BILATERAL TRADE PATTERNS AND WELFARE: AN EGYPT-EU PREFERENTIAL TRADE AGREEMENT

by

Denise Eby Konan and Keith E. Maskus

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1. Introduction

In recent years, computable general equilibrium (CGE) models have been used to analyze the impact of preferential trade liberalization for several countries. A standard approach is to rely on a model of a single, price-taking country where goods are differentiated by region of production and consumption follows the Armington assumption. An important parameter in determining the welfare implications of preferential trading arrangements (PTAs) is the pre-liberalization volume share of trade with the proposed partner. Yet, conventional theory has not examined the role of trade shares in this typical CGE modeling framework. This paper examines the role of the volume of partner country trade in determining the outcome of a PTA in a small-country CGE model where products are differentiated on a regional basis.

The traditional approach is characterized in Lipsey's (1970) model where a PTA between countries that already trade in large volumes with one another is less likely to be trade-diverting as the potential partner is already a low-cost supplier of the imported good. In contrast, the models of Panagariya (1996), Bhagwati and Panagariya (1996) and Schiff (1996) show that if a country is large (that is, able to influence the terms of trade) relative to the potential partner but is a small price taker in the rest of the world, then the smaller is the initial partner import share the lower are trade diversion (and overall) losses. In a partial-equilibrium, differentiated products model, Konan and Maskus (2000a), we show that an ambiguous relation exists between trade shares and gains from a PTA. For small levels of initial partner trade share, increases in that share are negatively related with welfare gains from a PTA. When initial trade volumes with the partner are relatively high, a positive relation exists between partner trade share and welfare gains.

The Bhagwati and Panagariya result relies on two key assumptions: that tradable products are homogeneous and that the domestic offer curve has finite elasticity. As de Melo and Robinson (1989) explained, however, this framework is not satisfying for single-country CGE model for several reasons. First,
the homogeneity assumption is not consistent with the two-way trade, which is generally observed in aggregated trade statistics. Second, homogeneity implies that small price changes from liberalization lead to extreme and unrealistic specialization in production when products are not differentiated. Third, especially for most developing countries, it is reasonable to assume that international terms of trade will not be significantly influenced by domestic trade reform. De Melo and Robinson have shown that the assumption of a price-taking, general equilibrium economy is theoretically consistent with that of product differentiation by region (the Armington assumption) when multi-sector models are not heavily disaggregated.

To illustrate these issues, we employ a CGE model of Egypt. The European Union (EU) is in the process of negotiating bilateral Euro-Mediterranean Agreements (EMAs) with several nations of the Middle East and North Africa (MENA) region (Hoekman and Djankov 1996). The EU has already reached agreements with Turkey and Tunisia. The case of Egypt is particularly interesting as its trading pattern is much less focused on the EU than are those of some of its African neighbors. In this paper we consider the potential for Egypt to gain from participation in the EMA initiative and the importance of Egypt's share of trade with the EU in determining such gain. Given actual Egyptian trade patterns, the direct trade impact of an EMA is negative. Welfare may rise overall as trade liberalization interacts with the domestic tax structure to enhance efficiency, a process that we describe in detail in a companion paper (Konan and Maskus (2000)).

2. Trade Creation and Trade Diversion with Differentiated Products

We extend the Vousden (1990, chapters 9 and 10) model of a small country to demonstrate the importance of partner trade shares. While simple in dimension, this model provides our basic definitions and analytical results. It also illustrates important features of the more complicated CGE model that is described in the next section.
Assume that a small country (A) trades with two regions, a potential partner (B) and the rest of the world (R). Country A’s importable goods are differentiated by region of origin, with imports labeled $M_B$ and $M_R$. These imports are imperfect substitutes and are purchased at exogenous prices. Initially, suppose that imports face no domestic competition. The basic implications of a PTA with B are illustrated in Figure 1. At an initial non-discriminatory ad valorem tariff of $t = (P_A^i/P^*_i - 1)$ within a sector $i$, country A imports quantities $M_B^i$ and $M_R^i$. Suppose that A moves to a PTA that eliminates the tariff on B but maintains the tariff on ROW. Consumer surplus in A’s market for the B good increases by the area $P_B^AACP_B^*$ while tariff revenues fall by $P_B^AABP_B^*$, resulting in a net welfare gain of area $ABC$, which may be defined as import trade creation.

However, because imports from B and ROW are imperfect substitutes, the fall in the price of the B good engenders a fall in country A’s demand for $M_R$, shown as a shift in Hicksian demand from $D_R^1$ to $D_R^2$. The revenue loss of area $EFGH$ may be defined as import trade diversion.

The net welfare effect in the import market, measured as the area $ABC - EFGH$, depends on three key parameters: the own-price elasticity of compensated demand for $M_B$, the elasticity of substitution between B and ROW imports, and the share of total import expenditures originating from B initially.

The import analysis is complicated when there is substitutability in consumption between imports and a domestically produced good. The fall in the price of country B’s imports reduces the demand for (and the price of) A’s substitute good. The demand for ROW imports declines also as the prices of B and A goods fall, represented by the shift from $D_R^1$ to $D_R^2$ Figure 1, resulting in trade- diversion welfare losses of area $EFGH$.\(^3\) Demand for the B import also falls from $D_B^1$ to $D_B^2$ in response to the lower A and ROW prices. While consumer surplus increases by area $P_B^Akp_B^*$, tariff revenues on B imports fall by $P_B^AABP_B^*$, resulting in an ambiguous change in welfare of area $mBn$ minus area $kAm$. The greater is the elasticity of substitution...
between the domestic good and imports, the greater is the follow-on decline in import demand, the lower is trade creation, and the greater is trade diversion.

While the partner import share remains an important determinant of PTA effects, it is impossible to derive expressions for trade creation (TC) and trade diversion (TD) as closed-form functions of that parameter. Numerical simulations for a PTA between Egypt and the EU, reported later in the paper, reveal that both processes are concave and non-monotonic functions of EU’s share of Egyptian imports. However, in this case economic welfare continuously increases in that share.

3. An Application Using a Computable General Equilibrium Model of Egypt

In this section we summarize our CGE model of a small country (Egypt) to demonstrate the importance of initial trade shares in the formation of a PTA. The basic framework extends the applied general equilibrium model developed by Maskus and Konan (1997).

We model Egypt as a small open economy (SOE) in which household and production decisions follow standard neoclassical assumptions of optimization. Of particular interest are the regional and sectoral aspects of Egypt’s international trade. In the model, bilateral trade flows with the EU (including Turkey) and the rest of the world (ROW) are distinguished for each of 38 sectors (three in agriculture, two in mining and quarrying, 21 in manufacturing, and 12 in services).

Final demand by a representative agent (RA) is determined by a nested utility function for given prices and budget constraint. In the first stage of the multi-level budgeting problem, the RA decides on aggregate purchases per sector according to a Cobb-Douglas subutility function. Given the first-stage allocation of income per sector, the RA decides how much to spend on domestic and imported goods of each sector.
according a CES subutility function. Egyptian importables in each sector are further differentiated by region of origin: the EU and ROW. These imports are imperfectly substitutable and are purchased at exogenous prices.

Note that, computationally, Armington differentiation is not inconsistent with assuming Egypt faces fixed foreign prices. De Melo and Robinson (1989) demonstrated that the assumption of a price-taking, general equilibrium economy is theoretically consistent with that of product differentiation by region when multi-sector models are not extensively disaggregated. The Armington assumption implies that the components of a composite Egyptian vegetable product, for example, differ from those of the EU or ROW composite. Yet Egypt does not have price-setting power in the aggregate market for tomatoes. Moreover, to assume alternatively that goods are homogeneous would not be consistent with two-way trade, which is generally observed in aggregated trade statistics.

The model is static and requires two closure rules. First, to achieve saving-investment balance we assume that the aggregate capital stock is exogenously fixed at the benchmark level and financed by consumer savings that act as a lump-sum transfer. The interest rate of capital is endogenously determined by factor-demand conditions. Second, the current-account balance is exogenously fixed in real terms at its benchmark deficit level. As external prices are fixed, Egypt’s real exchange rate, which we define as the shadow price of a foreign-currency index, will adjust to maintain the deficit as domestic prices and trade quantities vary.

Regarding the agent’s budget constraint, she receives income from supplying the labor and capital endowments. Supplemental income is obtained through foreign borrowing via the current-account deficit. In addition to consumption, the agent must pay for government borrowing and investment. Domestic price indexes are CES aggregates across home prices and imported prices and are functions of producer prices, a consumption tax, and tariffs.
Production in each sector exhibits constant returns and requires production labor, non-production labor, capital, and intermediate inputs. Primary factors are assumed to be perfectly mobile across sectors but internationally immobile. Firms maximize profits under perfectly competitive conditions. Intermediate goods and value added combine to produce final goods under a Leontief technology, with value added depending on labor and capital in a CES production function. The composite intermediate good is a CES aggregate of domestic and imported intermediates. Imported intermediates are further disaggregated into a CES nest of EU and ROW imports. Production costs depend on prices of factors and intermediate goods, tariffs and non-tariff barriers on intermediate inputs, and a tax on capital use. Production is sold into domestic and export markets using a constant elasticity of transformation (CET) nest, while exportables are further transformed into EU-bound and ROW-bound exports in a subsequent Armington CET nest. Market-clearing conditions in each product and factor market are included.

As trade reform will directly alter tax collections, a detailed treatment of Egyptian public finance is critical. We assume that the public consumes a fixed bundle of goods and services evaluated at endogenous prices. The government maintains a fixed real budget deficit and endogenously adjusts domestic tax instruments to counteract the revenue effects of tariff reforms. The primary replacement tax mechanism is assumed to be a goods and service tax (GST) which acts as a sales tax on final consumption. In practice the government also taxes capital usage, with capital defined here as operating surplus less depreciation. Capital taxes vary substantially across sectors and these rates are held fixed in the counterfactual simulations.

To implement the model empirically, we develop an Egyptian data set consisting of a Social Accounting Matrix (SAM) and a variety of policy, trade, and technology parameters for the year 1990. Relationships for intermediate demand, final demand, and valued added are defined by the 1989/90 Input-Output (IO) table for Egypt (CAPMAS 1994a,b). To account for recent reform activities in Egypt we update
policy parameters to a second benchmark year 1994. Thus, 1994 provides the benchmark for the ensuing simulations.

Major Egyptian import sectors include machinery, food processing, vegetable foodstuffs, and chemicals, while export flows are dominated by transportation (largely the Suez Canal), oil, and textiles. On a regional basis, Egypt provides an interesting case study as its trade structure is strongly diversified. According to 1994 trade data, less than half of all merchandise import and export trade is with the EU and these shares vary considerably across products. Egypt’s trading relations are much less focused on the EU than are those of other North African countries, such as Morocco (Rutherford, Tarr and Rutström 1997). In the absence of regional data on services trade, we assume that the EU’s initial shares are equivalent to its total merchandise import and export shares. Among the most important Egyptian production sectors are vegetable food products, animal products, food processing, trade, transport, social services, construction, and cotton textiles. Of these, services employ a disproportionate share of the labor force, while capital tends to be concentrated in agricultural sectors.

The IO Table is supplemented with data on government policy parameters. We apply effective rates of capital taxation calculated by the World Bank (1995) for 1990. There are no taxes levied on agriculture, an approximate 18% tax on manufactures (including mining and crude oil sectors), and approximately a 23% tax on services. By 1993 Egypt had phased in a goods and services tax and phased out indirect production taxes and most subsidies (World Bank, 1995). The GST is applied on the sales of goods and services, with rates that vary across industries. We treat the GST as a tax on domestic final demand (excluding government purchases).

Import-weighted tariff rates are computed from information on 1994 trade and tariff collections data by 8-digit Harmonized System classification. Currently, tariffs are levied on an MFN basis. We aggregate
these tariff rates to the IO sectors by developing import weights consistent with a concordance constructed by the authors. Various tariff exemptions imply that Egypt does not collect full revenue on its legal tariff rates, forcing us to scale the weighted rates down by approximately 20% to be consistent with 1994 revenues. It is difficult to obtain information on trade barriers in Egyptian services. Conversations with Egyptian experts indicate that the service sector is largely closed to foreign competition. A conservative implicit service tariff rate of 15% is assumed in the benchmark.

There are no formal empirical estimates of various Egyptian elasticities of domestic substitution and transformation. A survey of previous Egyptian elasticity assumptions is provided by Lofgren (1994) and we select benchmark parameters consistent with his reported ranges. The elasticity of substitution between labor and capital is assumed to vary across sectors, as taken from Harrison et al (1993). The various trade elasticities correspond to the central cases in Rutherford, Tarr and Rutström (1997). They include an Armington substitution elasticity between regional imports of 5.0 and between imported and domestic consumption of 2.0, and a transformation elasticity between regional exports of 8.0 and between domestic and exported output of 5.0.

4. Simulation Results

In this section we analyze various trade liberalization scenarios for Egypt: one MFN reform and two preferential trade agreements. The results of baseline counterfactual experiments are described. To illustrate the importance of initial bilateral trade shares with discriminatory tariff reform, we go on to perform detailed sensitivity analysis on trade shares.

4.1 Baseline Trade Liberalization Simulations
The baseline counterfactual experiments involve a set of trade liberalization exercises, the results of which are reported in Table 1. For comparison purposes, in Column (1) we report the results of a unilateral removal of all Egyptian tariffs, resulting in global free trade. The EU is assumed to provide no additional market access. This policy generates estimated welfare gains (measured as Hicksian equivalent variation) of 0.81 percent over benchmark 1994 levels. The real exchange rate depreciates by 1.24 percent in order to maintain the benchmark current-account deficit. Tariff elimination requires an offsetting rise in the consumption tax (GST) rates of 24 percent to sustain real government revenues.

Two possible outcomes of an EU partnership agreement are reported in Columns (2) and (3). Scenario EU_AT considers an agreement whereby Egypt eliminates all tariffs on EU products while maintaining existing tariffs on ROW. The EU responds by providing improved access in agriculture and textiles and clothing. Based on the estimates of Harrison, et al (1989), the benefit of inclusion in the EU’s common agricultural policy and greater access under its quotas on textiles and clothing is approximated as an eight-percent price increase for Egyptian exports bound for the EU in these sectors.

Any PTA would result in trade creation and trade diversion. As in our earlier theoretical model, we compute import TC as the change in consumer surplus less tariff-revenue losses on imports arriving from the EU. As Egypt also experiences an improvement in its terms of trade with the EU, the TC measure further includes the net increase in producer surplus for exporters to the EU. Trade diversion is computed as losses in tariff revenues on imports from ROW. The model estimates TC gains from this agreement of 500 million real Egyptian pounds and TD losses of 530 million pounds, implying a direct welfare loss of 30 million pounds. Thus, we find that the direct impact of this form of PTA would be negative for Egypt.

This direct measure of static welfare changes reflects the standard conception, in which TC and TD emerge against an idealized backdrop of an otherwise undistorted economy and no fiscal revenue target.
However, other distortions exist in the Egyptian economy and interact with trade reform, while the government is constrained to offset changes in tariff revenues with altered tax rates. We find that in the context of this PTA, the Egyptian government could lower the GST by 3.4 percent while maintaining a fixed deficit, implying an added gain in welfare. That is, despite the preferential lowering of tariffs, there is a reduction in the GST as resources and consumption flow into higher-taxed sectors in general equilibrium. Overall, EU_AT provides a 0.14 percent static gain in welfare. The real exchange rate depreciates by 1.25 percent to maintain the benchmark current-account imbalance.

In the second preferential trade agreement scenario, EU_TOT, the EU offers the same concessions in textiles and agriculture described in EU_AT and, in addition, recognizes Egyptian inspection practices and production standards. We assume this generates a one-percent reduction in EU non-tariff barriers on Egyptian exports, yielding an equivalent improvement in Egyptian export prices across the board. Trade creation and trade diversion estimates are comparable to those observed in the EU_AT scenario, with a smaller net welfare loss. Accounting for tax neutrality, the overall welfare gains of 0.27 percent are double the gains available under the first case. The GST is reduced by 3.59% and the real exchange rate depreciates by 0.95 percent.
4.2. Analysis of Different Bilateral Trade Shares

The preceding analysis was based on observed benchmark EU trade shares. Unlike the single-sector model in Section 2, these proportions vary across products, complicating the analysis of TC and TD as the aggregate EU trade shares change. To handle this problem, we simulate the impact of discriminatory trade reform under the supposition that Egypt’s imports and exports are more or less concentrated with the EU than is actually observed. That is, a series of (fictitious) new benchmarks is created in which sectoral European trade flows are assumed to range from 50 percent of observed imports and exports to 150 percent of actual flows. Sectoral ROW trade flows are redefined as the residual of total imports (exports) less simulated EU imports (exports). Note that for trade multipliers exceeding one it is possible for simulated EU imports (exports) to exceed total imports (exports) in some sectors. Trade in these cases is characterized as a corner solution whereby all benchmark imports (exports) are assumed to originate in (be destined to) the EU and ROW trade flows are set to zero. The counterfactual experiments, EU_AT and EU_TOT, are run against this backdrop of contrived EU trade.

Consider the impact of the EU_AT tariff reform under the presumption that Egyptian trade flows with the EU are half the observed benchmark levels. The results (not shown) are an estimated 329 million Egyptian pounds in welfare gain from TC with the EU, while TD losses are approximately 483 million pounds. Thus, at our lowest partner trade shares, the net welfare loss is -154 million pounds, or five times that using the observed shares.

Trade creation, trade diversion, net welfare and welfare (including tax offsets) are graphed as functions of EU trade multipliers in Figure 2. Confirming our theoretical results, TC and TD are concave functions of partner trade shares. Focusing purely on the difference between TC and TD, the economy stands to suffer a
fall in net welfare unless benchmark trade is approximately 1.11 times more heavily focused on the EU than that observed in our 1994 benchmark. Nonetheless, a larger simulated trade share with the EU appears to be associated with greater welfare gains (or smaller welfare losses).

As discussed above, aggregate welfare changes depend also on offsetting changes in tax rates for fiscal neutrality. Figure 2 also depicts aggregate change in welfare in response to the EU_AT trade agreement. Although they are highly correlated, aggregate welfare changes everywhere exceed direct welfare impacts, implying that TC and TD interact positively with endogenous domestic tax changes. The PTA generally results in an estimated rise in aggregate welfare except with small partner trade multipliers.

Similar results pertain with sensitivity analysis of trade shares in the EU_TOT case, as shown in Figure 3. Both TC and TD are concave with respect to the EU multiplier. Both net and aggregate welfare increase as the share of trade with the EU is scaled up. Direct welfare gains attributed directly to net trade creation are positive only for EU trade multipliers at or above about 1.07.

5. Concluding Remarks

This paper considers the welfare implications of a discriminatory preferential trading arrangement in a general equilibrium model where imports are differentiated by region of origin and terms of trade are fixed. The relationship between the initial (pre-reform) relative volume of trade with the potential partner and welfare changes is theoretically ambiguous. Applied general equilibrium analysis of Egyptian trade illustrates the issues with regionally differentiated trade flows. Our simulations indicate that potential Egyptian welfare gains from a European PTA are modest. Experiments altering the composition of Egyptian trading patterns show that trade creation and diversion are non-monotonic, concave functions of the benchmark share of trade with the PTA partner. Nonetheless, aggregate welfare gains rise with the initial partner trade share. Thus, in the particular
case considered here, the more focused Egypt's trade patterns are on the EU, the more the country would gain from a preferential trading arrangement.
References


Konan, Denise Eby and Keith E. Maskus, 2000a, “The Relation Between Partner Trade Shares and Domestic Welfare in a Preferential Trade Agreement with Differentiated Products,” manuscript, University of Hawaii.


Figure 1: Import Markets
Table 1—Baseline Trade Liberalization Scenarios (% change)

<table>
<thead>
<tr>
<th>Variable</th>
<th>GLOBAL (1)</th>
<th>EU_AT (2)</th>
<th>EU_TOT (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREATION*</td>
<td>0.50</td>
<td>0.51</td>
<td></td>
</tr>
<tr>
<td>DIVERSION*</td>
<td>0.53</td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>NET WELFARE</td>
<td>-0.03</td>
<td>-0.01</td>
<td></td>
</tr>
<tr>
<td>EXCHANGE</td>
<td>1.24</td>
<td>1.25</td>
<td>0.95</td>
</tr>
<tr>
<td>GST</td>
<td>24.03</td>
<td>-3.39</td>
<td>-3.59</td>
</tr>
<tr>
<td>WELFARE</td>
<td>0.81</td>
<td>0.14</td>
<td>0.27</td>
</tr>
</tbody>
</table>

* Measured in billion Egyptian pounds (ELs).

**SCENARIOS**

EU_AT is a PTA with the EU in which Egypt eliminates all tariffs on EU imports. The EU provides improved access in agricultural goods and textiles and clothing, resulting in an eight-percent rise in those Egyptian export prices to the EU.

EU_TOT extends scenario EU_AT. Egypt eliminates all tariffs on EU imports. The EU provides more liberal access to domestic markets, resulting in a one-percent increase in all export prices to the EU, with an eight-percent price increase in agriculture and textiles.

GLOBAL involves unilateral tariff elimination by Egypt against all trading partners. The EU grants no concessions and export prices are unchanged.

**VARIABLE ESTIMATES**

CREATION is the real increase in GDP (in billion Egyptian pounds) due to trade creation.

DIVERSION is the real decrease in GDP (in billion Egyptian pounds) due to trade diversion.

NET WELFARE equals CREATION minus DIVERSION.

EXCHANGE is the percentage change in the real exchange rate, or shadow price of foreign currency, necessary to maintain the benchmark current account imbalance.

GST is the percentage change in the consumer tax (or GST) required for government revenue neutrality.

WELFARE is the percentage change in real benchmark 1994 GDP measured in equivalent variation.
Figure 2: EU_AT Share Sensitivity Analysis

Money Metric Utility

EU Trade Share multipliers
Figure 3: EU_TOT Share Sensitivity Analysis

Money Metric Utility

EU Trade Share Multipliers
Endnotes

1 Our CGE model of Egyptian trade liberalization is established in the literature (Hoekman and Konan (2000), Hoekman, Konan, and Maskus (1998), Konan and Maskus (1997, 2000b), Maskus and Konan (1997)).


3 In general the shift in ROW demand would be different in this case than in the prior case but to avoid cluttering the diagram we use the same shift to depict both cases.

4 We assume that this demand structure also characterizes government consumption and investment spending.

5 Maskus and Konan (1997) also consider models with sector-specific capital in all sectors or selected resource-constrained sectors.

6 Throughout the counterfactual simulations the beverage tariff is not changed to reflect Egypt’s social policy for maintaining rigorous barriers on imported alcoholic beverages.

7 Because preferences are homothetic, this measure is a monotonic transformation of Hicksian equivalent variation.