UNIDO [11] for an analysis of the potential impact of these cost differentials on intra-MERCOSUR firm competition.

products, electrical machinery, electrical household appliances, and motor vehicles, the output shock is dramatic, leading to the virtual collapse of these industries. These extreme effects should be considered with caution, however. The cut in production, for instance, is significantly reduced when the number of firms is not allowed to vary. In two cases, namely, bricks and clay products and office machinery, the output cut reverts to a considerable increase. As discussed previously, what the results really suggest is that the rationalization process taking place during the transitional period will be particularly painful for Uruguayan firms. It should be mentioned here that no specific provisions are included in the MERCOSUR agreement to facilitate such rationalization. It seems evident, however, that government intervention, foreign investment, merging, and acquisition are of crucial importance for the survival of Uruguay's industry.

Competition on the enlarged market will be mainly dominated by interactions between Argentine and Brazilian firms. A general observation which can be made from the tables concerns the quite limited effect of the MERCOSUR trade-liberalization program on Brazilian industrial activity. Note indeed that the output shock is greater than 1 per cent only in electrical household appliances and in motor vehicles. Compare this with Argentina's large output increments in the four metal-mechanical industries. Two basic explanatory factors here are the comparatively large size of the Brazilian market[20] and the fact that the share of intra-regional trade in consumption is considerably larger for Argentina than for Brazil. Differences in the impact of tariff reductions between the two countries are quite apparent in electrical machinery, electrical household appliances, and motor vehicles. Concerning electrical household appliances, a 100 per cent reduction in tariffs increases output by 23 per cent and reduces average costs by 3 per cent for Argentina. Conversely, output falls by 3 per cent and average costs rise by 0.3 per cent for Brazil. These results correspond to the assumption of a fixed number of firms. Note that average costs tend to fall for Brazil and increase for Argentina when the assumption is relaxed. This is explained by the differential impact of trade liberalization on industry rationalization, namely, a growing number of firms in Argentina and a decreasing number of firms in Brazil.

Two additional observations in terms of winners and losers can be made from the right-hand panel in Table II. The industries that do best in terms of output growth are office machinery for Argentina and artificial and synthetic fibers for Brazil. The main reason for the notable competitive performance of Argentine firms in office machinery is Brazil's considerably higher tariff-level at the base year. There is also the fact that size-associated cost differentials for this industry are relatively low. These two factors enable Argentine firms to increase their share in both the domestic and the Brazilian markets when tariffs are removed. Actually, domestic market loss is relatively unimportant for Brazilian firms, amounting to less than 1 per cent. Note, however, that this represents more than 10 per cent of the Argentina market. The converse situation is true for the case of artificial and synthetic fibers. The reasons for this include weaker differences in pre-integration tariffs and the extremely small size of Argentine firms. This

[20] More than five times the size of the Argentine market for the selected industries.

places the latter in a less favorable position when tariffs are removed. As a consequence, Brazil gains considerably on the Argentine and Uruguayan import markets. This largely offsets the decline in sales in its own market.

B. *Bertrand vs. Cournot*

As stated in Section V, there is reason to believe that the Bertrand assumptions adapt better to actual market conditions in MERCOSUR countries than do the Cournot assumptions. The arguments relate to factors not taken into account by the model, mainly quotas and administrative controls, but which still have a strong impact on the market perception of firms as well as on the configuration of trade flows. There is no a prior reasoning, however, that is strong enough to assure the adequacy of one or the other hypothesis. Thus, it seems convenient to undertake a sensitivity analysis with respect to changes in market behavior assumptions.

As for the calibration results, Table I shows that the main differences are related to group elasticities and model conjectures. For the reasons stated in Section IV, product-group elasticities are systematically greater for Cournot than for Bertrand calibrations, and this implies a higher degree of product differentiation in the latter case. Model conjectures are in turn significantly larger than zero for Bertrand calibrations in almost all industries. Formally, this would indicate that when we assume Bertrand behavior, we are tacitly ascribing a collusive reaction-function to the firms concerning changes in the number of models. Cournot calibrations instead produce close-to-zero conjectures overall, and often they are negative; this indicates a fairly competitive equilibrium. Note, however, that as the number of models is relatively insensitive to the type of competition in the calibrations, and is assumed to be fixed in the simulations, the dilemma is more apparent than real.

Simulations results are considerably modified when market behavior assumptions are altered. The effects of a 50 per cent tariff reduction on MERCOSUR output for instance are invariably enlarged when Bertrand behavior is replaced by Cournot. The reason is that the impact on prices of a tariff reduction is stronger with Cournot than with Bertrand behavior. Consequently, the increase in demand and therefore the increase in output is also greater in the former case. In terms of the MERCOSUR as a whole and in the case of a fixed number of firms, the differential effects seem relatively low, reaching a maximum of 8 percentage points in synthetic fibers. The allocation of output changes by individual country, however, is highly affected, in many cases to an extent greater than is plausible. In synthetic fibers, for instance, Argentine output falls by 1 per cent under Bertrand assumptions and increases by near 200 per cent under Cournot assumptions. Corresponding figures for Brazil are 0.6 and -18 per cent, and 9 and 74 per cent for Uruguay. The differential effects are considerably enlarged when the tariff reduction is 100 per cent. With Cournot behavior the model collapses for synthetic fibers even under the assumption of a fixed number of firms. Quite far-fetched forecasts are also obtained in the case of electrical household appliances and motor vehicles for both Argentina and Brazil, and in office machinery for Uruguay.

VII. CUSTOMS UNION AND FOREIGN EXCHANGE POLICY

Up to now we have assumed that MERCOSUR's ROW tariffs remain unchanged. In this section, we allow these tariffs to converge into one common tariff. This, together with the removal of all intra-MERCOSUR tariff barriers, corresponds to the establishment of a customs union as envisaged in the Treaty of Asunción. The issue is incorporated in the simulations by setting intra-MERCOSUR tariffs at zero and replacing base ROW tariffs with their average. The latter procedure may in part be justified by the fact that MERCOSUR countries have not yet arrived at a decision concerning the level of the common tariff. It is worth noting here that the four countries have defined a timetable for the gradual reduction of their ROW tariffs during the transitional period. However, large inter-country differences in both average tariffs and degrees of tariff dispersion make the harmonization of import policies very difficult.[21]

The efforts of MERCOSUR countries to create fair rules of competition within a common market are currently being eroded by strong fluctuations in real exchange rates. Ultimately this may preclude the establishment of a customs union. At present this risk is considerable. Rates of inflation and monetary conditions in MERCOSUR countries continue to diverge; meanwhile no policy coordination on the foreign exchange market has been achieved. Brazil's monthly rate of inflation was three times that of Uruguay and ten times that of Argentina in 1992. In April of the same year, the exchange rate/inflation gap computed over twelve months was −24 percentage points for Argentina, 137 points for Brazil, and −25 points for Uruguay. All figures indicate that divergencies in real exchange rates among MERCOSUR countries will be amplified. This certainly will have a great impact on relative prices and therefore on trade flows.[22] It could thus be of interest to evaluate the welfare and production effects of variations in exchange rate parities. The scenario is the same as that described by Table II, i.e., tariff-free imports from partners and differential tariffs on imports from the ROW. In accordance with observed trends, we make the following assumptions about movements in real exchange rates: Argentina's currency appreciates by 5 per cent in relation to Brazil's currency and by 3.75 per cent in relation to Uruguay's currency in real terms. Accordingly, the Uruguay peso appreciates by 1.25 per

[21] A tiered tariff system was being negotiated at the time we performed the simulations. There was indications that the average tariff resulting from this system was to be about 30 per cent, that is, very close to the average of the basic ROW tariffs which appear in Table I. As stated in the introduction, the four MERCOSUR countries finally agreed to set a maximum external tariff of 20 per cent.

[22] A comparison of the evolution of prices in Argentina and Brazil with the evolution of prices in the United States is provided in UNIDO [11]. The resutls show that Argentina/Brazil relative prices fluctuated considerably during a fourteen months period. In a sample of thirteen products in May 1989, the price gap favored Argentina by 48 percentage points. One year later the gap had contracted to 5 percentage points. In September 1991, three months after the Argentina currency was pegged to the dollar, the gap had switched to favor Brazil by 10 percentage points. The authors of the study conclude that the greater part of these fluctuations was due to wide variations in exchange rates.

cent in relation to the Brazil cruzado. These movements in exchange rate parities, which seem quite modest compared with past variations, are incorporated into the simulation indirectly, as changes in trade costs. These increase for Argentine shipments to Brazil and decrease for Brazilian sales to Argentina. Uruguay's trade costs are also altered, though to a lesser degree.

Simulations were performed for both a fixed and variable number of firms. The results for a variable number of firms are displayed in Table IV. They will be compared with those analyzed in previous sections.

A. *The Effects of a Common Tariff*

There are marked differences in the impact of a common tariff among the countries. The most striking result in Table IV is the sharp decrease in Brazilian output. With a variable number of firms the adjustment leads literally to a wiping out of the Brazilian office machinery industry. Serious cutbacks in production are also recorded in the other metal-mechanical industries. A crucial factor here is the increased competition of ROW firms in the Brazilian market. Indeed, a common tariff equal to MERCOSUR average duties would imply considerably lower trade barriers against ROW suppliers for Brazil. This in turn would reduce the pre-union prices of imports from ROW. Prices fall by 14 per cent on average, causing domestic demand to shift away from home-produced products with subsequent drops in production. Increased exports to partners are not large enough to compensate local firms for the loss in domestic market share.

Argentine firms in turn reap considerable gains from joining Brazil in a customs union. They increase output in all industries and achieve significant reductions in average costs. The reason here is that the common tariff raises the prices of ROW imports while as Argentine firms are still able to gain market shares in Brazil.

In general the effects are also negative for Uruguay. Exceptions include electrical household appliances and synthetic fibers. As emerges from a comparison of Tables II and IV, the formation of a customs union makes the rationalization process less severe in the former industry and reinforces the favorable impact of the free trade area in the latter.

It should be recognized that these results are subject to reservations more serious than those made in the previous section. The reason is the existence of considerable nontariff barriers to trade with the ROW. These are likely to bias the pattern of price changes foreseen by the model from actual changes. This is true even when ROW tariffs remain unchanged in the simulations, but the risk undoubtedly increases when tariffs on both intra-MERCOSUR trade and trade with the ROW are allowed to vary. Note further that initial tariffs and the volume of trade affected by tariff cuts are considerably larger for the former type of trade than for the latter. It should also be noted that investment flows (including firm merging and acquisition) are likely to increase as integration gains momentum and this may reverse the effects produced by the simulations. All these factors make the results of comparative statics uncertain, especially when compared with the long-run effects on relative prices of the dismantling of nontariff barriers.

TABLE
REDUCTION OF TRADE BARRIERS: ALL
(Experiment: 100% Reduction in Intra-MERCOSUR Tariffs

	Impact of a Common	
	Argentina	Brazil
Synthetic fibers		
Δ % Change in production	29.15	−54.90
Δ % Change in average cost	−0.57	−0.09
Δ Change in welfare as % consumption	−1.65	18.19
Pharmaceutical products		
Δ % Change in production	3.96	−3.72
Δ % Change in average cost	−0.01	−0.00
Δ Change in welfare as % consumption	0.21	0.26
Bricks & clay products		
Δ % Change in production	n.a.	n.a.
Δ % Change in average cost	n.a.	n.a.
Δ Change in welfare as % consumption	n.a.	n.a.
Office machinery		
Δ % Change in production	439.80	−100.00
Δ % Change in average cost	−0.09	−0.00
Δ Change in welfare as % consumption	−6.50	27.30
Electrical machinery		
Δ % Change in production	48.76	−27.76
Δ % Change in average cost	−0.16	−0.00
Δ Change in welfare as % consumption	−0.94	5.95
Electrical household app.		
Δ % Change in production	27.62	−33.74
Δ % Change in average cost	−1.71	−0.09
Δ Change in welfare as % consumpiton	2.00	11.69
Motor vehicles		
Δ % Change in production	46.02	−49.51
Δ % Change in average cost	−1.86	−0.12
Δ Change in welfare as % consumption	2.99	19.26

This is particularly true for Brazil where the dynamic effects of the liberalization of trade with the ROW are expected to be strongest. However, we still believe that the analysis above throws some light on the problems which Brazilian firms would encounter if a low common tariff is adopted. It further aids in understanding why Brazil is actually pressing for the common tariff to be as high as possible in several industries while other countries are hoping for a lower level. Office machinery and motor vehicles are notorious examples of this conflict.

B. *The Effects of Disparities in Exchange Rate*

Disparities in exchange rates (DER) considerably improve the competitive position of Brazilian firms vis-à-vis those of Argentina. The effect is remarkably

IV

INDUSTRIES (COMPETITION: BERTRAND)

and 100% Increase in LAIA Preferential Tariff Reductions)

External Tariff		Impact of Disparities in Exchange Rates			
Uruguay	MERCOSUR	Argentina	Brazil	Uruguay	MERCOSUR
66.84	−42.83	−40.71	11.91	68.39	6.17
−1.52	0.45	−0.27	−0.17	−1.89	0.35
−2.81	15.13	2.94	−1.42	−0.03	−0.79
−4.02	−1.57	−1.58	1.42	0.62	0.55
−0.02	−0.00	−0.00	−0.02	−0.04	−0.01
−0.17	0.23	0.06	−0.13	−0.44	−0.08
n.a.	n.a.	−6.55	2.27	−100.00	1.05
n.a.	n.a.	0.00	−0.04	−0.00	−0.04
n.a.	n.a.	0.87	−0.07	16.03	0.06
−100.00	−66.71	−100.00	14.37	97.35	7.39
−0.00	0.57	−0.00	−0.05	−0.17	−0.09
−5.43	24.66	3.41	−2.27	−6.86	−1.86
−100.00	−23.52	−5.98	6.35	−100.00	5.38
−0.00	0.14	−0.10	−0.01	−0.00	−0.06
−2.79	5.43	2.68	−1.45	−2.29	−1.16
−46.97	−24.61	11.60	0.97	−71.02	1.75
−1.04	0.03	−0.99	−0.15	−2.07	−0.35
−2.70	9.93	1.36	0.04	−0.92	0.24
−100.00	−34.96	14.02	3.73	−100.00	5.00
−0.00	0.32	−1.28	−0.28	−0.00	−0.45
−7.34	16.26	3.62	−0.13	4.33	0.56

strong in synthetic fibers and office machinery. In the latter industry, the appreciation of the Argentine peso radically reverses Argentina's trade flows with its partners. When free entry and exit is allowed, the switch in domestic demand forces out all local firms. In synthetic fibers, 50 per cent of the firms exit the market, and this reduces output by 40 per cent. Brazil gets most of these market shares although Uruguay and the ROL as well make some gains in the Argentine import market.

These two cases are conspicuous examples of the harmful effect which the lack of policy coordination may have on the conditions of competition. This, however, is only one part of the story. With a fixed number of firms, Argentine output declines in all industries. The differential impact of DER in this case ranges from

−2 per cent in pharmaceutical products to −25 per cent in electrical machinery. The comparison also allows for drawing conclusions about the differential impact of DER on average costs when the number of firms is allowed to vary. As shown in Table II, average costs tend to fall in both Argentina and Brazil. The trend is maintained in Table IV, but the pattern of change in average costs is altered. Analysis of the rationalization process in motor vehicles throws light on the issue. With unchanged parities (Table II), integration reduces the number of firms by 5 per cent in Brazil and increases it by 22 per cent in Argentina.[23] Output changes are in accordance with this pattern, but larger, −4 and 35 per cent, respectively. As a consequence, average costs shrunk by 0.1 per cent in Brazil and by 1.8 per cent in Argentina. When the DER are enlarged as in Table IV, the number of firms increases by 6 per cent in Argentina and by 2 per cent in Brazil. Corresponding output increments are 14 and 3.7 per cent. It follows that the fall in average costs will tend to be amplified in Brazil and to contract in Argentina. The changes in percentage are 1.3 and 0.3 per cent, respectively.

Note, finally, that the cuts in production do not translate into such large losses in welfare due to substantial increases in both consumer surplus and tariff revenues.

VIII. CONCLUDING REMARKS

Some words of caution on the limitations of the present study are necessary before summarizing its main results. First, no general conclusion about the overall impact of integration on regional manufacturing output and welfare may be drawn from the simulations because of both the partial equilibrium nature of the model and the rather small number of sampled industries. Second, even if the model incorporates some dynamic aspects such as economies of scale and changes in market concentration, the policy experiments performed in this paper are basically exercises in comparative statics. Third, our approach has not considered the relationship between integration and flows of direct investment, including firm merging and acquisition. As the European experience demonstrates, the progressive integration of national markets tends to increase these flows and this considerably affects both trade patterns and output levels. For these reasons, our results should be at best viewed as crude approximations of the long-run effects of economic integration on trade, output, and welfare and to the adjustment process caused by intra-regional trade liberalization.

The findings of the experiments suggest that trade among MERCOSUR countries would dramatically increase if reciprocal tariff barriers are partially or completely abolished. The rapid growth of intra-regional trade which followed the first round of tariff reductions achieved in 1990–92 seems to confirm these expectations. Likewise, trade with the rest of the LAIA would expand when corresponding preferential tariff reductions are augmented, though not to such large degrees. As

[23] Changes in the number of firms are not displayed in the table. As already explained, the magnitude of these changes is endogenously determined in the simulations by assuming that profits are restored to zero for all firms in the industry [cf. equation (11) in Section V].

concerns trade with the rest of world, our results indicate that imports will contract as the liberalization of intra-regional trade gains momentum. Exports in turn will increase in all but two industries, namely, electrical household appliances and motor vehicles.

In terms of output impacts and the adjustment process, the main results of the paper can be summarized as follows. Major production cutbacks and the largest adjustment costs are predicted for Uruguay. The main factor behind this is quite small size of domestic firms. On the whole, the results for Uruguay demonstrate the importance of government intervention and foreign investment for the survival of several industrial sectors. The impact of trade liberalization on economic activity is stronger for Argentina than for Brazil in relative terms. This is mainly due to the comparatively large size of Brazil's domestic market and the low weight of intra-regional trade in Brazil's consumption. In general the results indicate that integration would reinforce the market power of firms located in Brazil, notwithstanding the fact that pre-integration tariffs are considerably higher for Brazil than for Argentina. The reason again is the higher likelihood for Argentine firms to incur inefficiency costs in the form of suboptimal production scale. In cases where tariff differentials are high and size-associated cost differentials low, however, Argentine firms are able to increase output and make gains in both the domestic and the Brazilian markets.

Overall welfare gains have been computed as changes in the sum of consumer welfare, profits, and government tariff revenues. For the MERCOSUR as a whole, the loss of tariff revenues tends to be matched by increases in consumer surplus. As a consequence, welfare gains are not quantitatively significant, amounting to 0.3 per cent on average. More relevant policy implications are drawn from the allocation of these gains by country. For the most part the welfare effects for Brazil and Argentina are positive, tending to increase when the tariff cut is also increased. This evidently argues in favor of accelerating the process of dismantling tariffs between the two countries. In the case of Uruguay, where the welfare effects are negative in four of the seven industries, th results instead lend some support to the argument in favor of lengthening the transitional period for attaining a zero tariff.

According to our results, current disparities in trade policies among MERCOSUR countries may create serious obstacles to the achievement of their integration objectives. A key concern here is the potential effects of adopting a low average common tariff when inter-country differences in both average tariffs and degrees of tariff dispersion are large. As shown by the experiment undertaken in this study, this is a potentially highly conflictive aspect of the integration process. Even if our quantification of the effects of forming a customs union are subject to serious reservations, it is still indicative of the importance of the issue and consistent with the experience of tariff negotiation so far. In particular, the results depict the problems which Brazilian firms would encounter if a low common tariff is adopted.

A last important result refers to the detrimental effect of disparities in exchange rates on the conditions of competition. The policy experiment undertaken in this

study reveals that the output impact of the simple abolition of tariffs may be considerably altered when regional parities are moderately amplified. In the experiment, a 5 per cent appreciation of Argentina's currency vis-à-vis Brazil's reduces Argentine post-integration output by 2 to 25 per cent.

REFERENCES

1. BEHAR, J. "Economic Integration and Intra-Industry Trade. The Case of the Argentine-Brazilian Trade Agreement," *Journal of Common Markets Studies,* Vol. 29, No. 5 (September 1991).
2. ————. *Trade and Economies of Scale in Mercosur Countries,* Informes de Investigación No. 69 (Stockholm: Institute of Latin American Studies, 1994).
3. CLINE, W. R. "Economies of Scale and Economic Integration in Latin America," in *Terms of Trade and the Optimum Tariff in Latin America,* ed. E. Conesa and J. Nuñez del Arco (Buenos Aires: Inter-American Development Bank and Institute for Latin American Integration, 1982).
4. GASIOREK, M.; SMITH, A.; and VENABLES, A. "Tariffs, Subsidies and Retaliation," *European Economic Review,* Vol. 33, Nos. 2–3 (March 1989).
5. GUAL, J.; MARTÍNEZ-GIRALT, X.; and VIVES, X. "Spain in the EC: The Impact of Trade Liberalization on Selected Industries," mimeographed (1989).
6. KRUGMAN, P. R. "Industrial Organization and International Trade," in *Handbook of Industrial Organization,* ed. R. Schmalensee and R. D. Willig (Amsterdam: North Holland Publishing Co., 1989).
7. NORMAN, V. D. "EFTA and the Internal European Market," *Economic Policy,* Vol. 9 (October 1989).
8. PRATTEN, C. F. "A Survey of the Economies of Scales," in *Basic Findings,* Vol. 2 of *Research of the "Costs of Non-Europe,"* Studies on the Economics of Integration (Brussels: Commission of the European Communities, 1988).
9. SHAPIRO, C. "Theories of Oligopoly Behavior," in *Handbook of Industrial Organization,* ed. R. Schmalensee and R. D. Willig (Amsterdam: North Holland Publishing Co., 1989).
10. SMITH, A., and VENABLES, A. "Completing the Internal Market in the European Community: Some Industry Simulations," *European Economic Review,* Vol. 32, No. 7 (September 1988).
11. United Nations Industrial Development Organization. *Trade Integration and Industrial Restructuring: The Case of MERCOSUR,* PPD. 235 (SPEC.) (Vienna: United Nations Industrial Development Organization, 1993).

APPENDIX

Demand function (2) in the text is derived from the sub-utility function:

$$Y_j=[\sum_i a_{ij}^{1/\varepsilon} n_i m_i x_{ij}^{(\varepsilon-1)/\varepsilon}]^{\varepsilon/(\varepsilon-1)}, \qquad \varepsilon>1,\ j=1,\ldots,I.$$

The function shows constant elasticity of substitution, and it is separable between the homogeneous and differentiated products.

As mentioned in the text, the functional form of e_{ij} and θ_{ij} depends on the choice of the output game. The following expressions are obtained from differentiating demand and inverse demand functions with respect to p_{ij} and m_i,

respectively. Changes are incorporated through the price index q_j (3) for Bertrand behavior and alternatively through the sub-utility function Y_j for Cournot behavior.

Bertrand

$$e_{ij}=\varepsilon-(\varepsilon-\mu)s_{ij},$$

$$\theta_{ij}=\frac{[(1-w_i)s_{ij}+w_i](\varepsilon-\mu)}{e_{ij}(\varepsilon-1)},$$

Cournot

$$e_{ij}=\frac{\varepsilon\mu}{\mu(\mu-\varepsilon)s_{ij}},$$

$$\theta_{ij}=\frac{[(1-w_i)s_{ij}+w_i](\varepsilon-\mu)}{\mu(\varepsilon-1)}.$$

The cost function is assumed to be the same for all firms. It is given by

$$C(x_i, m_i)=c[z(c_0+m_ic_m+m_ix_i)+(1-z)(m_ix_i^{\alpha})^{\beta}],$$

where z and $(1-z)$ are the weights and c, c_0, m_i, c_m, α, and β are the cost parameters.