Implications of the New Growth Theory to Agricultural Trade Research and Trade Policy

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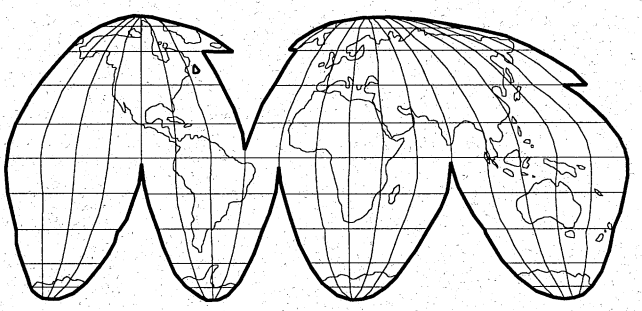

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On Turkey's European Trade Policy: How Desirable is a Status Quo?

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Abstract

Turkey has unilaterally decided to harmonize its tariffication structure with that of the European Union. For the country's authorities, this move to a Customs Union is only meant to be the first step toward fuller integration with Europe. There are signs, however, that political opposition to the government's pro competitive stance may be strong enough to bloc any further rapprochement with Europe. We suggest, using an applied intertemporal GE analysis, that to be welfare improving, the trade reform would have to be pursued further and nontariff barriers on European trade removed. Failure to do so could be more detrimental to domestic welfare than no reform at all.

Key words: Turkey, Dynamic applied general equilibrium, Customs Union

1. Introduction

Turkey (TR) has long held aspirations of becoming a full member of the former European Economic Community (EEC), now the European Union (EU).[1] Despite the rejection of its official re-application for full membership in April 1987, TR pursued unilaterally its trade liberalization efforts vis à vis the EEC by substantially reducing its sectoral tariffs on its European imports. In March 1995, TR decided to harmonize its tariffication structure with that of the EU in a "Customs Union" (CU) which has been put into effect in January, 1996.

For the Turkish authorities today, this move to a CU is only meant to be the first step toward the country's integration in the European Union. The next phase will require complying with the European Single Market rules, i.e., full integration of the commodity markets.[2] As one expects, such a pro competitive policy does not generate unanimous support in the country. Lobby groups are actively working to mobilize various elements of opposition to bring the pro competitive effort to a stop. The outcome of this political game is of course hard to predict, but it seems unlikely that the opposition parties will manage to force a complete policy reversal in the immediate future. Hence, a likely compromise could be as follows: the CU is history in the making and therefore a fact, but achievement of the second phase of the trade reform program has to be postponed if not altogether dropped from the agenda.

It is our objective in this paper to shed some light on the desirability, for TR, of such a status quo. For this purpose, we use an applied intertemporal GE model of foreign trade which recognizes increasing returns to scale production technologies in many sectors; existence of firm level product differentiation; and oligopolistic market structures. Our findings suggest strong negative welfare effects from the CU with Europe, because of the initially heavily distorted nature of the Turkish economy. In contrast, the second phase of the trade reform is projected to yield substantial gains for the domestic economy, though the

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1 Turkey's first official application to join the EEC was made as early as 1959. This led to the 1963 Ankara Agreement and the 1970 Added Protocol, which provided a specific blueprint of adjustment toward harmonization of the Turkish economy with its European counterparts. The relations suffered a stalemate between 1980 and 1986, as a result of the military coup of September, 1980.

2 Ultimately, monetary and labor market integration will have to be achieved if TR is to become a full member of the EU. Whether this third phase can be achieved in a reasonably near future is highly doubtful for both economical and political reasons. We therefore disregard this as a realistic current policy option.

cumulative gains remain quite modest. Our conclusion is therefore clear: from the point of view of TR, simple harmonization of the tariff system —the CU—can only be regarded as an interim phase which has to be complemented with further steps toward full market integration with the EU. A political compromise that would result in a CU status quo appears to be the worst possible option with likely negative welfare consequences for the country.

It is worth highlighting that, in contrast to most (if not to all) previous applied GE modeling efforts of the Turkish economy, we do not restrict our analysis to the measure of static reallocation effects. Our framework is intertemporal: we are able to apprehend transitional dynamic consequences of the policy options, and their growth effects.[3] To emphasize the importance of these effects, we provide a comparison between the predictions of the intertemporal model, and those generated from its static equivalent.[4] The results suggest that failure to take dynamic effects into account may lead to questionable policy conclusions.[5]

The plan of the paper is as follows. In section 2, we present the main features of the GE model, introduce the welfare measure and discuss our numerical treatment of dynamics. The policy scenarios are presented in section 3 together with a discussion of the main mechanisms at work based on partial equilibrium arguments. In section 4, we discuss the policy results, and we conclude in section 5. A formal presentation of the model is given in Appendix A. Some aspects of the calibration and of the computational strategy are discussed in Appendix B.[6]

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3 Previous applied GE analyses of the Turkish economy include: Dervis et al. (1982), Lewis and Urata (1983), Grais et al. (1984), Celasun (1986), Yeldan (1989) and Harrison et al. (1993).

4 By static equivalent we mean the original framework adequately restricted for the capital stock and foreign debt to remain constant.

5 It also has to be noted that the Turkish official Input/Output (I/O) and labor market statistics suffer from considerable biases which distort policy conclusions. Mercenier and Yeldan (1996) highlight, for instance, that the officially published I/O data consistently report implausibly high capital to labor ratios in value added, with capital shares approaching to 90 percent in most sectors. The authors show that those biases are large enough to affect basic policy recommendations. In a recent effort to correct these biases, Kose and Yeldan (1996) provide new estimates of factor shares compiled from the Household Labor Survey Statistics and from the Manufacturing Industry Surveys, which appear to be more reliable (though the share of capital in value added remains puzzlingly high in some sectors). We use this data base in the current analysis.

6 The data base has been documented else where: see Mercenier (1995a) and Mercenier and Yeldan (1996).

2. The Model

2.1 Overview

Turkey (*TR*) is part of a world economy consisting of itself and six other regions: Great Britain (*GB*), the Federal Republic of Germany (*D*), France (*F*), Italy (*I*), the rest of the EU, and the rest of the world (*ROW*). Each country has nine sectors of production, of which four are perfectly competitive.[7] In these sectors, countries are linked by an Armington system so that commodities are differentiated in demand by their geographical origin. The other five industries are modeled as noncompetitive.[8] In the latter sectors, firms are assumed to be symmetric within national boundaries. They operate with fixed primary factor costs and therefore face increasing returns to scale in production. They have no monopsony power on any market for inputs, either primary or intermediate. Each individual oligopolist produces a different good. Industry structure is assumed fixed in the short run; oligopolistic firms may then experience non zero profits. In the long run, however, entry and exit of competitors in a Chamberlinian fashion ensure that these rents vanish. The competitive game between oligopolistic firms is assumed to be Cournot-Nash. The instantaneous GE concept adopted is a compromise in terms of informational requirements between the primitive conjectural Cournot-Nash-Walras equilibrium of Negishi (1961) and the objective Cournot-Nash-Walras equilibrium introduced by Gabszewicz and Vial (1972).[9] In all sectors, competitive and noncompetitive, a detailed country- and sector-specific system of price-responsive intermediate demands is specified that recognizes differences among products from individual oligopolistic suppliers à la Ethier (1982).

Final demand decisions are made in each country by a single representative household that is competitive, infinitely lived, and utility-maximizing. The domestic household owns all the country's primary factors, namely, labor and physical capital, which it rents to domestic firms only, at the same competitive price regardless of the sector. In the short run, however,

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7 The four perfectly competitive sectors are agriculture and primary products; food, beverage, and tobacco; other manufacturing industries (textile, wood, paper, metallurgy and minerals); and transport and services.

8 The noncompetitive industries are pharmaceutical products; chemistry other than pharmaceutical products; motor vehicles; office machinery; and other machinery and transport materials.

9 Noncompetitive firms are endowed with full knowledge of the preferences and technologies of their clients, and they make use of this knowledge when maximizing profits. In their maximization, however, they neglect the feedback effect of their decisions on their profits via income (the *Ford effect*, see Gabszewicz and Vial, 1972) and via input-output multipliers (the *Nikaido effect*, see Nikaido, 1975).

total returns to capital may differ across industries: oligopolistic profits may add to capital rental earnings because of unexpected shocks. We abstract from leisure/labor decisions and population growth so that the variables under household control are consumption and investment. In making optimal decisions subject to their intertemporal budget constraints, households can borrow or lend on international markets. All final demands recognize differences among products from individual oligopolistic firms à la Dixit and Stiglitz (1977).

The only explicit role of the government is to raise tariffs, the proceeds of which are rebated to domestic consumers lump-sum.

National markets are assumed to be segmented in the initial equilibrium: because of various forms of nontariff barriers (NTBs)—such as norms, government procurement policies, security regulations—that prevent consumers from cross-border arbitraging, noncompetitive firms behave as price-discriminating oligopolists.

2.2 The Welfare Measure

Central to our analysis is the measure of welfare gains, which we now make precise. Let $\widehat{C}(t)$ be the reference stream of consumption and $C(t)$ be the corresponding time profile computed after implementation at $t=0$ of a once and for all previously unexpected trade policy change. The welfare gain is determined from the following utility indifference condition:

$$\int_0^\infty e^{-\rho t}\left[\widehat{C}(t)\,(1+\phi)\right]^{1-\gamma} dt \;=\; \int_0^\infty e^{-\rho t}\, C(t)^{1-\gamma}\, dt\,,$$

that is, the welfare gain resulting from the policy change is equivalent from the perspective of the representative Turkish household to increasing the reference consumption profile by ϕ percent. The measure ϕ accounts for both transitional and long-term effects of the policy on the household's well-being, putting relatively low weight on the latter because of discounting at rate ρ. It is sometimes useful to restrict the welfare analysis to steady-state effects, in particular when making comparisons with predictions from static models. To do this, we define $\lim_{t\to\infty}\widehat{C}(t) = \widehat{C}_{ss}$, $\lim_{t\to\infty}C(t) = C_{ss}$, and we plug these constant values into the utility indifference condition. Rearranging, we get

$$\widehat{C}_{ss}\,(1+\phi_{ss}) = C_{ss},$$

where ϕ_{ss} is the (equivalent variation) welfare measure most frequently used in static applied GE analysis.

2.3 The Numerical Treatment of Dynamics

The model is calibrated on base year data assuming the world economy in steady state.[10] For the computation of the transitional dynamics, we make use of recent results by Mercenier and Michel (1994) on temporal aggregation. We briefly sketch how the "curse of dimensionality" can be overturned using these results.

We write each representative household's intertemporal decision problem in the following abstract and compact form:

$$(3) \qquad \text{Max} \int_0^\infty e^{-\rho t}\, g(x(t),u(t))\, dt \qquad \text{s.t.} \quad \dot{x}(t) = f(x(t),u(t)) \ , \ x(0) = x_0 \text{ given,}$$

where $x(t)$, $u(t)$ are respectively state and decision vectors, and standard assumptions are made on the functions $g(.)$ and $f(.)$ for a stationary solution $(\hat{x},\hat{u})$ to exist. Consider the following finite horizon discrete-time approximate to problem (3):

$$(4) \qquad \begin{aligned} &\text{Max} \sum_{n=0}^{N-1} \alpha_n \Delta_n\, g(x(t_n),u(t_n)) + \beta_N \frac{1}{\rho}\, g(x,u(x))) \\ &\text{s.t.} \quad x(t_{n+1}) - x(t_n) = \Delta_n f(x(t_n),u(t_n)), \quad 0 \le n \le N-1, \quad x(t_0) = x_0 \text{ given,} \end{aligned}$$

where t_n $(n=0,\ldots,N)$ are dates (possibly unequally spaced), $\Delta_n = t_{n+1} - t_n$, α_n and β_N are (unknown) discount factors, and $u(x)$ is such that $f(x,u(x)) = 0$. Proposition 2 of Mercenier and Michel (1994) ensures that (3) and (4) have the same stationary equilibrium, if and only if the discount factors α_n and β_N satisfy:

$$\alpha_{n+1} = \frac{\alpha_n}{(1 + \rho\, \Delta_{n+1})} \qquad o \le n \le N-2 \ ,$$

$$\beta_N = \alpha_{N-1} \, .$$

We solve the model on a horizon of 35 years using five unequally distant grid dates: $t_0=1$, $t_1=5$, $t_2=10$, $t_3=20$, and $t_N=t_4=35$. Though the time-aggregation bias is obviously unknown—to evaluate this would require solving the system on a dense time grid, which is

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10 Though questionable for most LDCs, the steady state assumption is systematically adopted in applied GE models because it is extremely convenient for calibration. Mercenier and Sampaïo de Souza (1994) and Stockey (1995) are rare exceptions. Whether the additional complication is useful is still an open question.

not possible given the size of the model—results reported in Mercenier and Michel (1994) suggest that such approximations are quite accurate.

In the time-aggregated framework, the welfare criterion becomes the following: determine ϕ such that

$$\sum_{n=0}^{N-1} \alpha_n \Delta_n \left[\widehat{C}(t_n)(1+\phi)\right]^{1-\gamma} + \beta_N \frac{1}{\rho}\left[\widehat{C}(t_N)(1+\phi)\right]^{1-\gamma} = \sum_{n=0}^{N-1} \alpha_n \Delta_n \, C(t_n)^{1-\gamma} + \beta_N \frac{1}{\rho} C(t_N)^{1-\gamma}.$$

3. Description of the Experiments

3.1 The Benchmark

Nominally at least, the European Single Market has been completed since January 1993. In practice, of course, the program will take some time to become fully implemented and indeed longer still before its effects can be observed in the data. We therefore generate as an initial simulation the new international environment in which Turkey has to make its future policy decisions, i.e., we compute the post-Europe '92 equilibrium. This equilibrium serves as the benchmark for our following policy simulations.

3.2 The Trade Policy Experiments

In our first experiment, we implement the Turkish commitment to enter a customs union with the EU. Technically, this consists to set most tariffs on European imports to zero and to harmonize the rates on imports from the ROW with the existing European rates.[11] Formally, for most sectors,

$$\tau_{EU,TR} = 0, \;\; \tau_{ROW,TR} = \tau_{ROW,EU},$$

where $\tau_{i,j}$ is the tariff rate on flows from/to country i/j.

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11 Under the current policy setting, existing EU tariffication system on ROW imports are based on varying rates, with continuous adjustments. At the time of writing, we adopted the then existing (May, 1996) sectoral averages as our prevailing EU rates. These range from 0 percent (in pharmacy) to 10 percent (in other manufacturing). Furthermore, the current system leaves primary agriculture and processed food products outside the scope of the CU.

In the second experiment, TR is assumed to join the European Single Market.[12] This implies that, in addition to tariff harmonization, both the Turkish and the European firms switch from their initial price-discriminating strategy to a single-pricing behavior within the *Extended EU* (henceforth: EEU=EU+TR). Formally, let $v_{i,s}$ be the marginal production cost of a firm operating in sector s of country i; $z_{i,s,j}$ and $p_{i,s,j}$ respectively the amount sold and the price charged by the same firm on market j. The optimal pricing strategy of the firm is determined from

$$(5) \quad \frac{p_{i,s,TR} - v_{i,s}}{p_{i,s,TR}} = \lambda \frac{\partial \log p_{i,s,TR}}{\partial \log z_{i,s,TR}} + (1-\lambda) \frac{\partial \log p_{i,s,EEU}}{\partial \log z_{i,s,EEU}},$$

with $\lambda=1$ in the calibration. The experiment consists to set $\lambda=0$ with the elasticity on the right is evaluated using the EEU-aggregated demand.

The rationale behind this experiment is as follows: various forms of nontariff barriers (NTBs) exist, which confer to firms (domestic and foreign) the power to price discriminate between TR and other markets. Full integration of TR in the EU involves suppressing all forms of NTBs. This should restore cross-border arbitraging and force firms to charge a unique price within the EEU. Because NTBs are essentially unobservable, we treat them as latent variables, and generate the effects of their elimination by forcing the individual firms to adopt single pricing within the (now extended) European market on the basis of their average EEU-wide monopoly power. The interpretation is that this behavioral change is the firm's optimal strategic reaction to the disappearance of the NTBs.

What can TR expect from such a trade integration experiment in terms of welfare? Turkish firms are thought, initially, to charge higher prices in their domestic market, in which they usually hold the largest share (see Table 1.1). A move to a single-price strategy within the EEU would, therefore, induce a reduction of prices charged by those firms on the home market (together with increases in export prices; see Table 1.2 for the initial ratio of domestic price to average export prices to EU). The conjecture is that consumer prices will decline relative to factor prices and that Turkish households will be better off. In addition, in the long run, a rationalization effect à la Harris (1984) could result from adjustments in industry structure. Indeed, the new pricing rule could reduce industry profits,[13] induce exit

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12 See, among others, Smith and Venables (1988) and Mercenier (1995a).

13 Although from an individual firm's point of view, the switch to single pricing should reduce its profits if everything else is held fixed, it is far from obvious that this will be the case when all firms in the industry change their pricing strategy in a similar way.

Table 1-1. Major Structural Characteristics of the Turkish Economy, 1990

Sectors	Share of Value Added in Gross Output (%)	Share of Capital in Value Added (%)	Ratio of Exports to Value Added (%)	Share of Exports to EU in Total Exports (%)	Ratio of Imports to Value Added (%)	Gross Tariff Rate (%)	Share of Domestic Good in Domestic Demand (%)	Industry Concentration (Herfindahl Index)
Agriculture	67.8	34.5	4.0	39.2	4.7	15.2	96.4	
Food Processing	28.2	65.2	40.7	31.2	42.2	26.6	85.5	
Pharmaceuticals	40.8	72.8	20.2	54.7	72.9	31.8	70.1	0.06
Chemicals	42.0	84.2	14.3	40.0	76.3	26.8	69.8	0.20
Motor Vehicles	37.1	66.1	7.9	51.6	88.6	47.8	66.6	0.08
Office Machinery	38.2	67.7	35.2	51.6	1183.8	3.4	15.6	0.50
Other Machinery	37.5	66.7	23.5	51.6	250.7	16.6	45.4	0.13
Other Manufacturing	38.0	63.4	44.4	59.5	67.7	6.7	75.2	
Services	80.5	60.1	0.0	0.0	0.0		100.0	

Table 1-2. Assumed and Calibrated Parameters of the Instantenous Equilibrium

	Armington Elasticities (*)	Product Differentiation Elasticities (*)	Scale Elasticities (**)	Ratio of Dom Price to Average Export Price to EU (**)
Agriculture	2.0			
Food Processing	2.0			
Pharmaceuticals		5.0	1.30	1.047
Chemicals		5.0	1.44	1.162
Motor Vehicles		10.0	1.18	1.061
Office Machinery		10.0	1.20	1.091
Other Machinery		7.0	1.23	1.060
Other Manufacturing	5.0			
Services				

(*) Assumed; (**) Calibrated.

so that a smaller number of surviving firms would operate on a larger scale with lower average costs.[14] The positive outcome for the consumer of this structural adjustment could, however, be offset by two companion effects. Exit of firms from an industry means reduced product diversity. This has a direct welfare cost, since consumers are endowed with love-of-variety type of preferences (see Dixit and Stiglitz, 1977). Furthermore, diversity in available intermediate goods affects production efficiency in all sectors: everything else equal, exit of firms in an industry increases variable unit costs in all other sectors, competitive and noncompetitive (see Ethier, 1982). Our aim here is to measure these effects and analyze how they combine to affect the level and pattern—intertemporal and intersectoral—of welfare, production, and employment.

3.3 Highlight of the Basic Mechanisms at Work

Systematic sectoral patterns are, of course, not to be expected because of GE effects. One may nevertheless trace the type of adjustments that take place using selected sectoral variables and partial equilibrium arguments. For this purpose, we give in Table 2 some results for TR's *chemical* industry. The first part of the table illustrates the importance of market segmentation in the calibrated equilibrium and the effect this segmentation has on the firm's initial pricing behavior. Turkish firms in this industry clearly price-discriminate between the domestic and foreign customers. They charge the highest price on the domestic market in which they enjoy a strong monopoly advantage due to their large market share.

The second part of the table reports on the effects of TR's forming a customs union with the EU. Numbers are percentage deviations from the benchmark. For clarity, we only report results for the first year following the policy implementation and for the steady state. As Turkish customers substitute in favor of foreign goods, domestic prices are forced downward in all sectors, and lead to a fall in factor prices (w and r). Variable unit costs v therefore unambiguously fall in all sectors, as well as total fixed costs in those industries that are noncompetitive. In the domestic market, foreign penetration erodes the monopoly power previously enjoyed by local producers in the chemical industry: the firm's average selling price $\bar{p}$ falls by 12.7 percent. Note that in this industry, the drop in $\bar{p}$ unambiguously exceeds the cost saving effect of the trade liberalization (average costs V decline by 8.1 percent) so that, even if the production scale were to remain unchanged, the firm would experience negative profits. The situation is actually worse: because of a combination of

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[14] Obviously, if only because of substitution effects, new firms could simultaneously enter the industry in some other countries.

Table 2

Selected Results for the Turkish Chemicals Industry

Calibrated spread of prices to:		*GB*	0.869
		D	0.869
		F	0.869
		I	0.869
		Rest of EU	0.869
		TR	1.010
		RoW	0.869
Effects of customs union with EU (% changes w.r.to base case)		On impact (first year)	On steady state
Average selling price	$\bar{p}$	-12.7	-11.1
Variable unit cost	v	-10.3	-10.5
Wage rate	w	-7.7	-9.0
Rental price of capital	r	-7.7	-11.2
Average cost	V	-8.1	-11.1
Output scale (per firm)	Q	-4.6	1.8
Number of firms	n	0.0	-28.7
Efficiency gains		-4.4	2.0
Full commodity market integration with EU (% changes w.r. to post customs union equilibrium)		On impact (first year)	On steady state
Average selling price	$\bar{p}$	-4.8	-6.5
Variable unit cost	v	0.1	-0.6
Wage rate	w	2.2	1.9
Rental price of capital	r	2.5	0.4
Average cost	V	-3.8	-6.5
Output scale (per firm)	Q	17.4	30.8
Number of firms	n	0.0	-0.9
Efficiency gains		14.7	25.1

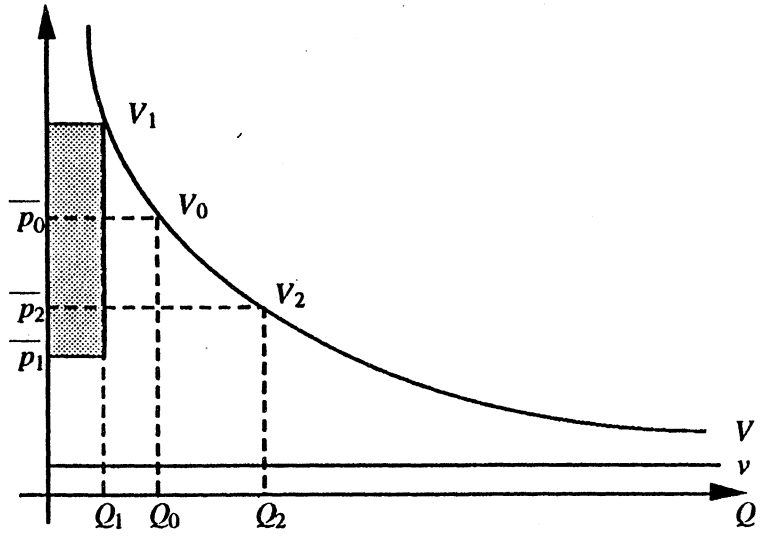

Figure 1a

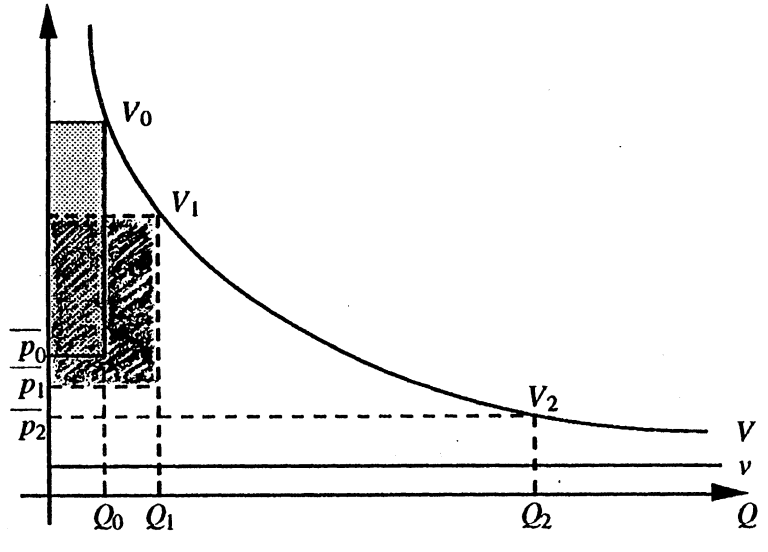

Figure 1b

substitution and income effects, the firm is forced up along its average cost curve since the volume of its sales Q declines by 4.6 percent. The average scale in the Turkish chemical industry is unambiguously too small for all existing firms to survive. More than a quarter of the firms will be forced out of the market (28.7 percent), hence making it possible for survivors to operate more efficiently, *i.e.*, on a larger scale (1.8 percent) with lower total unit costs (11.1 percent). The long term efficiency gains (*i.e.*, the real cost savings due to increased scale on initial output) achieved in the sector because of this industry-rationalization mechanism (Harris, 1984) amounts to approximately 2.0 percent. Figure 1a schematizes this basic mechanism.[15]

In the third part of Table 2, we report on the effects of TR's joining the European Single Market. All numbers are percentage deviations from the post-CU equilibrium.[16] This is highlighted in Figure 1b by the fact that at the initial first year production scale Q_0, total unit costs V_0 exceed the average selling price $\bar{p}_0$ and profits are negative.[17] Turkish oligopolists initially charge the highest price on their home market, whichever the industry. The adoption of a single pricing rule within the EEU integrated market therefore results in lower prices for domestic consumers and lower average selling prices for local producers of chemical products in the short run (–4.8%). This reduction in the price-cost margins boosts demand up by 17.4 percent. At the aggregate level, the same mechanism operates resulting in increased competition for resources (short term wages and capital rentals increase by approximately 2%) but generally with lower prices in noncompetitive industries. As a result, the variable unit costs in Turkish chemicals are essentially unchanged (+0.1%). Though total fixed costs have also increased, unit production costs have been reduced by 3.8 percent since the firms now operate at larger scale. The achieved gains in efficiency (14.7%) are, however, not large enough to prevent existing firms from experiencing negative profits (the thicker shaded rectangle in Figure 1b) and some producers will be forced out of that industry. The necessary long term change in industry concentration turns out to be quite modest (–0.9%) thanks to growth effects which will be documented in the next section.

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15 For graphical convenience, we make the simplifying assumption that both average and marginal cost curves are unaffected by the trade experiments.

16 To get the cumulative deviation effect of the two policies w.r. to the benchmark therefore requires summing the reported results of the two simulations.

17 The thinner shaded rectangle in Figure 1b is accordingly the same as in Figure 1a. As was also the case in the previous one, for graphical convenience we assume in the figure that both average and marginal cost curves are fixed.

4. Is a Customs Union With Europe Enough?

The first policy we evaluate is the CU currently under implementation. The first part of Table 3 reports the solution time profile of major aggregate variables. The tariff reform induces a strong deterioration of the terms of trade. The wealth contraction shifts the time profile of consumption downward. Investment increases over the whole time horizon, however, despite the negative wealth shock. This is because the new time structure of prices make it optimal for consumers to substitute future for current consumption. Hence, production capacities increase though not monotonously: the capital stock overshoots its new steady-state level during the transition. As a result, the long-term supply of capital services only mildly increases, by less than one percent. Important intersectoral adjustments take place simultaneously. In particular, rationalization of imperfectly competitive industries improve the competitiveness of the country's industrial sector, generating long-term aggregate efficiency gains (i.e., real cost savings due to increased scale on initial output) of almost three percent. However, the policy's overall positive impact on steady-state factor supply and efficiency is too modest to compensate for the terms of trade loss: the welfare cost amounts to a sacrifice of real consumption on the whole time horizon of almost one percent (ϕ=–0.832 %).[18] The results clearly suggest that a partial trade liberalization policy, limited to the tariff harmonization reform as currently under implementation, is undesirable.

If Turkey were to join the European Single Market, it would have to get rid not only of tariffs but also of all forms of nontariff barriers. Observe from Figure 2 how the elimination of NTBs shifts up the time path of consumption, but only mildly affects the time profile of aggregate variables. The second part of Table 3 confirms that the overall impact on the economy is quite substantial.[19] The reason is to be found in sectors of activity initially dominated by inefficient local oligopolists. The opening up of domestic markets to international competition forces Turkish producers to cut prices in the domestic market—where they have large shares and, hence, strong monopoly power—and to move down along their average cost curve to face the induced expansion of demand. The efficiency gains hence achieved by the second-phase reform vary between 12 and 19 percent (depending on the position on the time axis). The cost-saving shock has a positive wealth effect which is responsible for the upward shift of the consumption profile. It also boosts up capital accumulation with an expansion of steady-state capacities close to 2 percent.

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18 In all calculations, we use a discount rate of 7%.

19 Note that the table reports the marginal impact of each policy experiment, whereas cumulative effects (i.e., deviations with respect to benchmark) are plotted in the figure.

Table 3
Dynamic General Equilibrium Effects of Trade Liberalization Scenarios for Turkey

	3a : Customs Union with EU (% Changes From *Benchmark*)					3b : Full Commodity Market Integration with EU (% Changes From *Customs Union*)				
Periods	**1**	**5**	**10**	**20**	**35**	**1**	**5**	**10**	**20**	**35**
Aggregate consumption	-1.82	-1.12	-0.53	-0.27	-0.34	0.28	0.69	1.05	1.23	1.28
Aggregate investment	6.42	4.57	1.67	0.30	0.90	4.50	3.79	2.33	1.92	1.89
Capital stock	0.00	1.32	1.99	1.86	0.90	0.00	0.92	1.51	1.85	1.89
Aggregate efficiency gains	-4.95	-2.78	-1.12	0.71	2.88	12.36	13.22	14.03	15.55	18.40
Wage rate	-7.71	-7.82	-8.16	-8.53	-8.98	2.25	2.25	2.14	2.05	1.94
Rental price of capital	-7.74	-9.30	-10.40	-11.04	-11.24	2.52	1.63	0.97	0.58	0.39
Price indexes of :										
- consumption	-9.35	-10.00	-10.52	-10.75	-10.68	1.24	0.85	0.53	0.36	0.32
- investment	-10.06	-10.63	-11.08	-11.26	-11.21	1.17	0.84	0.54	0.40	0.37
Terms of trade	-9.02	-9.69	-10.21	-10.48	-10.49	1.38	1.02	0.72	0.57	0.56
	Welfare (ϕ) = -0.832					Welfare (ϕ) = +0.897				

Table 4
Static Re-allocation Effects of Trade Liberalization Scenarios for Turkey

	Customs Union with EU (*)	Full Commodity Market Integration with EU (**)
Aggregate consumption	-2.97	0.74
Aggregate investment	0.00	0.00
Capital stock	0.00	0.00
Aggregate efficiency gains	2.34	15.02
Wage rate	-4.01	0.28
Rental price of capital	-5.35	0.28
Price indexes of:		
- consumption	-5.13	-0.38
- investment	-5.64	-0.36
Terms of trade	-10.90	0.59

(*) Percentage changes from *Benchmark*
(**) Percentage changes from *Customs Union*

Figure 2a
Aggregate Real Consumption under Customs Union and Full Market Integration with EU
(% changes from benchmark)

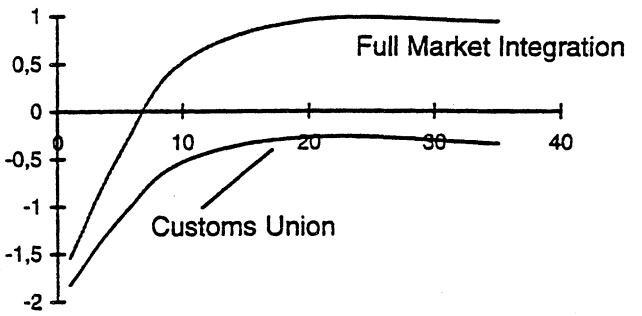
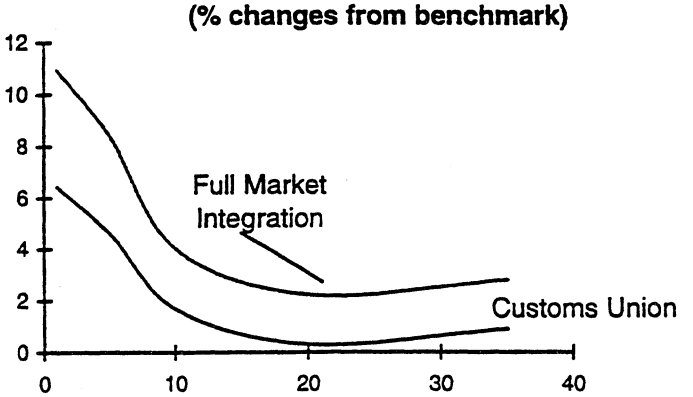


Figure 2b
Aggregate Real Investment under Customs Union and Full Market Integration with EU
(% changes from benchmark)



Domestic consumers are clearly made better-off under this extended policy reform: real consumption has unambiguously increased on the whole time horizon. More formally, to be indifferent between this and the previous equilibrium allocations, Turkish households would have to be compensated in the latter case by an amount equivalent to almost one percent of their consumption flows over the whole time horizon (ϕ=+0.897 %). Observe from the cumulated equivalent variation, that the welfare effect for TR of full trade integration with the EU is positive, though admittedly quite modest.

The policy conclusion that emerges from these numbers seems therefore quite clear: a partial trade reform in the form of a tariff harmonization with Europe is undesirable if it is not complemented by a systematic elimination of all forms of nontariff barriers that shield domestic oligopolists from foreign competition at the expense of local consumers.

Another conclusion that emerges from the previous exercise is that intertemporal linkages are important, and can not be assumed away in policy analysis. To highlight this, we perform the same set of experiments using the model adequately constrained to account only for static reallocations. The results are reported in Table 4. Comparing the aggregate consumption figures in this table to the corresponding steady-state numbers in the previous one clearly proves the powerful role played by intertemporal mechanisms. In particular, full trade integration with the EU would be judged strongly detrimental to the Turkish household (–2.23%) if growth effects had been neglected.

5. Conclusion

For both political and economical reasons, TR has met strong resistance to its long held aspiration of becoming a full member of the European bloc. Despite this, and presumably as a demonstration of commitment to this aspiration, the Turkish authorities have completed the adjustment process as outlined in the 1963 Ankara Agreement, and in 1996 unilaterally undertook a trade reform by harmonizing the country's tariff structure to that of the EU. The resulting Customs Union is regarded as a temporary first step toward full commodity-trade integration within the unified European market.

There are signs, however, that political opposition to the government's pro competitive stance may be strong enough to bloc any further move toward fuller trade liberalization. We have shown in this paper that such a status quo should not be considered "an acceptable compromise". According to our evaluations using applied intertemporal GE analysis, the Turkish households would be impoverished by *a partial* trade reform. In other words, to be

welfare improving, the trade reform would have to be pursued further and nontariff barriers on European trade removed. Failure to do so could be more detrimental to domestic welfare than no reform at all.

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Appendix A: The Model

Turkey (*TR*) is part of a world economy consisting of itself and six other regions: Great Britain, the Federal Republic of Germany, France, Italy, the rest of the EU, and the rest of the world.

1 The dynamic structure

In each country, there is a single representative household, that is competitive, infinitely lived, and utility-maximizing. The domestic household owns all the country's primary factors, namely, labor and physical capital, which it rents to domestic firms only, at competitive prices w and r, respectively. (For notational convenience, we drop the country subscript in this subsection.) We abstract from leisure/labor decisions and population growth so that labor is in fixed supply L. The decision variables of the household are consumption C and investment I. In making these optimal decisions, the household has access to international financial markets on which it can borrow or lend. Its intertemporal decision problem is to maximize

$$\text{(A.1)} \qquad \int_0^\infty e^{-\rho t} \frac{C(t)^{1-\gamma}}{1-\gamma}\, dt,$$

subject to

$$\text{(A.2)} \qquad \dot{K}(t) = I(t) - \delta K(t),$$

$$\text{(A.3)} \qquad \int_0^\infty e^{-\rho t}\left[p_c(t)C(t) + p_I(t)I(t)\right] dt \leq \int_0^\infty e^{-\rho t}\left[w(t)L(t) + r(t)K(t) + \sum_s \pi_s(t) + G(t)\right] dt + F(0),$$

$K(0)$, $F(0)$ given.

Equation (A.2) accounts for capital accumulation with exponential depreciation. Equation (A.3) is the household's intertemporal budget constraint. It specifies that the sum of discounted stream of consumption and investment expenditures (for convenience, all prices are defined as undiscounted) cannot exceed the discounted sum of revenues earned from primary factor ownership and government transfers $G(t)$ plus initial holding of foreign assets $F(0)$. The term $\Sigma_s\, \pi_s(t)$ in the budget constraint accounts for the possibility that, in the short run, because of

unexpected shocks to imperfectly competitive industries, supranormal profits may add to capital rental earnings. All countries have the same constant discount rates ρ.

2 The instantaneous equilibrium structure

We now neglect the time index. We identify sectors of activity by indices s and t, with S representing the set of all industries, so that $s,t = 1,...,S$. The set S is partitioned into the subset of competitive, constant returns to scale sectors, denoted C, and the subset of noncompetitive, increasing returns to scale industries, denoted $\overline{C}$.[1] Countries are identified by indices i and j, with $i,j = 1,...,W$ and $W = EU \cup TR \cup ROW$, where EU represents the European Union, and ROW represents the rest of the world. We keep track of the trade flows by following the usual practice that identifies the first two indices with, respectively, the country and the industry supplying the good and, when appropriate, the next two with the client country and industry.[2]

The household

For exposition ease, we break household i's static decision making into a consumer and an investor choice problem. This breakage is innocuous, given our separability assumptions on preferences and investment technologies. The domestic consumer values products of competitive industries from different countries as imperfect substitutes (the Armington assumption), while the consumer treats as specific each good produced by individual firms operating in the noncompetitive industries (the Dixit-Stiglitz 1977 specification). We use a two-level utility function. The first level combines consumption goods $c_{.si}$ and assumes constant expenditure shares ρ_{si}. The second level determines the optimal composition of the consumption aggregates in terms of geographical origin for competitive industries or in terms of the individual firm's product for the noncompetitive sectors. Formally, the consumer's preferences are

$$\log C_i = \sum_{s \in S} \rho_{si} \log c_{.si}, \qquad \sum_{s \in S} \rho_{si} = 1,$$

$$\text{(A.4)} \quad c_{.si} = \left\{ \sum_{j \in W} \delta^c_{jsi} \, c_{jsi}^{\frac{\sigma_s - 1}{\sigma_s}} \right\}^{\frac{\sigma_s}{\sigma_s - 1}}, \qquad s \in C,$$

$$c_{.si} = \left\{ \sum_{j \in W} n_{js} \, \delta^c_{jsi} \, c_{jsi}^{\frac{\sigma^f_s - 1}{\sigma^f_s}} \right\}^{\frac{\sigma^f_s}{\sigma^f_s - 1}}, \qquad s \in \overline{C},$$

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1 Though C also denotes aggregate consumption, no confusion can arise.

2 Thus, a subscript $isjt$ indicates a flow originating in country i, sector s with country j, sector t as the destination.

where δ^c_{jsi} denotes the share parameters, σ_s denotes the Armington substitution elasticities, σ^f_s denotes the Dixit-Stiglitz differentiation elasticities, and n_{js} denotes the number of symmetric oligopolists operating in country j, sector s.[3] Observe that when $s \in C$, c_{jsi} denotes the sales to the consumer of the whole industry s of country j, whereas when $s \in \overline{C}$, it represents the sales of a single representative firm. The interpretation of the two elasticities σ_s and σ^f_s is therefore very different: the latter will typically be larger than the former. For goods that are nontraded we have $\delta^c_{jsi}=0 \; \forall j \neq i$.

The consumer maximizes (A.4) with respect to c_{jsi}, subject to

$$\text{(A.5)} \quad p_{ci} C_i \geq \sum_{j \in W} \left(\sum_{s \in C} (1+\tau_{jsi})\, p_{jsi}\, c_{jsi} + \sum_{s \in \overline{C}} (1+\tau_{jsi})\, p_{jsi}\, n_{js}\, c_{jsi} \right),$$

where τ_{jsi} is tariff rates, p_{jsi} is prices on which consumers have no influence, and the term on the left side results from the intertemporal decision of the household.

The investor's problem is to determine the optimal composition of the domestic investment good; for this, the investor maximizes (A.6) with respect to I_{jsi}:

$$\log I_i = \sum_{s \in S} \omega_{si} \log I_{.si}, \qquad \sum_{s \in S} \omega_{si} = 1,$$

$$\text{(A.6)} \quad I_{.si} = \left\{ \sum_{j \in W} \delta^I_{jsi}\, I_{jsi}^{\frac{\sigma_s - 1}{\sigma_s}} \right\}^{\frac{\sigma_s}{\sigma_s - 1}}, \qquad s \in C,$$

$$I_{.si} = \left\{ \sum_{j \in W} n_{js}\, \delta^I_{jsi}\, I_{jsi}^{\frac{\sigma^f_s - 1}{\sigma^f_s}} \right\}^{\frac{\sigma^f_s}{\sigma^f_s - 1}}, \qquad s \in \overline{C},$$

subject to

$$\text{(A.7)} \quad p_{Ii} I_i \geq \sum_{j \in W} \left(\sum_{s \in C} (1+\tau_{jsi})\, p_{jsi}\, I_{jsi} + \sum_{s \in \overline{C}} (1+\tau_{jsi})\, p_{jsi}\, n_{js}\, I_{jsi} \right),$$

where, again, τ_{jsi} is tariff rates, p_{jsi} is prices which investors take as given, and the term on the left side results from the intertemporal decision of the household. Observe that the share parameters δ^c_{jsi} and δ^I_{jsi} in (A.4) and (A.6) are specific to each decision problem, so that price

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3 The symmetry assumption implies that imperfectly competitive domestic firms within a sector have the same cost structure and market shares.

responsiveness of the two final demand components will differ, even though the consumer and the investor are assumed to have the same substitution and differentiation elasticities (σ_s and σ_s^f) since no econometric information is available on potential differences.

The Firms

a) Competitive industries. In competitive industries, the representative firm of country i, sector s operates with constant returns to scale technologies, combining variable capital K_{is}^v and labor L_{is}^v as well as intermediate inputs x_{jtis}. Material inputs are introduced into the production function in a way similar to the way consumption goods are treated in the preferences of households: with an Armington specification for goods produced by competitive industries and with an Ethier 1982 specification, i.e., with product differentiation at the firm level, in the imperfectly competitive sectors. Input demands by country i's representative producer of sector $s \in C$ result from the minimization of the variable unit cost v_{is}:

$$\text{(A.8)} \quad v_{is}\, Q_{is} = \sum_{j \in W} \left(\sum_{t \in C} (1+\tau_{jti})\, p_{jti}\, x_{jtis} + \sum_{t \in \overline{C}} (1+\tau_{jti})\, p_{jti}\, n_{jt}\, x_{jtis} \right) + w_i L_{is}^v + r_i K_{is}^v$$

for a given level of output Q_{is}, such that

$$\log Q_{is} \leq \alpha_{Lis} \log L_{is}^v + \alpha_{Kis} \log K_{is}^v + \sum_{t \in S} \alpha_{tis} \log x_{.tis},$$

$$\text{(A.9)} \quad x_{.tis} = \left\{ \sum_{j \in W} \beta_{jtis}\, x_{jtis}^{\frac{\sigma_t - 1}{\sigma_t}} \right\}^{\frac{\sigma_t}{\sigma_t - 1}}, \qquad t \in C,$$

$$x_{.tis} = \left\{ \sum_{j \in W} n_{jt}\, \beta_{jtis}\, x_{jtis}^{\frac{\sigma_t^x - 1}{\sigma_t^x}} \right\}^{\frac{\sigma_t^x}{\sigma_t^x - 1}}, \qquad t \in \overline{C},$$

where the αs and the βs are share parameters with

$$\alpha_{Lis} + \alpha_{Kis} + \sum_{t \in S} \alpha_{tis} = 1,$$

$\beta_{jtis}=0\ \forall j \neq i$ if t is nontraded, and σ_s and σ_s^x have the same interpretations as σ_s and σ_s^f in (A.4) and (A.6). Though there is no reason to expect that final and intermediate demanders differentiate identically products from different firms, we assume that $\sigma_s^x = \sigma_s^f$ in absence of econometric information on these differences.

Cost minimization implies marginal cost pricing ($p_{isj}=v_{is}$) and zero profits ($\pi_{is}=0$) in the competitive sectors.

b) Noncompetitive industries. Noncompetitive industries have increasing returns to scale in production. We model this by assuming that in addition to variable costs associated with technological constraints similar to (A.8) and (A.9), the individual firms in country i, sector s face fixed primary factor costs. This introduces a wedge between total unit costs V_{is} and marginal costs v_{is}:

$$\text{(A.10)} \quad V_{is} = v_{is} + \frac{\left[w_i L_{is}^F + r_i K_{is}^F\right]}{Q_{is}}, \qquad s \in \overline{C},$$

where Q_{is}, L_{is}^F and K_{is}^F denote, respectively, the individual firm's output, fixed labor, and fixed capital.

Because of the presence of various forms of nontariff barriers, national economies are assumed initially segmented. The noncompetitive firm facing demand segmentation takes advantage of the monopoly power it has on each individual country market. For this purpose, the firm is endowed with the knowledge of preferences (A.4) and technologies (A.6) through (A.9) of its clients. It then performs a partial equilibrium profit maximization calculation assuming that in each country, each individual client's current-price expenditure on the whole industry is unaffected by its own strategic action z_{isj}, so that

$$\text{(A.11)} \quad \begin{aligned} \frac{\partial(\rho_{sj} p_{cj} C_j)}{\partial z_{isj}} &= 0, \quad j \in W, \\ \frac{\partial(\omega_{sj} p_{lj} I_j)}{\partial z_{isj}} &= 0, \quad j \in W, \\ \frac{\partial(\alpha_{sjt} v_{jt} Q_{jt})}{\partial z_{isj}} &= 0, \quad j \in W, t \in S. \end{aligned}$$

We make the Cournot assumption of noncooperative behavior with sales to each individual market as the strategic variable z_{isj}. Profit maximization then yields that

$$\text{(A.12)} \quad \frac{p_{isj} - v_{is}}{p_{isj}} = \frac{\partial \log p_{isj}}{\partial \log z_{isj}}, \qquad s \in \overline{C}, j \in W,$$

with

$$\text{(A.13)} \quad Q_{is} = \sum_{j \in W} z_{isj}.$$

The computation of the elasticities on the right side of (A.12) requires inverting log-linearized aggregate demand systems. This is a very complex calculation, the details of which are given in Mercenier 1995b.

The definition of oligopolistic industry profits then immediately follows:

$$\text{(A.14)} \quad \pi_{is} = n_{is}\left(\sum_{j\in W} p_{isj}\, z_{isj} - V_{is}\, Q_{is}\right), \qquad s\in \overline{C}.$$

<u>The static equilibrium conditions</u>

The instantaneous GE is defined as a static allocation supported by a vector of prices (p_{isj}, w_i, r_i), $s\in S$, and $i,j\in W$ consistent with the intertemporal constraints and choices in (A.1) through (A.3) and such that

- Tariff revenues are rebated to consumers lump-sum:

$$\text{(A.15)} \quad G_i = \sum_{j\in W}\left(\sum_{s\in C} \tau_{jsi}\, p_{jsi}\, (c_{jsi}+I_{jsi}+\sum_{t\in S} x_{jsit}) + \sum_{s\in \overline{C}} \tau_{jsi}\, p_{jsi}\, n_{js}\, (c_{jsi}+I_{jsi}+\sum_{t\in S} x_{jsit})\right);$$

- Consumers maximize (A.4) subject to (A.5);

- Investors maximize (A.6) subject to (A.7);

- Firms minimize (A.8) subject to (A.9);

- Oligopolistic firms set prices according to (A.12) and satisfy the resulting demand so that

$$\text{(A.16)} \quad z_{isj} = c_{isj} + I_{isj} + \sum_{t\in S} x_{isjt}, \qquad s\in \overline{C},\ i,j\in W,$$

  and (A.13) holds;

- Supply equals demand on each competitive market:

$$\text{(A.17)} \quad Q_{is} = \sum_{j\in W}\left[c_{isj} + I_{isj} + \sum_{t\in S} x_{isjt}\right], \qquad s\in C,\ i\in W;$$

$$\text{(A.18)} \quad K_i = \sum_{s\in C} K^v_{is} + \sum_{s\in \overline{C}} n_{is}\left[K^v_{is} + K^F_{is}\right], \qquad i,j\in W;$$

$$\text{(A.19)}\quad L_i = \sum_{s\in C} L_{is}^{v} + \sum_{s\in \overline{C}} n_{is}\left[L_{is}^{v} + L_{is}^{F}\right], \quad i,j\in W;$$

- Industry concentration $n_{is}>1$ ($s\in \overline{C}$, and $i\in W$), adjusts with inertia to the existence of nonnegative oligopoly rents so that, in the long run, these rents are null. The process of entry and exit of firms is implemented in the following way:

$$\text{(A.20)}\quad \begin{aligned} & n_{is}(0) \textit{ given}, \quad n_{is}(\infty) \textit{ such that } \pi_{is}(\infty) = 0, \\ & \dot{n}_{is}(t) = \theta\left[n_{is}(\infty) - n_{is}(0)\right],\ 0<\theta<1. \end{aligned}$$

The first period *ROW* wage rate is chosen as the numeraire.

Appendix B: Calibration and Computational Strategy

The calibration procedure for the instantaneous GE is extensively discussed in Mercenier 1995a. We avoid duplication and focus our discussion on the treatment of dynamics.

We first note that the budget constraint (A.3) can be equivalently written in the following differential form:

$$\text{(B.1)} \quad \begin{aligned} &\dot{F}(t) = \rho F(t) + w(t)L(t) + r(t)K(t) + \sum_s \pi_s(t) + G(t) - \left[p_c(t)C(t) + p_I(t)I(t)\right], \\ &F(0) \text{ given}, \quad \lim_{t\to\infty} e^{-\rho t} F(t) = 0, \end{aligned}$$

where again we neglect country subscripts for notational ease. We next make use of results by Mercenier and Michel 1994 on dynamic aggregation and write the following finite-horizon discrete-time approximation to the individual household's intertemporal choice problem:

$$\text{(B.2)} \quad \text{Max} \quad \sum_{n=0}^{N-1} \alpha_n \Delta_n \frac{C(t_n)^{1-\gamma}}{1-\gamma} + \beta_N \frac{1}{\rho} \frac{C(t_N)^{1-\gamma}}{1-\gamma}$$

such that

$$\begin{aligned} &F(t_{n+1}) - F(t_n) = \\ &\Delta_n \left[\rho F(t_n) + w(t_n)L(t_n) + r(t_n)K(t_n) + \sum_s \pi_s(t_n) + G(t_n) - p_c(t_n)C(t_n) - p_I(t_n)I(t_n)\right], \\ &K(t_{n+1}) - K(t_n) = \Delta_n \left[I(t_n) - \delta K(t_n)\right], \\ &F(t_0), K(t_0) \textit{ given}, \end{aligned}$$

where t_n, Δ_n, α_n and β_N are as introduced in section 2.3. Assuming the world economy initially is in steady-state, these results make the calibration of the intertemporal equilibrium straightforward using the following first-order conditions:

$$\begin{aligned} \left[\frac{C(t_{n-1})}{C(t_n)}\right]^{-\gamma} &= \frac{p_c(t_{n-1})}{p_c(t_n)}, \quad 0 < n \leq N, \\ p_I(t_{n-1}) &= \frac{1}{1+\rho\Delta_n}\left[\Delta_n r(t_n) + (1-\delta\Delta_n) p_I(t_n)\right], \quad 0 < n < N, \\ p_I(t_N) &= \frac{1}{\rho}\left[r(t_N) - \delta\, p_I(t_N)\right]. \end{aligned}$$

Reduced as it is by dynamic aggregation, the dimensionality of this five-period model is still a numerical challenge. To overcome this problem, we build on Negishi's 1961 existence proof of an imperfectly competitive GE. We first exogenize oligopolistic markups and solve for the intertemporal equilibrium allocations, prices, and industry structures.[4] Using these newly computed prices and market shares, we then upgrade the optimal markups. We iterate Gauss-Seidel way until convergence to a fixed point.

This numerical procedure proved quite reliable, and no computational difficulty is worth reporting. Nevertheless, there is little control on the search path with such a strategy, and no serious exploration of the possible existence of more than one equilibrium is possible. This is particularly unpleasant in view of the recent results of Mercenier 1995b, which suggest that in this generation of applied GE models, multiple equilibria can exist. It should be emphasized, however, that even though the structure of the instantaneous GE equilibrium of this model bears strong similarities to that of Mercenier 1995b, the treatment of factor markets differs substantially: we do not assume here that factors and factor owners move internationally. Though there is no reason to believe that the change eliminates the risk of nonuniqueness, numerical tests with Mercenier's 1995b model suggest that the risk is actually reduced.

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4 All computations have been performed using GAMS/MINOS (Brooke et al. 1988).