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Working Paper

Modelling Developing Countries' Policies in General Equilibrium

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Preface & Acknowledgements
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to
*Modelling Developing Countries'
Policies in General Equilibrium*

By
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Preface and Acknowledgments

These two volumes *Modelling Developing Countries' Policies in General Equilibrium* and *Developing Countries in the World Economy* are a collection of mostly co-authored work at Universities and at the World Bank.

My years at the Research Department at the World Bank brought me a lot. The research department was instrumental in the development of general equilibrium modelling and the papers in volume I, *Modelling Developing Countries' Policies in General Equilibrium* owe a great deal to the atmosphere there. For anyone interested in developing countries, the World Bank was, and still largely remains, a place to be.

For the twenty years at the University of Geneva, I am thankful for the opportunity to enter into new collaborations and to start working on the political economy of trade and migration policies. Several papers in volume II are the result of these collaborations.

But my longest and closest affiliation--almost thirty years--has been with CERDI, the premier department in France for studying development, especially problems on Africa, and now with FERDI, its closely affiliated think-Tank that has just celebrated its tenth anniversary. Lectures and seminars at CERDI were the source of collaborations and served as springboard for work in progress. And now, at FERDI we are involved in the debate and design of sustainable development strategies and on how to finance them in an inclusive way. Some of the challenges ahead are raised in the papers in volume II, *Developing Countries in the World Economy*.

All of the papers have previously been published in academic journals or in books. I thank the publishers for the permission to reprint them. I thank Bob Stern for inviting (and prodding) me to reflect and put these volumes together and the staff at World Scientific Publishing for seeing through the production process. I also owe a great debt to my family, Isabelle, Lea, Elissa and Ines for their patience and support.

Looking back, I have had the good fortune of engaging in these collaborations. Reflecting on them, I have mostly been on the receiving side in the exchange of ideas. I owe my co-authors a great debt and feel fortunate that many a collaboration has turned into a lasting friendship. I dedicate these volumes to them.

Geneva, January 2015

Introduction to *Modelling Developing Countries' Policies in General Equilibrium*

This volume collects papers written over the period 1975-1995 when I was active in general equilibrium modelling. At the time, applied (often called computable) general equilibrium (CGE) modelling was as much about solving models as it was about the study of the effects of policies on resource allocation and welfare. Two strands were developing independently. One, at Yale, pursued by Shoven and Whalley used solution methods developed by Scarf (1973) to study the effects of taxation policies (fiscal and trade) on resource allocation in a world of perfect competition à la Arrow and Debreu. The objective was to quantify the efficiency effects of tax reforms in an economy-wide setting (Shoven and Whalley (1992)). The other strand was pursued at the World Bank's research department (Adelman and Robinson (1978), Dervis et al. 1982)). There, emphasis was on the structural/dualistic features of developing economies (Chenery (1979)) and about reaching internal-external balance in the face of external and internal shocks. Quantifying the medium to long-run economy-wide effects of macro (exchange rate) and micro (mostly trade) policies on wages, prices, the distribution of income, patterns of industrialization and rural-urban linkages was to help inform World Bank lending activities.

While both strands were developing at the same time, in spite of using the word 'general equilibrium', they had a very different focus. Those in the Yale tradition had a firm micro-focus: they were largely concerned about extending the qualitative tax analysis developed in 2X2 general equilibrium models by Arnold Harberger and Harry Johnson to multiple sectors and factors, then to multiple countries. Those at the World Bank grew out of an earlier literature on multi-sector planning where prices were absent from the resource allocation process of a dualistic economy moving away from labor surplus. Developing countries' structural transformation was complicated by having to deal with the oil, terms-of-trade and external debt shocks of the 1970s. The papers collected here cover applications in both traditions.

Whether it was on simplex-based methods, or on tâtonnement processes and jacobian algorithms, much effort was expended in model calibration and in devising rapidly converging solutions to large systems of simultaneous non-linear equations. Frontier work on the development of solution techniques was also taking place at the World Bank with the GAMS high-level modelling system (Brooke et al. 1988)) that progressively replaced case-by-case often 'home-made' solution techniques. A big step forward, GAMS and its integrated palette of high-performance solvers contributed to the proliferation of CGE modelling.

The word count below from the [Google books Ngram Viewer](#) for 'computable general equilibrium and applied general equilibrium' in economics books shows rising traction until around 1992 when it starts a slow decline. By then modelers were running out of new applications and on innovative models based on sufficiently accepted behavioral assumptions. Also attention turned towards micro-simulation tools—many embedded in CGE models—as multiple household and firm-level data sets became available to allow for more direct analysis of policies on firms and households

(see the surveys in Dixon and Joergenson (2013)). The decline probably also reflects fatigue growing out of misuse and abuse of economy-wide general equilibrium applications.

Figure 1: Word Count
 (Computable General Equilibrium + Applied General Equilibrium)/economics



Source: Google Ngram viewer

All applications reported here are single-country models calibrated to a base year Social Accounting Matrix (SAM) assumed to reflect an equilibrium in the economy under the selected behavioral assumptions (often referred to as 'model closure'). All applications either have a trade focus, direct or indirect. Model closures contrasted include: perfect or imperfect competition; macro and/ or micro equilibrium; externalities; distortions in goods or factor markets. Policy choices differ across applications. In many it is an invisible government, but in some it is lobbying activity (with or without concern about overall efficiency). With few exceptions, all elasticities are taken off the shelf. No Monte Carlo simulation from distributions of parameter estimates, but quick and dirty sensitivity analysis with robustness focusing instead on alternative closure rules.

Part I: Capturing Economy-Wide Linkages

Papers in part I focus on key assumptions and on the scope covered by the models. Chapter 1, later called the 1-2-3 model (one country, two sectors, and three goods) presents the simplest open-economy trade model. It incorporates product differentiation on the import side (often called the Armington assumption) and on the export side (Constant Elasticity of Transformation (CET)). This formulation became the standard formulation for single-country models (except for the applications in chapters 11 and 14 where goods of different origin are assumed to be perfect substitutes). The paper also clarifies the homogeneity property of micro-focussed perfect-

competition CGEs and how the values of the 'exchange rate or conversion factor' depend on the choice of numéraire and shows how the equilibrium in the model is affected by a transfer and by a change in trade policy. As shown in the paper, the symmetric product differentiation assumption for imports and exports also accommodates the small-country assumption, a realistic assumption in many environments for the magnitudes involved in most trade policy reforms. The small-country assumption avoids searching for the trade policy that would maximize a country's welfare, an unrealistic endeavor in any case since, in a single country model, one cannot consider reactions by trade partners. Representation of the trade equilibrium by offer curves also shows that the formulation with product differentiation fits squarely in accepted trade theory.

Externalities are often introduced in CGEs. Chapter 2 extends the model of chapter 1 to incorporate the externality from exporting that has often been said to be the distinguishing characteristic between Import-Substitution Industrialization (ISI) and Export-Led Growth (ELG) strategies. It was motivated by the failure of the standard trade model to track reasonably well the development of the Korean economy where changes in the structure of the economy observed during the take-off stage could not be captured by the standard CGE model with product differentiation the import and export side (see the model presented in chapter 8 with the exogenous updating of trade shares between periods). The paper starts from the model in chapter 1 and adds learning-by-doing externalities from export activities to offer a possible explanation for the observed patterns of structural change in Korea during its first phase of industrialization into light-manufacturing during the period 1972-75. Then, a the rapid move of resources out of agriculture took place with a stable agricultural terms-of-trade index and a fall of nearly 40% in the price index of capital goods. This parsimonious model tracks well this period in Korea's ELG industrialization. As the mechanisms through which these Marshallian externalities might operate in an ELG strategy are not specified, the skeletal model is only a first step, though perhaps one to consider for aggregating firm-level estimates into an economy-wide framework.

The remaining chapters in part I move progressively towards incorporating macro mechanisms extending beyond (some might say departing) from the micro foundations underlying the applications to tax problems mentioned above. The extensions start with the modelling of alternative policies to adjust to an external shock coming from the combination of declining terms-of-trade, a rising service on external debt and the impossibility to borrow externally. This was the typical situation of the period of adjustment lending in the 1980s. Then, the World Bank, typically focusing on medium-term growth prospects, also had to address a closing of the expenditure-income gap. (Chapter 7 figure 2 shows the links between the current account, factor accumulation, the sectoral pattern of technical progress and the corresponding equilibrium real exchange rate.)

Chapter 3, written at a time when two-gap fix-price models were used to study foreign exchange shortages in developing countries, was motivated by a foreign exchange crisis in Turkey in the late 70s when the country had to effect an external transfer (captured in the model by adjustment to a reduction in external borrowing). The model was used to contrast adjustment by rationing (fix price or premium) with adjustment by a depreciation of the real exchange rate. Simulations

showed the large changes in relative prices and ensuing income redistribution along with the extra costs in terms of lost GDP from adjusting by rationing foreign exchange rather than by a depreciation of the real exchange rate. In another application, after validation over the period 1973-77, the model was used to decompose the role of several real factors (differential in inflation rates, fall in remittances, higher OECD export prices, oil price rise and residual factors) in the equilibrium value of the real exchange rate. These are summarized in chapter 7, table 6.

Chapters 4 and 5 explore the consequences of a different episode that also ended up requiring a closing of the expenditure-income gap. In the late 1970s, Chile combined deep across-the-board structural reforms (see Melo (2015), chapter 1) with a macro stabilization using the exchange rate as an anchor to reduce inflationary expectations. The policy package also included an opening of the capital account which was unusual in developing countries at the time. Restrictions on employment in the labor market were also lifted, but the authorities maintained wage indexation on past inflation in the labor market in the formal sector. Large capital inflows ensued.

Chapter 4 explores a puzzle about this episode and two views about the causes of the sharp 1982 recession. The puzzle related to the high growth rate during the 1977-81 reform period in spite of low investment rates. To investigate this, the model was used in the spirit of Total Factor Productivity (TFP) studies to arrive at a combined estimate of increased capacity utilization and TFP growth. Back-of-the-envelope attributions to the reform-induced TFP growth were also carried out. In a second step, the model was used to contrast two views about the causes of the 1982 recession: external (a fall in the price of copper and higher interest rate on external debt service) versus internal (large capital flows combined with an exogenous real exchange rate resulting in a loss in external competitiveness). Insofar as the large capital inflows were induced by the fixing of the exchange rate, the simulations suggest that it was mostly domestic policies rather than external events that contributed to the crisis.

At the time, Chile was pursuing a policy to reduce inflation. A CGE model is not the first tool that comes to mind to study an episode of disinflation. In Chile, this period corresponded to one with high unemployment (over 10%) and important structural change resulting from the ongoing micro reforms. It was therefore necessary to take into account employment effects that would accompany the anti-inflationary policies. Chapter 5 does so by tacking an ad-hoc macro model to determine the price level which, in turn, was used to determine wages and employment in the manufacturing sector. Two ad-hoc extensions were added to the model. First, to account for the observed consumption splurge in durable goods purchases that occurred as the fixed exchange rate regime was losing credibility, domestic savings were related negatively to capital inflows (an ad-hoc short-cut to mimic forward-looking behavior in an economy in strong macroeconomic disequilibrium). Second, extraneous estimates from a three-asset portfolio model estimated from quarterly data were used to estimate the loss in reserves following from an expansion in the money supply. These estimates were then combined with a Phillips curve, also estimated from quarterly data to determine nominal wages. The outcome was a hybrid model with econometric estimates from quarterly data yearly data on sectoral employment. In this extended model, a reduction in

capital inflows, reduces the price level, and attenuates wage increases. While the paper recognizes that the macro issues raised by the Chilean experience deserved a separate investigation, a skeleton multi-sector model would eventually be needed to trace the employment implications of a reduction in capital inflows.

Chapter 6 goes further. It presents a micro-macro “maquette” addressed to the critique that the structural adjustment programs of the IMF and World Bank administered to countries did not focus on the welfare of the poor (see the critiques to the programs in the introduction). The joint participation of the two institutions meant that these packages had two components: demand management to stabilize the economy and structural adjustment to address supply-side effects of micro-focussed reforms. The maquette links the short-run impact of macroeconomic policies that affect the distribution of income through inflation, the interest rate and other price changes with the medium to long-run distributional effects resulting incentive reforms. Portfolio shifts in response to asset price changes capture the often-heard criticism that structural adjustment packages worsened the distribution of income as owners of foreign-denominated assets gained from the devaluations that were part of the adjustment packages.

This maquette blends distributional shifts coming from relative price changes in multi-sector models with those coming from changes in asset prices captured in an IS-LM framework. Getting there required many debatable assumptions (no expectations, full adjustments in goods and asset markets within each period, no taking into account of rising external on expectations). How realistic and useful these shortcut assumptions are has to be left to the reader when comparing simulation results from alternative packages to an unquestionable adjustment facing developing countries at the time: effecting an external transfer. Simulations suggest that adjustment to an external shock (increase in the interest rate on the external debt and deterioration in the terms of trade) by an exchange rate depreciation dominates packages with contractionary monetary policy or fiscal contraction.

Chapter 7 surveys CGE contributions to the analysis of trade policy scenarios in developing countries. Among those not covered here are estimates of the extra costs of rent-seeking activities and the design of trade policies to raise revenue at least cost in environments with limited administrative capacity where some sectors cannot be taxed and where broad-based instruments like an income tax are not available. Trade policy strategies in the face of an external borrowing constraint represent another important application not covered in the applications here. The survey discusses the set-up of applications to optimal borrowing strategies which equate the real social discount rate with the real cost of foreign borrowing and the real rate of return on capital. Results from an application to a tariff reduction program in Thailand under a lending constraint are reported. They show that the loss in tariff revenue from a tariff reform could result in substantial negative welfare effects as a result of a reduction of foreign credit as the risk of debt repudiation increase following the reduction in tariff revenue.

Part II: Archetype Economies

Part II collects papers built around archetype economies. I was, and remain, a fan of archetype analysis in CGE modelling for two reasons. First, from the start, the reader is invited to accept that the estimates are orders of magnitude. Also since archetype applications go to the essential structural features of the economy, they naturally push the modeler to experiment with different formulations. This approach, emphasizing mechanisms rather than numerical outcomes, is helpful in bringing forth a focus on orders of magnitude rather than on numerical results. Second, in developing countries especially, differences in structure can be significant and result in different outcomes for a same shock or a same policy response to a similar shock.

The 1970s and 1980s were also characterized by systemic shocks. These were identical across many countries (the oil price rise or the rise in interest rates to service the external debt were the same across countries) had differential effects because inherited structures were different: a typical Latin American economy was different from a typical African or from an East Asian economy. Under these—but also under other—conditions, simulations on archetype economies are instructive: they show not only that, as expected, different policy responses to an identical shock have different outcomes, but also that the same policy response has different outcomes across archetypes.

Chapter 8, written at the time when the merits of an industrialization strategy focusing on the domestic market were still debated, contrasts the development path of a representative country following an ELG strategy with one following an (ISI) strategy. The simulations suggest orders of magnitude of efficiency costs related to the bias in incentives under and ISI strategy and the lower capital accumulation from a given savings rate for the ISI strategy because of the higher relative price of capital goods under that strategy. The paper also reports on the marginal efficiency of capital inflows across strategies, an obvious improvement on those suggested by the earlier two-gap models.

Chapters 9 and 10 simulate the effects of external shocks on income distribution in archetype economies with income groups distinguished along three dimensions: sector of activity, source of income (capital or wages in chapter 9 augmented by the holding of assets in chapter 10) and within group variance.

In chapter 9, the emphasis is on distributional conflicts generated by the choice of adjustment policy (devaluation, premium rationing with or without fixed wages). Assuming that society is roughly partitioned into relevant power groups that evaluate correctly their fate ex-ante under each adjustment mechanism, simulation results are used to see how the political struggle between gainers and losers is reflected in the choice of adjustment policy under different weighing schemes: 'one person one vote'; 'one rupee one vote', and the 'elite' measured by the top 5 percent in the overall distribution of income. Policy rankings reported in table 9 show that rankings are invariant across archetypes and that devaluation is only selected under 'one person one-vote' while premium rationing is selected under the 'elite' scheme.

Chapter 10 applies the maquette presented in chapter 7 for a Latin American and an African archetype where. To bracket possibilities, closure rules are purposely orthogonal (flexible prices for Africa, mark-up pricing in the modern sector for Latin America; households and firms hold foreign assets and debt only in the Latin America archetype; downward wage rigidity in the Latin American archetype). Not surprisingly, the distributional consequences of a same adjustment policy are usually radically different across the two archetypes underscoring the importance of taking into account institutional and structural characteristics when drawing structural adjustment packages. In sum, 'one size does not fit all'.

Chapters 11 and 12 deal with two aspects of trade policy that benefit from being examined in general equilibrium. In chapter 11, the infant-industry argument is re-examined in an extended setting more appropriate to the environment where protection was used to promote industrialization. In the standard discussion of the infant-industry argument, the static cost of protection are pitted against the dynamic gains of protecting sectors with presumably higher productivity growth in an otherwise Walrasian full-employment model and no other market frictions or market imperfections. To caricature that representation, the comparisons are between two industrialization strategies twenty to fifty years apart (the time it takes to industrialize) with silence over how the economy gets from here to there. In an economy in the early stages of industrialization, it is more likely that labor is either unemployed or available to the modern protected sector along a Harris-Todaro migration mechanism. As to investment, it could be perhaps be determined exogenously (by animal spirits!) or by a constant savings out of income or a constant savings out of profits. Finally, profit rates across sectors that guide the allocation of investment are unlikely to be equalized instantaneously as capital is reallocated across sectors through depreciation, the speed of reallocation a parameter varied across simulations. These descriptions amount to many market imperfections that can be usefully decomposed by simulations. The figures in the paper showing the ratio of utility levels under the protection and the laissez-faire industrialization strategies in a 3-sector stylized model show quite different paths under rather small differences in assumptions.

Chapter 12 explores the view that trade policy choices reflect a mixture of lobbying activity and concern about overall efficiency. If this view is approximately correct, then can archetype economies approximate two stylized patterns in the data: (i) higher protection in low-income countries; (ii) a protection of manufacturing at the expense of agriculture in low-income countries and the opposite in high-income countries (see chapter 12, figure 1). The paper sets up a lobbying model with intermediate inputs leading to two predictions: (i) the net political power of final industries is greater than that of intermediate industries implying that, as observed in the data, there is tariff escalation by degree of processing: (ii) tariffs are higher in countries with sparse inter-industry linkages (i.e. developing countries) because there is less counter-lobbying activity. Simulations with archetypes representative of high and low-income economies reproduce the two predictions from the theoretical model that are observed in the data.

The rise of migratory pressures from South has raised the issue of appropriate measures by the North wishing to reduce them: direct measures (e.g. aid to increase income in the South) or indirect measures (e.g. a reduction in trade barriers on imports from the South). But again there is diversity in migratory pressures depending on country characteristics. Chapter 13 contrasts direct and indirect measures for two archetypes to show that trade and migration policies cannot be assessed separately.

Part III: Costs of Protection from Trade Policy Regimes in Developing Countries

Part III report on papers that examined the costs associated with developing-country trade policy regimes. At the time, Non-Tariff Barriers (NTBs) in the form of Quantitative Restrictions (QRs) on imports were pervasive leading to additional losses resulting from rent-seeking behavior. It was also often observed that firms were operating at an inefficient scale combined with market power coming from domestic markets sheltered by NTBs. Distortions in factor markets were also suggested as an important source of the misallocation of resources, with differentials in rural-urban wages far exceeding those that would result from differences in the costs of living (augmented by migration costs). Chapter 14, drawn from my Phd thesis, revisits earlier partial equilibrium estimates of the costs of distortions in the labor market. Looking back 40 years, if the paper had merit at the time, it fell short on several counts including the specification of foreign trade.

Chapter 15 also revisits an earlier literature on Effective Rates of Protection (ERP) in a model where product differentiation solved the problem of excessive specialization in models where domestic and foreign traded products are perfect substitutes. Would a ranking of sectors by descending order of ERPs be a good predictor of resource pulls following a tariff reform? As explained and shown in the paper, taking into account changes in the prices of non-traded goods and other general equilibrium effects gives a different ranking of resource pulls than those predicted from a ranking of ERPs.

An influential paper by Richard Harris (1984) opened the way for the modelling of trade policy with scale economies and imperfect competition, an extension that lent itself well to the models with product differentiation. Assuming conveniently the small-country assumption, free trade would no longer be Pareto optimal as scale economies and imperfect competition result in a departure from marginal cost pricing. Maintaining the small country assumption through the CET while foreign firms are left out of the picture avoided specialization, but at the cost of giving a technological advantage to domestic firms that nonetheless eventually experience decreasing returns to scale in exporting activities. Also, even if the use of consistent conjectural variations to model imperfect competition may still be the best game in town, it falls short of characterizing satisfactorily behavior in oligopolistic markets.

Despite these trade-offs, these assumptions were adopted in the papers reported in chapters 16 to 18 (and 20 to 23). On the positive side, these shortcuts (and shortcomings!) allow for a decomposition of the welfare effects of protection under different behavioral assumptions into all

the effects (except for product variety) identified in the trade literature under imperfect competition: scale economies, entry-exit and departure from marginal cost pricing.

Chapter 16 written for a festschrift presented to Béla Balassa, tested his recommendation of according temporary protection cum market neutrality with an across-the-board protection to domestic sales and exports for new industries. The paper decomposed the magnitude of the welfare effects into entry/exit, scale efficiency and, in some cases, the non-neutrality of incentives. The illustrative simulations suggested that policies achieving neutral incentives were superior to those creating non-neutral incentives.

Chapter 17 was inspired by Korea's development strategy between 1973 and 1979 during which Heavy and Chemical Industries (HCI) received four fifth of all investments (usually at preferential rates) and protection from import competition. As documented in the paper, a very concentrated market structure emerged with especially high price-cost margins in the sectors shielded from import competition (see table 10.1). This led Korea to change its strategy and reduce protection to the HCI sectors. The model in chapter 17 is calibrated to these stylized facts and the welfare effects of trade liberalization are calculated under different model closures including one in which trade liberalization forces firms to price less collusively in the domestic market. Because agriculture was the most protected sector in Korea, in all cases, trade liberalization leads to a reallocation of resources away agriculture towards industry. In some cases, there is sufficient firm entry to result in a welfare loss. Without suggestion an active industrialization policy, the paper notes that the Korean industrial policy of favoring conglomerates (the 'jaebol'), and hence preventing entry, was consistent with exploiting scale economies but that it should be complemented by the discipline in domestic markets that would accompany competition from imports. Overall, however, under the ranges of alternatives considered, the gains from trade liberalization are greater under the more realistic scenarios assuming increasing returns to scale in the HCI sector.

Chapter 18 tries to put boundaries on the welfare costs of QR trade regimes by setting up a stylized model of a semi-industrial economy and computing the welfare costs of imposing a rationing of imports (20% reduction from free trade). Several assumptions about collusive behavior are envisaged, including the possibility that the extent of collusive behavior falls with firm entry to deter cheating.

Taken together, while incorporating important general equilibrium effects, these applications also reveal the limitations of what can be learnt with sector level data. Understanding firm entry/exit patterns into exporting activity and the drivers of increases in firm productivity (learning by exporting or, instead by self-selection of the most efficient firms in the distribution into exporting) are needed to better understand the links between trade policy and efficiency. The recent empirical trade literature with heterogeneous firms is a step in the right direction. At the same time, the range of outcomes illustrated in the papers here with models that ignore firm-heterogeneity suggests that it might still be difficult to generalize on the basis of these new findings that will, likely, continue to context-specific.

Chapter 19 deals with Rules of Origin (RoO), a new form of protection. With the worldwide fall in tariff protection, and the elimination of many NTBs, a new form of discriminatory trade restriction has come about. These are the origin requirements that must be satisfied by exporters to benefit from preferential market access. The rapidly growing number of preferential trading agreements (many between developed and developing countries) have resulted in Rules of Origin (RoO) that appear largely restrictive beyond those that would be needed to prevent trade deflection. Chapter 19 is a case study for Mexican exporters of Textiles and Apparel (T&A) to the US market where the average MFN tariff averaged 12% (Melo (2015), chps. 11 and 15 describe these RoO and give further estimates of their costs). Here meeting origin required Mexican exporters to source textiles from the US (rather from the rest-of-the world). Pass-through estimates, based on HS-8 tariff line data, show that a third of the increase in the border price of final Mexican goods exported to the US goes to compensate for the higher cost of intermediates purchased from the US. Partial equilibrium calibrated simulations show that RoO approximately halved the gains to Mexican producers from preferential market access. So even in sectors like T&A where preferential margins are still substantial, RoO are a circuitous way of raising the profits of upstream industries in the developed-country partners by creating captive markets in the downstream final-goods producing sectors in the developing-country partner.

Part IV: Estimating the Costs of US Foreign Trade Policy

Part IV collects work about the US economy. It is included here to give examples of trade policy issues that can be investigated with more extensive data and knowledge about institutional details that should be taken into account when evaluating trade policies. Chapters 20 to 23 report on extensions from a project with David Tarr seeking to estimate the relative costs of 'transparent' protection (i.e. tariffs) vs the 'opaque' protection via Non-tariff Barriers (NTBs) in three sectors (Voluntary Export Restraints (VERs) in the auto sector and QRs in the steel and textile sectors). Melo and Tarr (1992) discuss data sources and key parameters at greater length than the papers here. With arguably reliable/plausible estimates of key elasticities and of the rents associated with NTBs, our efforts were directed at careful calibration under different assumptions about the functioning of the economy in the three protected sectors. This meant always starting from the same equilibrium under the different assumptions selected in: (i) goods markets---perfect vs-imperfect competition; (ii) factor markets---endogenous vs. exogenous labor supply and wage determination in the protected sectors; (iii) distribution of quota rents from the NTBs.

Chapter 20 assumes that all sectors in the US economy were operating under perfect competitions and so concentrates on the employment reallocation effect of removing protection in the three sectors under different assumptions about the distribution of rents. Subtracting the costs from workers having to search for new employment (on average for 6 years), with a discount rate of 7%, the benefit cost ratio of 65 of removing protection in the these three sectors. The paper also shows that the welfare costs from QRs in the three sectors would be equivalent to a radial expansion of tariffs across sectors resulting in an average protection of 20%---a result that illustrated forcefully the economic costs of buying acquiescence from foreigners to restrict their exports to the US.

Chapter 21 models the US auto industry during the US-Japan VER (1981-84) recognizing that the industry operated under increasing returns to scale, and that profits were higher during the period of the VER. We also took into account that Japanese auto producers shared part of the rents with US auto dealers and that 'tariff-jumping' Foreign Direct Investment (FDI) by Japanese auto producers was also taking place. The case study produced under different assumptions about the functioning of the auto industry and capital mobility in response to the VER. The case study shows that taking into account the endogenous determination of quota rents and the induced FDI reduced welfare costs by about 10%.

Chapter 22 contests a claim that a tariff on sectors with wage distortions (the case of the US auto and steel sectors where wages were determined by labor unions) could be welfare improving if the tariff compensated sufficiently for the penalty coming from the wage distortion. Recognizing that the wage premium is endogenous because of the presence of labor unions, the paper shows that, contrarily to what was claimed, the wage premium in fact exacerbated the costs of protection.

Chapter 23 uses the model to estimate the welfare costs of alternative taxation of the petroleum industries debated at the time. The estimates show that raising a desired revenue by restricting taxes to refined petroleum imports (as desired by US petroleum refiners) would cost around 25 times more than if an excise tax was imposed on all petroleum products. The paper also gives estimates of the combination of excise taxes and import tariffs on the crude oil and petroleum products sectors that would raise a specified revenue at least welfare cost.

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“Sur quoi la fondera-t-il l'économie du monde qu'il veut gouverner? Sera-ce sur le caprice de chaque particulier? Quelle confusion! Sera-ce sur la justice? Il l'ignore.”

Pascal



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