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FREE TRADE AGREEMENT METHODOLOGY MANUAL

FINAL REPORT

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FREE TRADE AGREEMENT METHODOLOGY MANUAL

FINAL REPORT

SUSTAINABLE ACHIEVEMENT OF BUSINESS EXPANSION AND QUALITY (SABEQ)

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BEARINGPOINT, INC.

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Preface

The contents presented in this document should not be viewed as a substitute for intensive market analysis, industry studies, policy studies, and so on. Rather this guide should be viewed as a methodology for identifying advantages and pitfalls of current and potential RIAs, quantifying some of the impacts grossly, and suggesting just which future analysis or studies would be crucial. The "rules of thumb" developed are just that – important indicators, not the last word – but they do draw on many decades of economic theory and practical experience with RIAs.

1. INTRODUCTION: BACKGROUND & CONTEXT

1.1 THE REGIONAL TRADE ALTERNATIVE

The world economy since World War II has become much more integrated. Following eight successive multilateral rounds of negotiations under the General Agreement on Tariffs and Trade (GATT), international trade today is substantially unimpeded by commercial barriers relative to the dismal experience of the 1930s. However, high tariffs and other barriers to trade and investment still remain in place, especially for developing countries and particular sectors, including agriculture, in developed countries. One approach for moving forward with trade liberalization has been to negotiate regional integration agreements ranging from flexible, mostly trade oriented free trade agreements (FTA) to deeper partnerships and even economic union as in the EU. All of these agreements are sanctioned and proscribed as legitimate exceptions within the multilateral framework by GATT Article XXIV, GATS Article V, and, for the developing countries including Jordan, the Enabling Claus of the 1979 Agreement.

While regional trade agreements have a certain economic and political appeal, they have long been viewed with suspicion by multilateralists and advocated only with great caution by economists. The multilateralists see the danger of distracting attention from the broad system of nondiscrimination through "most favored nation" (MFN, now "normal trade relations" (NTR)) and "national treatment". Economists since at least Viner [1950] have articulated clearly that there is no theoretical presumption that regional trade agreements will make a country better off.

1.2 EMPIRICAL EVIDENCE -- SUCCESSES AND FAILURES

There is general agreement that whether or not existing RIAs have been successful is an empirical issue and the evidence is mixed. Among the many studies are those by Frankel *et al*. (1996), Soloaga and Winters (1999), Zahniser et al. (2002), and for CGE models Burfisher and Jones (1998). Among 63 countries between 1965 and 1992, evidence of trade creation and trade diversion showed no clear bias one way or the other. In Latin America, no evidence of increased intra-bloc (RIA) trade was found. Gravity models (discussed below) have suggested a positive and significant impact on Mexico's trade from NAFTA. However, Panagariya (1997) finds a $3.26 billion potential loss for Mexico from NAFTA using a slightly different methodology, whereas Brown (1993) estimated before implementation a potential slight gain using yet another methodological approach.

Recently, using the gravity model approach, Tang (2005) has found that the formation of the ANZCER led to trade diversion from non-member countries, while the ASEAN free trade area resulted in a trade increase with non-member countries. He found little effect for NAFTA in contrast to earlier studies cited above. Elliot (2007) employs a gravity model to find that regional integration does not necessarily increase trade flows and may in some cases be associated with a decline in the case of CARICOM.

Using the Computable General Equilibrium (CGE) methodology (discussed below) studies have been made of NAFTA, Western Hemisphere integration, EU expansion, and APEC. The studies indicate welfare improvement for both members and the world, except for the U.S. when it is a non-member. An excellent survey of these studies and some of the issues involved is provided in Burfisher, Robinson, and Thierfelder (2003).

1.3 JORDAN AND ITS RECORD

Jordan is, of course, a contracting member of the WTO (2000) and has further entered into several RIAs of various "deepness" which are not all fully implemented yet. Current arrangements include the JUSFTA (2001), the GAFTA (1998), an Association Agreement with the EU (2002), an FTA with the EFTA (2002), an FTA with Egypt, Tunisia and Morocco (2004, the Agadir Declaration) as a step toward a 2010 Euro-Mediterranean FTA. In the last five years, trade volume impacts, aside from the QIZs which are a somewhat special case, have been weak. An excellent survey of these and impending agreements is provided by Saif and Neaime (2006) who find *potentially* large amounts of trade creation with the EU-FTA and especially with the GAFTA, but more modest trade creation with the JUSFTA. All of the arrangements entailed trade diversion, especially the EU-FTA, although the EFTA was of little consequence in any dimension. These findings comport roughly with those of various USAID-AMIR studies as, for example, AMIR (2004, 2006).

There is at least one CGE model of Jordan employed by Lucke (2001), Feraboli (2006), and others. The model has been used to explore the fiscal impact of trade liberalization in Jordan as well as some of the welfare consequences of an Association Agreement with the EU. Findings tend to suggest welfare enhancement but with potentially large negative government revenue implications due to the loss of tariffs. The issue then becomes how best to restore fiscal balance – expenditure reductions or alternative tax enhancements. This model could clearly be used to address other scenarios and potential RIAs when appropriate (discussed below).

2. Choosing an Approach for Selecting New Partner Countries or Assessing Current Agreements

2.1 BROAD CONSIDERATIONS

Although this document provides specific economic guidance for assessing a potential FTA partner, more broadly it is important to remember that any agreement is in the context of an overall national approach to improving the welfare of citizens. FTAs are typically not the most important thing a nation can do to promote prosperity, growth and development. Unilateral free trade and securing property rights, for example, has been a successful model for some of the world's richest countries. Also, there are a host of non-economic considerations involving international relations and domestic politics.

Two specific economic considerations of importance, but not addressed in this document, are "path dependence" and "deepness of integration." Path dependence refers to the reality that any future FTA will be in the context of existing agreements and may be influenced by future agreements not yet considered. Thus, any agreement may become more or less valuable as new agreements are constructed. In particular, currently existing agreements may become less valuable as Jordan or its partners enter into new agreements. Also, an agreement under consideration may be beneficial in the current climate but harmful if the potential partner enters into other agreements. Deepness of integration refers to the negotiated level of economic freedom. Traditional FTAs address trade and to some extent investment, but deeper integration may involve movements of labor, harmonized fiscal policies, and so on.

2.2 TECHNICAL CONSIDERATIONS: CGE, GRAVITY MODELS, CPE/INDICATORS

There are several accepted methodologies which can be applied when evaluating RIAs. These include several quantitative approaches each of which should usually be complemented with a qualitative component. The choice of quantitative approach depends on two things: Potential *terms of trade effects* and the *deepness of integration*. If agreements being considered are very broad, like the Doha Round, or involve large countries, like the EU, an agreement by altering world trade patterns could change world prices or regional prices net of tariffs. Also, trading partners might have very unique products so that they are in a sense large countries with respect to their exports. For example, Grenada is a small country except economically it is the source of fifteen percent (15%) of world nutmeg exports. If these terms of trade effects are large, it is important to take them into account when evaluating an agreement. In such cases, a general equilibrium methodology is required. A ***Computable GeneralEquilibrium model*** (CGE) is one appropriate methodology, although there are some well known disadvantages to such an approach (Annex 1). Since Jordan is a small country without highly differentiated production – i.e. there exist substitutes for most of Jordan's export and import products in terms of other world suppliers – terms of trade effects on world prices are unlikely to matter. Methodologically the appropriate test is a simple market

power index defined as Jordan's share of world exports and imports by product (Annex 2). Note that Jordan's share in the particular RIA in question is irrelevant unless trade in a particular product is only traded within the RIA and not at all with non-members. In fact, Jordan's largest export share of the world market is only 1.6% (fertilizers) and other things are less than ½ of 1%. For existing RIAs, shares are bigger but not dominant.

Also, the nature of any RIA beyond traditional liberalization of trade and investment can matter. If the integration under consideration is "deep", then there are many intangibles that are important but difficult to quantify. These may include technical assistance, legal or regulatory reforms, side agreements on the environment or labor practices, domestic tax harmonization with other RIA members, and so on. EU Partnership Agreements for example tend to be deeper than traditional FTAs. For existing agreements, one widely applied approach used to analyze such complicated agreements employs a ***Gravity Model*** (Annex 3). While sometimes criticized as lacking firm theoretical underpinnings, the approach is useful for evaluating the impact of existing RIAs. However, in general the gravity model approach is less useful when considering potential trade agreement partners.

The third approach presented in this document exploits indicators of potential impact and a ***computable partial equilibrium methodology*** aimed to quantify particular industry effects and government revenue implications. The advantage of this approach is that it is firmly rooted in received economic thinking, isolates potential impacts on particular industries, yields intuitively appealing rules of thumb for evaluating potential trade agreements, and is straight forward to implement with data that is both reliable and widely available. It also suggests the logic of *quantitative potential trade flow indicators*. Finally, this methodology is more useful in identifying and quantifying potential *government revenue effects* because it exploits more disaggregated sector level data which is important when tariffs are not uniform as is the case in Jordan.

In what follows we restrict the analysis to traditional FTAs. The focus is on quantitative aspects but we emphasize that qualitative industry studies, assessment of implementation rules and modalities, and so on is always necessary. In fact, standard methodology in assessing any RIA would include an analysis of non-quantifiable effects and provisions such as:

1. Establishment of Free Trade Area and FTA Definitions
2. Market Access
3. Specific Industries of Interest (e.g. Textiles and Apparel)
4. Rules of Origin
5. Customs Administration
6. Sanitary and Phytosanitary Measures
7. Technical Barriers to Trade
8. Safeguards
9. Government Procurement
10. Investment

11. Cross-Border Trade in Services
12. Financial Services
13. Telecommunications
14. Electronic Commerce
15. Intellectual Property Rights
16. Labor
17. Environment
18. Transparency
19. Administration of the Agreement
20. Dispute Settlement
21. Exceptions
22. Final Provisions

3. Isolating and Measuring the Impact of Current and Potential FTAs

3.1. THE BASIC FRAMEWORK AND LOGIC OF THE QUANTITATIVE INDICATORS AND ANALYSIS

In this section we develop the analytics of quantifying the sectoral impact of an FTA and provide the underlying logic of quantitative indicators of potential impact. In subsequent sections we present each indicator and discuss how the sector impact analysis is operationalized. We proceed initially at a partial equilibrium level focusing on a variety of industries in isolation. As discussed above in "Choosing an Approach for selecting new partner countries or assessing current agreements", this is justified by the still small size of each industry relative both to the world economy, certainly, and to the overall size of the domestic economies under consideration. Technically, we assume that the output variations of one industry do not impose significant cost effects on other industries. We provide the formal specification of the model in Appendix 1, and summarize our approach using Figures 1 and 2 below. Note that the logic is applicable generally. It is only the actual estimation later that is sensitive to the partial equilibrium assumption. In principle, the demand and supply curves below could be thought of as general equilibrium demand and supply (Corden, 1997). We specify the simple *perfect substitutes* version of the model below, although we provide the *imperfect substitutes* version in Appendix 1. This latter version is appropriate when Jordan produces unique products or varieties not available elsewhere in the world.

3.1.1. EXPORTS

Consider first the class of goods which are potentially exported from Jordan to a partner country – for example, jewelry, furniture, or ceramics. We will assume that the FTA in question is a bilateral one and address the complications of multiple country FTAs later.

Focusing on any one such good and the partner market, Figure 1 depicts the partner import demand (D_{part}) and Jordanian export supply (S_J) of goods potentially eligible for FTA treatment, where the quantity of the good and the price are denoted by Q and P, respectively. (We will refer to these sorts of goods as "potential FTA exports", or just "exports" where the meaning is clearly in reference to the FTA.)

The supply curve is used to capture four forces at work. Specifically, any FTA-induced price increase for Jordanian exporters to the partner market will induce a positive supply response of FTA exports owing to:

i) an **increase** in the level of output (and employment) of the good produced in Jordan and exported to the Partner;

ii) a **diversion** of some of the already existing level of Jordanian output from alternative export destinations to the Partner market;

iii) a **conversion** of some of the already existing level of Jordanian exports to the Partner from NTR (MFN applied base tariffs) status to FTA (duty-free) status;

iv) a **conversion** of some already existing level of Jordanian exports to the Partner from existing bilateral trade agreement concessions status to FTA (duty-free) status. If the new partner is joining a current FTA (e.g., GAFTA), then this may entail a shifting of Jordanian exports from current FTA members to the new member.

As explained below, the first three effects are clearly welfare enhancing for Jordan, with effect "i)" governing increased employment, while effect "iv)" is largely neutral, although it could entail some positive aspects through cost reductions associated with more liberal FTA rules of origin as was the case with the JUSFTA where Jordan already had GSP and QIZ duty free access to the U.S. market before JUSFTA or the Agadir Declaration where accumulation is the important advantage.

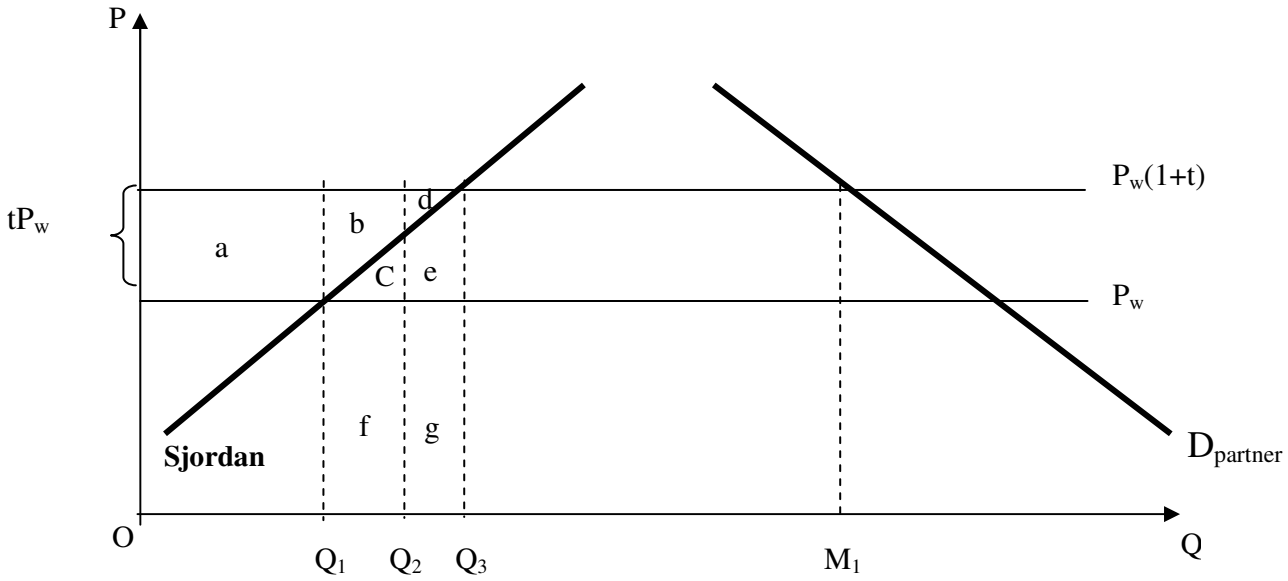

Figure 1: Effects of Trade Preferences in the Partner Market

- The world price for the good is given by P_W and is assumed to be unaffected by the level of trade between the Partner and Jordan. This assumption and its alternative are discussed in the next section.
- The Partner applicable MFN *ad valorem* tariff on imports of this good is denoted by t so that the demand price in the partner market is given by $P = (1+t)P_W$, but exporters only receive this price net of the tariff, or P_W.
- Total imports for this good are given by M_1, determined by the total quantity of imports demanded by the partner at domestic price P of which Jordan supplies a portion.
- In the absence of any other trade preferences for Jordan, Jordanian exports to the market are given by Q_1. Tariff revenue collected on Jordanian exports, tP_WQ_1, is given by the area "a". Now, when the FTA is fully implemented, qualifying Jordanian exports are exempt from the import duty and so exporters receive the full tariff protected domestic price P. Jordanian exports to the partner market for this good increase to Q_3, displacing an equivalent amount of exports from other non-preferred countries. Of these increased exports, $Q_2 - Q_1$ we assume comes from increased production in Jordan and the rest derive from Jordanian exports diverted from other non-partner markets.

Furthermore, industry export earnings and value added rise. If all of the previous NTR exports qualify for FTA status, the surplus now available to Jordanian exporters rises by the full amount of previous tariff revenue payments plus a bit more, in total denoted by the area a + b + c + d + e. (Note that areas f and g represent increased export earnings in the partner market, but that amount could have been earned elsewhere by selling at the world price, P_W, and so is netted out of "net welfare export earnings.") In particular, the areas indicated in Figure 1 correspond to:

- **a**, the price premium on existing exports owing to the exemption from the tariff;
- **b + c**, the increased net revenues owing to the increase in Jordanian production of new exports;
- **d + e**, the increased net revenues owing to diversion from previous export markets to the partner market;
- **c + e**, the increased costs of producing new goods or diverting existing exports to the partner market; and
- **f + g**, increased export earnings in the partner market that could have been earned in other world markets anyway.

3.1.2. TRADE CREATION AND TERMS OF TRADE EFFECTS

In the discussion so far there has been no role for an external terms of trade (world prices) movement. This is driven by the maintained assumption that Jordan is relatively small relative to world markets and its exports are typically not unique in the sense of being highly differentiated products that only Jordan can produce. (Even Dead Sea products do not qualify as there are many highly substitutable alternatives.)

Nonetheless, for products that are very unique, the appropriate modification to the model above is to incorporate the *imperfect substitutes methodology* (Appendix 1). For potentially large impacts on world markets, a CGE model such as GTAP (www.gtap.org) would be appropriate.

Finally, if the researcher has strong reason to believe that a potential FTA may engender important external price changes in the market, the methodology is consistent with allowing a price increase or reduction to be incorporated.

3.1.3. IMPORTS

Figure 2 illustrates a similar methodology relating to imports from the Partner gaining duty free access into Jordan. Consider a good which is exported from the Partner to Jordan. The product may or may not be produced locally in Jordan, although the illustration assumes that there is some import-competing production.

M_2

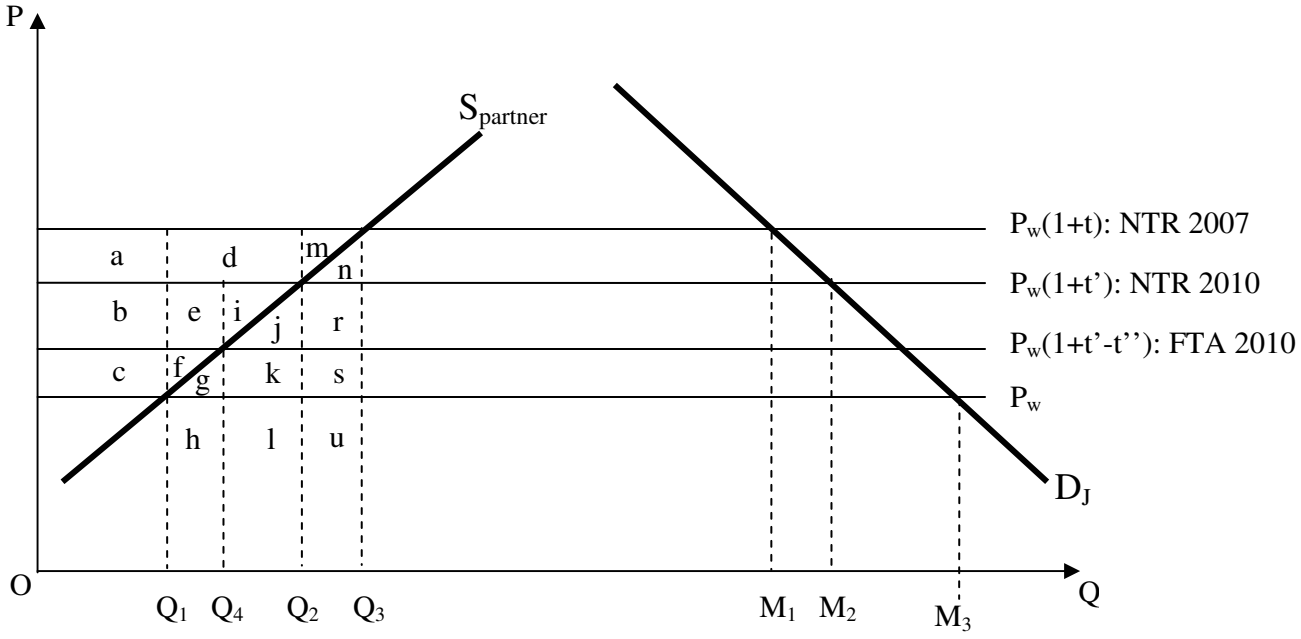

Figure 2: Effects of Trade Preferences in the Jordanian Market

Again, we take the world price of such a good, P_W, to be unaffected by the Agreement. Figure 2 depicts the Jordanian domestic import demand for the good as D_J and the supply from the Partner to Jordan as $S_{partner}$, with the supply curve reflecting both the production response and the trade diversion response as before. The domestic price of the good, P, reflects any Jordanian tariff, t, so that $P = (1+t) P_W$ for the tariff schedule before the FTA. In the absence of tariff preferences, assuming the initial year 2007 NTR tariff rate t, Partner exporters receive the supply price P_W, which is net of the tariff, and so supply Q_1 of Jordan's total imports M_1 of the good. Tariff revenue collected from Partner exporters is given by the area a + b + c.

With the full implementation of the FTA, the applied tariff falls to zero, and so Partner exporters now supply the Jordanian market with the larger quantity Q_3 at the domestic price P, of which some portion (not shown) may derive from new production and the rest is diverted trade. In this case, the duty-free Partner exports displace the exports of other countries resulting in increased export earnings of tP_WQ_3. Geometrically, this is shown by the area a+b+c+d+e+f+g+i+j+k+m+n+r+s.

In fact, the FTA may not be fully implemented immediately and any calculations should reflect the lower but still non-zero Jordanian FTA tariffs, denoted t'' in Figure 2 where for illustration we suppose that a transition year is 2010. Furthermore, our calculations should reflect that the preference margin for Partner exports can be eroded somewhat by the continuing policy of Jordan lowering overall NTR tariffs for all of its trading partners.

In Figure 2, the future (2010 for illustration) NTR applied base tariff is shown as t' resulting in total imports from all sources of M_2 and, of this, in exports from the Partner being somewhat lower at Q_2 when the zero tariffs are fully implemented and, for 2010, at

Q_4 since the Partner selling price net of the non-zero FTA tariff is $P = (1 + t' - t'') P_W$. Hence, the value of FTA access in terms of additional net export earnings is reduced to $(t'-t'') P_W Q_4$, or geometrically area c+f+g. (Area g represents any real resource cost of increased Partner exports to Jordan. Area h represents export earnings, but these earnings could have been realized by exporting anywhere at the world price and so are netted out from the FTA calculation of benefit.

3.1.4. EMPLOYMENT EFFECTS

Employment will be created in exporting industries as output expands in response to the FTA trade preferences. Note that, in our theoretical framework, the FTA does not reduce employment in any import-competing industries because the increased imports come at the expense of non-FTA country exporters who must now compete on less favorable terms and so see their exports displaced by Partner or Jordanian exports.

In Figure 1, for example, the FTA is credited with increased output in Jordan for this industry of $Q_2 - Q_1$, the rest being attributed to converted existing exports, Q_1, and trade diverted from other Jordanian export markets to the Partner market, $Q_3 - Q_2$. Roughly, the increase in Jordanian production will generate employment in proportion to the industry output change. So, for example, the direct employment effect will be the percentage change in the export prices due to trade preferences times the price elasticity of supply times current employment in the industry. For example, a five percent increase in the export price when the price elasticity of supply is 2 will induce a ten percent increase in employment in such an industry. Of course, there will also be positive indirect employment effects as the expanding industries increase their demand for locally supplied intermediate inputs, transport services, and so on.

3.1.5. INVESTMENT EFFECTS

Potential investment effects are notoriously difficult to quantify and may be better addressed by qualitative studies based on patterns of local and foreign investment and on business surveys. Nonetheless, one quantitative approach to estimating investment effects is to assume that existing patterns of investment in Jordanian industry will be altered in proportion to the predicted changes in industry output. Thus, if for example exports of tiles are predicted to increase by 15%, and if current tile producers are financed by 80% local investment and 20% foreign capital, then it might be (cautiously) inferred that local investment in the industry would increase by 12% (i.e., 0.8x0.15) and foreign investment might increase by 3% (i.e., 0.2x0.15).

4. Potential Trade Flow Indicators and "Rules of Thumb"

The model of Section 3.0 highlights the market characteristics which are most compatible with a welfare enhancing FTA when non-member trade is not totally displaced by the FTA. Complementary to these are the "Johnson Rules" which identify the conditions for net welfare gains for FTA members when external terms of trade movements are potentially important (Johnson, 1960).

4.1. ECONOMIC CHARACTERISTICS FOR FAVORABLE FTA

4.1.1. FACTORS MORE FAVORABLE TO A WELFARE ENHANCING FTA WHEN NON-MEMBERS ARE NOT TOTALLY DISPLACED FROM TRADE

(Note that these rules depend on an absence of external terms of trade effects.)

Partner export market:

- High Partner tariffs on Jordan exports
- Large amount of Jordan exports and large relative market share
- Low Jordan industry costs relative to non-members
- High Jordan export elasticity of supply
- High Partner tariffs relative to other Jordan export markets
- Few future Partner FTAs anticipated with Jordan-like economies
- Slow pace of Partner tariff reform on products of Jordanian interest

Jordan import-competing market

- Low import tariffs where concessions will be given
- Low Partner amount of exports to Jordan and low relative market share
- Low Partner export elasticity of supply
- Expeditious lowering of Jordan's NTR tariffs in products of Partner exports

The logic of these rules is apparent from the discussion of Section 3.0. Consider Figures 1 and 2 of the section. In the export markets, Jordan gains the most when Partner concessions are on export industries which already have a large presence in the partner market and where the Jordanian exporters can respond to price increases aggressively. In Figure 1, this roughly corresponds to a supply curve that is flatter and Partner tariffs which are high. Also, if Jordan's costs are low the gains will be higher and if Jordan's costs are low relative to non-members or the pace of Partner extending concessions to other countries is slow then the gains are likely not to be eroded in the future.

In the import-competing market, the extra quantity supplied comes from the Partner due to Jordan's tariff concessions. Jordan will lose somewhat owing to duty-free Partner exports displacing cheaper non-member exports which are dutiable. Hence, Jordan gains most if this effect is small. This in turn would be the case if the Partner had a relatively small share of the Jordan market, if Jordan's tariffs are already or will be low in the future for products of Partner interest, and if the Partner export supply elasticity is low. Unless the Partner has unique products or displaces all imports of non-members, however, there will be no beneficial terms of trade (lower prices in Jordan) effect.

4.1.2. FACTORS MORE FAVORABLE TO A WELFARE ENHANCING FTA WHEN THERE ARE (EXTERNAL) TERMS OF TRADE EFFECTS ("JOHNSON RULES")

As noted above, if Jordan's trade agreements are likely to engender significant effects on world prices, then the rules of thumb are somewhat modified. Specifically, factors likely to be most compatible with welfare gains in Jordan would include:

- Higher initial level of Jordan tariffs
- More elastic partner country export supply curve
- Smaller initial differences in costs between the partner country and the other foreign sources of supply for goods which they both can produce
- More elastic partner country supply of such goods and less elastic foreign supply of them
- More inelastic foreign export supply to and more inelastic foreign demand for exports

Intuitively, the first two factors are compatible with more trade creation, the second two with less trade diversion, and the last factor most amenable to a substantial terms of trade improvement.

While Jordan is probably unlikely to unleash large external terms of trade changes, the researcher may want to be informed by the business community and relevant GOJ agencies such as Jordan Enterprise.

4.2. INDICATORS AND MEASUREMENT

Operationally the conditions more or less favorable to a successful FTA are measured with some aggregate trade flow indexes summarized below and provided in an *Excel Spreadsheet* format with this document. These indicators are also discussed in World Bank (2002) which is provided as well.

4.2.1. RELATIVE GROWTH RATES (GR) OF MERCHANDISE EXPORTS AND IMPORTS

Indicator: $GR_i = (X_{tB}/X_{tE}^{)(1/n-1)}*100$ where X_{tB} and X_{tE} are the trade values of product i in the beginning period and the end period; n is the number of years

Data Sources: Trademap.org (In that data, GR is already calculated for 5 year intervals.)

Interpretation: Indicates which industries are growing fastest in trade. The indicator is suggestive of comparative advantage (more positive) or comparative disadvantage (less positive or negative) industries. The indicator can be calculated and compared with the world growth rates or with various individual potential partners. More favorable would be faster growth rates both overall and specifically to the potential partner countries with slower or negative growth in the partner countries.

4.2.2. REVEALED COMPARATIVE ADVANTAGE (RCA)

Indicator: $RCA_{ij} = (x_{ij}/X_{it})/(x_{wj}/X_{wt})$ where x_{ij} and x_{wj} are the values of country i's exports of product j and of world exports of product j; X_{it} and X_{wt} are the country's total exports and world total exports.

Data Sources: Trademap.org

Interpretation: The RCA index is used to assess a country's export potential in particular products. An RCA greater than unity suggests a revealed comparative advantage and less than unity a revealed comparative disadvantage. The RCA can also provide useful information about potential trade prospects with new partners. If countries have similar RCA profiles, it is unlikely that trade will be much affected by any FTA. Thus, the RCA should be computed for Jordan and any potential Partner and then compared.

4.2.3. EXPORT SPECIALIZATION (ES) INDEX

Indicator: $ES = (x_{ij}/X_{it})/(m_{kj}/M_{kt})$ where x_{ij} and X_{it} are export values of country i in product j and total exports of country i; m_{kj} and M_{kt} are the import values of product j in market k and total imports in market k.

Data Sources: Trademap.org

Interpretation: The ES is similar to the RCA but with reference to a particular market. This makes it especially useful for identifying potential FTA partners. In particular, the indicator shows the ratio of country i's export potential to country k's import needs. If the ES is greater than unity it indicates favorable specialization opportunities in market k. A value less than unity indicates a revealed comparative disadvantage in market k.

4.2.4. EXPORT SIMILARITY (XS) INDEX

Indicator: XS(j,k) = sum [min (X_{ij},X_{ik})*100] where X_{ij} and X_{ik} are industry i's export shares in country j's and country k's exports.

Data Sources: Trademap.org

Interpretation: The XS indicator varies between 0 and 100. Zero indicates complete dissimilarity between export destination markets and 100 complete similarity. Thus, 100 might be taken as more compatible to a non-trade diverting FTA. But, of course, trade would be lower. Also, the index could be taken to indicate countries that would be rivals in a FTA or the potential for trade diversion if only one of the countries were to join the FTA.

4.2.5. TRADE COMPLEMENTARITY (TC) INDEX

Indicator: $TC_{ij} = 100 - sum(abs(m_{ik} - x_{ij})/2)$ where m_{ik} is the share of good i in all imports of country k; x_{ij} is the share of good i in the global exports of country j.

Data Sources: Trademap.org

Interpretation: The TC Index aims to reveal the prospects for intraregional trade by showing how well the structures of a country's imports and exports match. It is useful to calculate this index for prospective FTAs and then compare it with other FTAs and their performance. A value of zero indicates no goods that are exported by one country are imported by the other and a value of 100 indicates the export and import shares exactly match. Higher values are more favorable to a proposed FTA.

4.2.6. TRADE INTENSITY (TI) INDEX

Indicator: $T_{ij} = (x_{ij}/X_{it})/(x_{wj}/X_{wt})$ where x_{ij} and x_{wj} are the values of country i's exports and of world exports to country j; X_{it} and X_{wt} a country i's total exports and total world exports.

Data Sources: Trademap.org

Interpretation: The TI index measures if the value of trade between two countries is larger or smaller than expected based on their importance in world trade. A value greater than unity indicates larger trade flows than might be expected. In this sense, higher values are more favorable to an FTA.

4.2.7. INDEX OF INTRAINDUSTRY TRADE (IIT)

Indicator: $IIT_{jk} = 1 - [sum_i\ abs(X_{ijk} - M_{ijk})/ (X_{ijk} - M_{ijk})]$ where X_{ijk} and M_{ijk} are exports and imports of products from industry i in country j to and from country k. The World

Bank (2002) notes that the computation is generally confined to manufactured goods defined at the Standard Industrial Trade Classification (SITC) three-digit level.

Data Sources: Trademap.org for HS. SITC data available from World Development Indicators (WDI).

Interpretation: This measure is used as a measure of potential trade growth within a particular industry due to the exchange of a wide range of varieties of similar products. It is meant to complement the usual measures of comparative advantage which give rise to interindustry trade. The index ranges from zero – no intraindustry trade – to unity – complete intraindustry trade. An index number closer to unity might indicate the potential for taking advantage of a larger market.

5. Sector Specific Impact Analysis and Government Revenues

In this section we present the methodology for identifying the potential effects of an FTA on specific industries. The analysis is essentially the mathematical specification of the logic of Figures 1 and 2 above. The details are explained in the "Calibration" section below and in Appendix 1. An *Excel Spreadsheet* is provided with the equations and calculations already entered. We begin, however, with a note of caution.

5.1. A NOTE ON IMPLEMENTING AND INTERPRETING THE SECTOR IMPACT ANALYSIS

Figures 1 and 2 can be used to highlight one of the methodological challenges confronting any analysis of current or especially future agreements and partners. In particular, other exogenous changes unrelated to the FTA may serve as important contributing factors which mitigate (or enhance) the importance of the FTA itself. However, and significantly, note that any growth in the size of the Partner economy *per se*, while affecting the level of Partner imports, does *not* alter the level of imports from Jordan since the world supply is taken to be perfectly elastic and so accommodates all of the increase in Partner demand at a constant price. Similarly, any changes in Jordanian demand on account of growing national income will not affect our calculations. Also, while the nominal exchange rate has been constant over the recent period, the real effective exchange rate has not. However, the large depreciation in the Jordanian trade-weighted real exchange rate between 2000 and 2005 should be considered when analyzing trade data from that period.

When considering future trade agreements, there are still three potentially important exogenous factors:

- First, world prices for particular Jordanian export goods may change in the future. In Figure 1, for example, if after the FTA is formed the world price increases for whatever reason, then Jordanian exports might be expected to increase as well, independently of any trade preference.

- Second, costs of production in Jordan or transportation/retailing to the partner market could change exogenously in the future due, say, to technical progress, uncompensated changes in labor productivity, or altered intermediate input costs. This would result in the supply curve in Figure 1 shifting either upward or downward and so result in modified export levels even in the absence of a FTA.

- Finally, any new FTA is only one among many possible alterations to the global trade environment and other important policy changes around the world could modify export patterns. Even beyond events in Iraq, a historically important market for Jordan, other events such as modified access to alternative Jordanian export markets or exogenous foreign investment flows into Jordan could be the source of increased Jordanian exports.

Similar considerations would apply to Partner exports to Jordan

5.2. APPLYING THE METHODOLOGY

5.2.1. SELECTING THE SECTORS

The methodology requires that the researcher identify the potential partner countries along with key export and import-competing sectors of particular focus. This would typically be guided by the indicator values of the last section.

Potential indicators for identifying partner countries of interest might include trade pattern characteristics such as:

- Trade Intensity index
- Export Similarity (ES) index
- Trade Complementarity index:
- Intra-Industry Index (IIT)index

Potential indicators for identifying industries of interest might include industry characteristics such as:

- Market share
- Growth rate
- Higher RCA values
- Higher ES values

5.3. CALIBRATION

The data and parameter values need to be supplied by the researcher.

5.3.1. DATA AND PARAMETERS

The approach taken here assumes that both Jordan's exports and imports are potentially supplied by worldwide competitors with an aggregate supply curve that is perfectly elastic. That is, the world price is taken as constant regardless of the quantity of Jordanian exports to or imports from world markets. This assumption should be justified empirically. In the case of the JUSFTA, for instance, the assumption clearly holds. For example, while one of Jordan's major exports to the United States is certain machinery and other equipment (HS 84) at $7.9 million in 2005, China's exports alone to the United States of these goods is $52.7 billion. The assumption does, however, preclude any consumption gains from the FTA. (See, for example, Bhagwati and Panagariya (1996) and World Bank (2000) on empirical support for this assumption.) However, note that this means that our estimates of welfare benefits are, if anything, biased downwards. Any FTA-induced lower prices or improvements in quality of goods will result in increased net positive national welfare gains captured by consumers as "consumer surplus."

Within the FTA, the supply curves for the Partner and for Jordan of any particular good are taken to be less than perfectly elastic. This is empirically justified so long as the formation of the FTA with its tariff preferences results in less than complete trade diversion. That is, for both the Partner and Jordan, imports within the FTA continue to compete with similar goods from countries outside the FTA which enjoy no trade preferences. In the case of Jordan's exports to most potential partners, this is to be expected simply due to the size of Jordan's economy which makes it impossible for any Jordanian industry to service the entire market before encountering material shortages or cost constraints. For Partner exports to Jordan, currently apparently the costs of supplying most goods from other countries increase as the scale of exports increases. (Otherwise, one countries goods would displace all similar goods from the rest of the world in Jordan.) This undoubtedly owes in part to the increasing costs of transportation and logistics involved in supplying a distant market, as well as to any increasing marginal costs of actually producing the good in question.

Various studies [DEPRA (1998), Hufbauer and Elliott (1994), NBER (2004)] provide a range of plausible elasticity estimates which can be used to guide parameterization of the

model. The crucial parameter is the relevant export supply elasticity which governs our "predicted exports." The import demand elasticity plays no role since world prices are assumed to be unaffected by the FTA and we assume initially that neither country's exports to the other totally displace trade from other regions of the world which enter at MFN tariff rates. The actual parameter values utilized for export supply elasticities might range from 0.5 to 10. Saif and Neaime (2006) take import demand elasticities to be on -0.85 for Jordan, implying an even smaller (in absolute value) Jordanian production price elasticity of supply

A good source for required data which is available to Jordan Enterprise is the ITC TradeMap (http://www.trademap.org/). Data for prices and quantities also can be taken from the IMF (***http://dsbb.imf.org/Applications/web/dsbbhome/***), UNCTAD, and the USITC ***(http://dataweb.usitc.gov/***). Export data are notoriously unreliable since, while imports regularly pass through customs procedures, exports are much less reliably monitored. For example, using the IMF *Direction of Trade* data base, reported imports from Jordan for the United States and exports to the United States from Jordan differ by from 10 percent to 250 percent from 1999 to 2005. Consequently, data should be cross-checked from both the import and export side when possible.

In initializing the model for computation of estimated supply and export earnings effects, we take units of each good to be one U.S. dollar's worth of output when quantity data is unavailable, so that the world price is initially unity. Otherwise, price is set as the unit value of exports or imports.

5.4. OUTPUT, INTERPRETATION AND SENSITIVITY ANALYSIS

The parameter values and required raw data can be entered directly into the Spreadsheet. An example is shown below as Exhibits 1 – 4. Required data are indicated by "enter data" in the column head. Calculations follow.

5.4.1. AN EXAMPLE

For example, Exhibit 1 shows the Spreadsheet that appears under the tab "Export Sectors." This is the calculation that accords with Figure 1 in the text above. The example supposes a potential FTA with Pakistan and data concords to the 2-digit HS sectors. Only one industry – HS 31, Fertilizers – is actually shown. The data to input is available from TradeMap and is shown under the tab "Raw Data (Jordan)" in the Spreadsheet. From the raw data the researcher enters the value (in 1,000s of USD) and quantity of current industry exports. Note that since the physical quantity of fertilizer is not available, the unit price is taken to be USD 1 of fertilizer. From the Pakistan tariff schedule the tariff 15 (%) is entered. The assumption is that the reduction in the tariff

will be to zero so that 100 (%) is entered. (Clearly alternative scenarios or staged implementation could be investigated by entering percentages less than 100.) A key piece of data is the price elasticity of supply. In the example the value 2.0 has been entered. The output shows that this scenario results in a 0.15 increase in price (15% since price is taken to be 1) since the price in this case goes up by the full amount of the tariff. Exports to Pakistan thus would increase by USD 7,231,800 per annum. The net welfare increase is less than USD 4,813.4 thousands per annum – because the calculation subtracts out implied increases in resource costs associated with fertilizer production. Additional calculations (not shown) can be made relating to employment and domestic production if the domestic production elasticity of supply is entered into the Spreadsheet.

Exhibit 2 recounts a similar example for the case of a Jordanian import from Pakistan – HS 10, Cereals. In this case, the Jordan tariff concession results in a loss of welfare of USD 85,400 per annum due entirely to foregone tariff revenue on current and additional imports from Pakistan ("trade diversion"). Since Pakistan's exports do not totally displace other imports of cereal into Jordan, and since Pakistan's cereal has other close substitutes available from other world markets, there is no "trade creation."

5.4.2. SENSITIVITY ANALYSIS

The Spreadsheet provides a simple way to check on alternative scenarios. In particular, the researcher should experiment with other elasticities, ranging perhaps from 1.0 to 5 or based on special knowledge gleaned from other studies or from the business community.

Also, alternative reductions in the tariffs could be investigated since most FTAs phase in tariff reductions rather than move immediately to zero tariffs.

Naturally, a range of industries should be investigated. Also, data may be usefully entered at a less aggregated level than 2-digit HS. Or, SITC data could be used, although this would then need to be concorded with the tariff schedules.

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Exhibits 1-4

Exhibit 1: An Export Industry

Sector Impact Analysis: Trade Flows CPE

Data Source: Trade Map; Jordan Tariff Schedule; Partner Country Tariff Schedule

Home Country (*Jordan*) **Partner Country** (*partner country*)

Export Industry		*enter data*	*enter data*	**calculated**	*enter data*	*enter data*	*enter data*	**calculated**	**calculated**	**calculated**
HS rev. 1 or BOP	***Product or service***	***Value of Indusry Exports to Partner Country (USD '000s)***	***Quantity of Exports*** *(e.g. tonnes) if known (Default enter value of industry exports to partner)*	***Price (Unit value)*** *(Default price is 1(unity): See Manual)*	***Import Tariff in Partner Country*** *(%)*	***Proposed Percentage (%) Reduction of Tariff in Partner Country***	***Price Elasticity of Export Supply*** *(Default elasticity enter 1.5)*	***Predicted Change in Price with Cut in Partner FTA Tariff***	***Predicted Change in Exports to Partner Country*** *(value)*	***Change in Welfare (producer surplus)***
31	Fertilizers	13884	13884	1	15	100	2	0.15	7231.8	4813.4

Exhibit 2: An Import-competing Industry

Sector Impact Analysis: Trade Flows CPE											
Data Source: Trade Map; Jordan Tariff Schedule; Partner Country Tariff Schedule											
Home Country (*Jordan*)			**Partner Country** (*partner country*)								
Import Industry		*enter data*	*enter data*	**calculated**	*enter data*	*enter data*	*enter data*	**calculated**	**calculated**		**calculated**
HS rev. 1 or BOP	***Product or service***	***Value of Indusry Imports from Partner Country (USD '000s)***	***Quantity of Imports from Partner Country*** *(e.g. tons) if known (Default enter value of industry exports to partner)*	***Price (Unit value)*** *(Default price is 1(unity): See Manual)*	***Import Tariff in Jordan*** *(%)*	***Proposed Percentage (%) Reduction of Tariff in Jordan***	***Partner Country Price Elasticity of Export Supply*** *(Default elasticity enter 1.5)*	***Predicted Change in Price Received by Partner Country Exporters with Cut in Partner FTA Tariff***	***Predicted Change in Imports from Partner Country*** *(value)*	***Predicted Change in Jordan Tariff Revenue***	***Change in Welfare (net of terms of trade change)***
10	Cereals	1199	1199	1	6.3	100	2	0.063	241.2	-85.4	-85.4

Exhibit 3: Trademap.org Input Data

Product code	Product label	Jordan's exports to Pakistan		Pakistan's imports from world			Jordan's exports to world		
		Value 2005 in US$ thousand	Annual growth in value between 2001-2005, %	Value 2005 in US$ thousand	Annual growth in value between 2001-2005, %	Market share in world imports %	Value 2005 in US$ thousand	Annual growth in value between 2001-2005, %	Mark share wor expo %
	All products	21,532	-7	25,096,575		0.2	4,278,660	17	0
1	Live animals	0		2,413		0	15,403	24	0.1
2	Meat and edible meat offal	0		2,956		0	10,258	184	0
3	Fish, crustaceans, molluscs, aquatic invertebrates nes	0		1,678		0	1,052	9	0
29	Organic chemicals	273	9	1,266,362		0.4	9,314	7	0
30	Pharmaceutical products	537	12	223,518		0.1	294,068	10	0.1
31	Fertilizers	13,884	-8	655,736		2	458,437	14	1.6
32	Tanning, dyeing extracts, tannins, derivs,pigments etc	0		205,360		0.4	25,990	15	0

Exhibit 4: Trademap.org Input Data

Product code	Product label	Pakistan's exports to Jordan		Jordan's imports from world			Pakistan's exports to world			
		Value 2005 in US$ thousand	Annual growth in value between 2001-2005, %	Value 2005 in US$ thousand	Annual growth in value between 2001-2005, %	Market share in world imports %	Value 2005 in US$ thousand	Annual growth in value between 2001-2005, %	Market share in world exports %	Indicative potential trade in US$ thousand
	All products	25,625		10,454,580	22	0.1	16,050,201		0.2	1,523,251
1	Live animals	21		52,297	5	0.4	3,235		0	983
2	Meat and edible meat offal	0		91,461	19	0.1	18,983		0	4,784
3	Fish, crustaceans, molluscs, aquatic invertebrates nes	92		18,962	22	0	146,657		0.3	16,687
4	Dairy products, eggs, honey, edible animal product nes	0		125,027	15	0.3	22,792		0.1	7,191
5	Products of animal origin, nes	0		388	93	0	15,818		0.3	13
6	Live trees, plants, etc	0		5,237	14	0	673		0	521
7	Edible vegetables and ….	10		42,304	8	0.1	109,935		0.3	21,490
8	Edible fruit, nuts, peel of citrus fruit, melons	0		72,311	12	0.1	106,452		0.2	15,038
9	Coffee, tea, mate and spices	10		36,519	7	0.2	21,390		0.1	2,485
10	Cereals	1,199		347,624	17	0.7	1,100,585		2.5	57,953

Annexes 1-4

Annex 1

A1.0 Elements of a Computable (Applied) General Equilibrium Model

Multi-country computable general equilibrium (CGE) models are mathematically well-specified (complete) characterizations of a trading equilibrium and are suited to capturing sector interaction effects and, in particular when evaluating a RIAs, terms of trade effects. Commodities are taken to be uniquely differentiated by country of origin. Substitution elasticities for commodities between members and non-members of the RIA then govern the demand for non-member goods. Since terms of trade effects and overall trade pattern effects can be simulated for a variety of agreements, the CGE is capable of capturing welfare implications.

While CGEs have their critics (See, for example Schiff and Winters (2003).), the methodology is widely accepted as useful when mixed with sensitivity analysis for parameters and interpreted cautiously as a stylized representation of the world. Data requirements can be demanding, but this is true of many economic models and sensitivity analysis can be used to highlight potential problems.

For concreteness, a very simple CGE model of the Egyptian economy (Cassing and Tokarick, 2007) is included below. Models of RIAs in the literature portraying economies as consisting of ten sectors typically entail hundreds of equations, even more parameters which need to be supplied from the data, and considerable effort in calibrating the baseline model, and so on.

A1.1 An Example: Structure of A Simple Applied General Equilibrium Model

A1.1.1 Model Structure

This example illustrates an applied general equilibrium model of the Egyptian economy that consists of six sectors (oil, service exports, manufactured exports, agriculture, imported manufactures, and a nontraded good) and eight factors of production (labor, capital, and sector-specific factors). Labor and capital are mobile across all sectors. A representative household receives all factor income, as well as all revenue collected from taxation. Egypt is assumed to be a small country, so the terms of trade are exogenous. The price of non-traded goods adjusts to bring about equilibrium in the goods market.

- ***Production Structure***

Value added in each sector VA_j is produced by combining a labor input L_j, with capital K_j and a specific factor F^1_j according to a constant elasticity of substitution (CES) production function :

[1] Fi represents inputs that are specific to industry i ("fixed factors" or "intersectorally immobile factors") such as land, specific industry equipment, etc. It is identified in the Social Accounting Matrix, Fi Fi Fi

$$X_j = A_j[\alpha_j L_j^{-\rho_j} + \beta_j K_j^{-\rho_j} + (1-\alpha_j-\beta_j)F_j^{-\rho_j}]^{(-1/\rho_j)} \quad \text{(A.1)}$$

where A_j, α_j, and β_j, are constants, and $\rho_j = \frac{(1-\sigma_j)}{\sigma_j}$ where σ_j is the elasticity of substitution between factors in sector j. Note that this specification assumes that the elasticity of substitution among all three factors is the same within a given sector. The allocation of the mobile factors—labor and capital—across sectors is determined by equating the value of the marginal product of each factor with its factor price. For labor, this is where the value of the marginal product of labor equals the aggregate wage rate:

$$W = \frac{\partial X_j}{\partial L_j} PD_j \quad \text{(A.2)}$$

where PD_j is the consumption price of the jth good and W is the wage rate. Similarly for capital:

$$R = \frac{\partial X_j}{\partial K_j} PD_j \quad \text{(A.3)}$$

where R is the rental rate on capital. Each factor must be fully employed, so

$$\sum_j L_j = \bar{L} \quad \text{(A.4)}$$

and

$$\sum_j K_j = \bar{K} \quad \text{(A.5)}$$

The return to the specific factor in each sector, f_j, is determined as a residual (since F_j is fixed) so as to satisfy a zero-profit condition:

$$PS_j VA_j = WL_j + RK_j + f_j F_j \quad \text{(A.6),}$$

where PS_j is the producer price of good j.

❖ ***Aggregate income and demand***

Aggregate income available for spending by the representative consumer (Y) equals the sum of factor income, government revenue, and foreign borrowing, B, which is assumed to be fixed in terms of the numeraire:

Fi represents inputs that are specific to industry i ("fixed factors" or "intersectorally immobile factors") such as land, specific industry equipment, etc. It is identified in the Social Accounting Matrix, sometimes as other factors, and the per unit price is recovered as a residual after taking out payments to the mobile factors -- K and L in the model offered..

$$Y = W\bar{L} + R\bar{K} + \sum_j f_j F_j + GR + B \qquad \text{(A.7).}$$

Government revenue equals indirect tax revenue plus tariff revenue:

$$GR = \sum_j tx_j PS_j X_j + \sum_j tm_j PW_j MD_j \qquad \text{(A.8)}$$

where tx_j is the indirect tax (or subsidy rate if negative) on good j, tm_j is the tariff rate on good j, PW_j is the international price of good j, and MD_j are imports of good j. As imports are treated as perfect substitutes for domestically produced goods, imports equal the difference between domestic demand and production.

❖ ***Aggregate demand***

Absent information on elasticities of demand in Egypt, we assume that a representative consumer maximizes a Cobb-Douglass utility function defined over the six goods. The resulting demand functions are:

$$DD_j = \frac{s_j Y}{PD_j} \qquad \text{(A.9)}$$

where PD_j is the consumer price (inclusive of taxes or tariffs), DD_j is the demand for good j, and s_j is the budget share of good j. Of course, with this demand structure, the own-price elasticity of demand is -1, the cross-price elasticities are zero, and the income elasticity of demand is 1.

The prices paid by the consumer differ from the prices received by the producer, due to indirect taxes. Furthermore, for the traded goods, prices paid by the consumer and received by the producer differ from world prices as a result of tariffs on imports. For imported goods:

$$PS_j = PW_j(1 + tm_j) \qquad \text{(A.10)}$$

while for exported goods, the producer price equals the world price, since there are no export taxes or subsidies:

$$PS_j = PW_j \qquad \text{(A.11).}$$

For commodities subject to a consumption tax, the price paid by the consumer differs from the price received by the producer according to:

$$PD_j = PS_j(1+tx_j) \quad \text{(A.12).}$$

❖ ***Equilibrium***

Equilibrium in the model is achieved when a set of factor prices is found that generates zero profits in each sector and is consistent with full employment of each factor. In this model, the terms of trade are given exogenously, so the price of the nontraded good adjusts to achieve equilibrium. In the nontraded sector, demand must equal supply:

$$DD_N = X_N \quad \text{(A.13).}$$

For the imported good:

$$DD_M = X_M + MD_M \quad \text{(A.14),}$$

Where DDm is the domestic demand for the imported good and MD_M is import demand while for the exported good:

$$DD_X + E_X = X_X \quad \text{(A.15)}$$

where E_j are exports of good j.

A1.1.2 Data, Elasticities, and Parameter Values

The simulation results in Cassing and Tokarick (2007) were generated using hypothetical values for factor intensities and the substitution elasticities. Parameter values are determined by the technique of calibration, described in Mansur and Whalley (1984). Calibration entails using data on exogenous and endogenous variables in the base year to "solve for" unknown parameter values. Because of this technique, the model will replicate the base year data exactly, that is, the model will produce values for all the endogenous variables that match the observed values.

The results from the simulations are based on data for the Egyptian economy for 1998, taken from a social accounting matrix compiled by Löfgren and El-Said (1999). Parameter values are determined by the technique of calibration (described above), and thus, the model replicates the structure of the Egyptian economy in 1998. The rates of growth in the capital stock and the labor force are taken from Kheir-El-Din and Moursi (2002). In production, values for the elasticity of substitution are taken from Dimaranan and McDougall (1997). The tariff rate on agricultural goods is taken to be 6.5 percent and 27.2 percent on manufacturing goods. We also model an excise tax of 5 percent on the nontraded good

Annex 2

A2.0 Market Power Indexes

Sometimes a country or a group of countries is large enough in world markets to be able to significantly affect the external terms of trade (world prices) through the level of its trade volume. Thus, for example, OPEC seems to be able to raise world oil prices by restricting output. Or, the United States policy of sugar import restrictions has probably depressed world sugar prices. Since an RIA changes trade volumes within and between the member countries, such agreements have the potential to alter the terms of trade and so this needs to be taken into account when choosing the methodology appropriate for evaluating any regional trade agreement such as a FTA.

Whether or not a country or group of countries is so significant in world markets for particular products or industries can be measured roughly using indexes of market power. (Of course, the business community, government, or trade attaches are also likely to have common sense estimates of the degree of importance of Jordanian imports or exports relative to world production and trade.) For example, a common index used in the industrial organization literature is the so-called Lerner Index (A. Lerner, 1934):

$$L = (P - MC)/P$$

Where

L = Lerner index

P = Per unit price of the good analyzed

MC = Marginal cost

Cabral (2000) shows how measures of market power may be required for industries and not just firms, and shows how when this is taken into account, the Lerner Index can be represented by:

$$L_H = H/\eta$$

Where

L_H = Lerner index with more than one firm

H = Herfindahl market concentration index

η = Price elasticity of demand in absolute value

Typically, variables should be measured relative to world prices and markets. As a practical matter, for Jordan both indexes are likely to be nearly zero for almost all products. That is, Jordan like most smaller countries lacks world market power as a rule. The indexes could also be calculated relative to the potential RIA partners as a first approximation of whether or not prices inside the RIA are likely to change much when non-members are totally excluded from the industry by high enough trade barriers. Again, as a practical matter, this is not likely to be the case for RIAs in which Jordan is currently or potentially a participant.

An excellent survey of these and other measures with specific examples can be found in:

http://economia.uniandes.edu.co/var/rw/archivos/cede/documentos/d2005-61.pdf

A GENERALIZED INDEX OF MARKET POWER- By HERNÁN VALLEJO G1.

Abstract

This paper analyses two approaches to measuring market power –the commonly used Lerner index and a range of exploitation measures-. It is argued that the Lerner index is designed to quantify market power from the supply side, and the exploitation measures are designed to quantify market power from the demand side, and that those two approaches do not always behave in a symmetric way, since they do not always have the same bounds. To sort out these potentially undesirable properties, this paper proposes a new general index to measure market power, which is symmetrical in the sense that it is bounded between cero and one, regardless of whether the market power comes from the supply or the demand side. The index proposed allows for the presence of more than one firm and for the existence of conjectural variations.

Keywords: Market Power, Mark Up, Mark Down, Lerner Index, Exploitation Measures, Industrial Organization, Conjectural Variations.

JEL Classification: D49, L10, L11.

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Annex 3

While terms of trade effects and trade volume effects determine the welfare impact of RIAs, much attention has focused on measuring just trade volume changes – "trade creation" and "trade diversion" – because it is empirically much less demanding. For a small country like Jordan with few highly differentiated products, this approach offers some promise. Crawford and Laird (2001) survey changes in trade flows associated with six regional trade agreements and found that trade within the agreement areas increased 7.1 percent on average. Gravity models offer a methodology _.

The basic gravity model includes several variables to predict trade flows between countries: Typically, income, per capita income, geographical distance, and exchange rate volatility. In addition, when addressing RIAs, the model needs to add regional dummy variables to measure the trade increase and decrease associated with the trade agreement. The simple model then specifies for estimation by ordinary least square (OLS) an equation such as:

$$\log(T_{ij}) = B_0+B_1\log(GDP_iGDP_j)+B_2\log[(GDP/Pop)_i(GDP/Pop)_j]+B_3\log(Dist_{ij}) +B_4(Volat_{ij})+B_5(RIAintra_{ij})+B_6(RIAextra_{ij})+e_{ij}$$

Where;

T_{ij}: export values between countries i and j,

(GDP_iGDP_j): the product of GDP in country i and country j,

$(GDP/Pop)_i(GDP/Pop)_j$: the product of per capita GDP in country i and country j,

$(Dist_{ij})$: geographical distance between countries i and j,

$(Volat_{ij})$: volatility of the bilateral exchange rate between country i and country j,

$(RIAintra_{ij})$[2]: 1 when both countries i and j belong to the RIA, 0 otherwise

$(RIAextra_{ij})$: 1 when either countries i or j belongs to the RIA and the other is non-RIA, 0 otherwise

(Of course, depending on the context a wide variety of other variables might be added to the estimating equation.)

The data required are bilateral trade flows and the indicated explanatory variables, usually for a certain time period like 19xx to 2006. The data are available from IMF, various, or COMTRADE, and reported in Trademap.

A3.1 Interpretation

[2] RIA intra ij is a variable in the gravity model which indicates membership in the RIA (regional integration agreement) for both countries I and j when the value is set to 1 and non-membership when the value is set to zero. Thus, it will pick up the importance for joint membership on the bilateral trade flows

The first four exogenous (RHS) variables are standard and usually explain bilateral trade flows fairly well. The last two variables measure trade creation and trade diversion.

Although there are some critiques of this approach relating to suspicious theoretical underpinnings and issues concerning endogeneity, the approach is accepted widely as useful. Empirical results have varied in their findings.

Annex 4: Model Specification

AA1 the Perfect Substitutes Model

❖ Supply Estimates:

Using the notation of Section 3.0, write the constant elasticity supply curve as

$$Q = aP^E$$

where "a" is a parameter initializing the position of the supply curve and E is the price elasticity of export supply.

In our predictions we define units of exports to be USD 1 of each product at world prices and so initialize P_W to unity, "a" to the observed level of exports, Q_1, and E to whatever is specified as input (default = 1.5). We assume the world supply curve for each product is perfectly elastic and so P_W is fixed.

For calculations of hypotheticals, we take the natural log of the supply equation and use the ad valorem tariff data reported by the researcher as input. For the cost saving supply shifts, one could introduce a parameter to shift the supply curve downward by xx percent at every quantity.

❖ Demand:

Note that the import demand function plays no role and so we do not use it

AA2 The Imperfect Substitutes Model

MODEL FOR EVALUATING THE EFFECT OF ELIMINATING TARIFFS ON TEXTILES AND APPAREL

Commission staff used partial equilibrium modeling to estimate the economic effects of immediate removal of tariffs on U.S. apparel imports. The model used in this study is a nonlinear, imperfect substitutes model.[1] Trade and U.S. production data were taken from official statistics of the U.S. Department of Commerce. Import substitution elasticities are taken from Hertel et al.,[2] and demand elasticities are from Kim.[3] The supply elasticities were assumed to be 5 for the United States, 10 for Oman, and 15 for the rest of the world.[4] Trade and production data are for January-September 2005. Calculated duties were used as proxies for the tariff rates.

The following model illustrates the case of granting a product FTA duty-free status. The illustration is for a product for which domestic production, FTA imports, and non-FTA imports are imperfect substitutes, and shows the basic results of a tariff removal on a portion of imports.

Consider the market for imports from Oman illustrated in fig. C-1, panel (a). The line labeled D_b is the U.S. demand for imports from Oman, the line labeled S_b is the supply of imports from Oman with the tariff in place, and the line labeled S_b' is the supply of imports from Oman without the tariff (i.e., the product is receiving duty-free treatment under the FTA). Point A is the equilibrium with the

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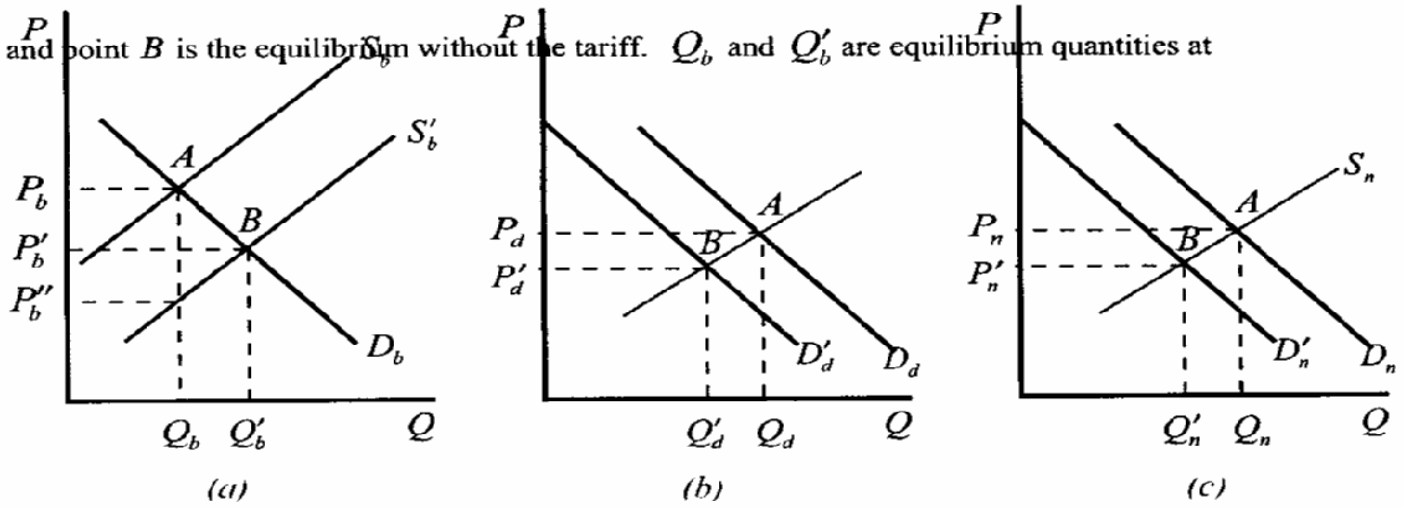
[1] For derivations, see Paul S. Armington, "A Theory of Demand for Products Distinguished by Place of Production," *IMF Staff Papers*, vol. 16 (1969), pp. 159-176; and J. Francois and K. Hall, "Partial Equilibrium Modeling," in J. Francois and K. Reinert, eds., *Applied Methods for Trade Policy Analysis, A Handbook* (Cambridge: Cambridge University Press, 1997).

[2] Thomas Hertel, David Hummels, Maros Ivanic and Roman Keeney, *How Confident Can We Be in CGE-Based Assessments of Free Trade Agreements?* GTAP Working Paper No. 26, 2003, available at *http://www.gtap.agecon.purdue.edu/resources/working_papers.asp*.

[3] Kisung Kim, "U.S. Aggregate Demand for Clothing and Shoes: Effects of Non-durable Expenditures, Price and Demographic Changes," *International Journal of Consumer Studies*, vol. 27, no. 2, March 2003, pp. 111-125. The demand elasticity is a simple average of the own-price elasticities for men's and women's apparel.

[4] The supply elasticity for exports from Oman was assumed to be less than that for the rest of the world because of labor and transportation issues related to Oman's exports.

tariff in place,



and point B is the equilibrium without the tariff. Q_b and Q'_b are equilibrium quantities at A and B, respectively. P_b and P'_b are equilibrium prices at A and B, and P''_b is the price received by Oman producers when the tariff is in place. The difference between P_b and P''_b denotes the tariff, t.

In the model, a tariff reduction leads to a decrease in the price of the imported good and an increase in sales of the good in the United States. The lower price paid for the import in the United States leads to a reduction in the demand for U.S. production of the good, as well as for imports from non-FTA countries. These demand shifts, along with supply responses to the lower demand, determine the reduction in U.S. output and non-FTA imports.

The changes in panel (a) lead to the changes seen in panels (b) and (c), where the demand curves shift from D_d and D_n to D'_d and D'_n, respectively. Equilibrium quantity in the market for domestic production moves from Q_d to Q'_d, and in a similar manner for the market for nonbeneficiary imports, equilibrium quantity falls from Q_n to Q'_n.

Derivation of U.S. Import, Production, and Net Welfare Effects

The basic building blocks of the model are shown below. Armington shows that if consumers have well-behaved constant elasticity of substitution (CES) utility functions, demand for a good in a product grouping can be expressed as follows:

$$q_i = b_i^{\sigma} q \left(\frac{p_i}{p} \right)^{-\sigma}$$

where q_i denotes quantity demanded for good i in the U.S. market;[5] p_i is the price of good i in the U market; σ is the elasticity of substitution for the product grouping; q is the demand for the aggregate product (that is, all goods in the product grouping); p is a price index for the aggregate product (define below); and b_i^{σ} is a constant.[6] As Armington states, the above equation "... can be written in a variety useful ways."[7] One of these useful ways can be derived as follows. The aggregate price index p is defined as

$$p = \left(\sum_i b_i^{\sigma} p_i^{1-\sigma} \right)^{\frac{1}{1-\sigma}} .$$

In addition, the aggregate quantity index q can be defined as

$$q = k_A p^{\eta_A}$$

where k_A is a constant and η_A is the aggregate demand elasticity for the product grouping (natural sig

Substituting equation (3) into equation (1) yields

$$q_i = b_i^{\sigma} k_A p^{\eta_A} \left(\frac{p_i}{p} \right)^{-\sigma} .$$

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[5] The product grouping consists of similar goods from different sources. For example, goods *i*, *j*, and *k* would indicate thi similar goods from three different sources. See Armington (1969) for further discussion of the concept.

[6] Armington (1969), p. 167.

[7] Ibid., p. 168.

Further manipulation and simplification yields

$$q_i = b_i^{\sigma} k_A \frac{p^{(\sigma+\eta_A)}}{p_i^{\sigma}},$$

which establishes the demand for q_i in terms of prices, elasticities, and constants.

The supply of each good in the product grouping is represented in constant supply elastici

$$q_i = K_{si} p_i^{\varepsilon_{si}},$$

where K_{si} is a constant and ε_{si} is the price elasticity of supply for good i.

Excess supply functions are set up for each good in the product grouping with the followi general form:

$$K_{si} p_i^{\varepsilon_{si}} - b_i^{\sigma} k_A \frac{p^{\sigma+\eta_A}}{p^{\sigma}} = 0.$$

The model is calibrated using initial trade and production data and setting all internal prices to un benchmark calibration. It can be shown that calibration yields $K_{si} = b_i^{\sigma} k_A$ for the i^{th} good so tl equation (4) can be rendered as

$$p_i^{\varepsilon_{si}} - \frac{p^{\sigma+\eta_A}}{p_i^{\sigma}} = 0 \ .$$

If there are n goods, the model consists of n equations like (4') plus an equation for the price aggregator p, which are solved simultaneously in prices by an iterative technique.

For the case of a product eligible for FTA duty-free treatment, the equations are as follow

$$\left[p_b(1+t)\right]^{\varepsilon_{sb}} - \frac{p^{\sigma+\eta_A}}{p_b^{\sigma}} = 0 \quad \text{for imports from FTA beneficiary countries,}$$

$$p_n^{\varepsilon_{sn}} - \frac{p^{\sigma+\eta_A}}{p_n^{\sigma}} = 0$$ for imports from nonpartner countries,

$$p_d^{\varepsilon_{sd}} - \frac{p^{\sigma+\eta_A}}{p_d^{\sigma}} = 0$$ for U.S. domestic production, and

$$p = \left(\sum_{i=b,n,d} b_i^{\sigma} p_i^{1-\sigma} \right)^{\frac{1}{1-\sigma}}$$ for the price aggregator.

The prices obtained in the solution to these equations are used to calculate trade and production values, and resulting percentage changes in total imports and domestic production are computed relative to the original (benchmark) import and production values.

Welfare effects

The gain in consumer welfare is measured as the area between the price axis and the aggregate demand curve evaluated at the initial price and the resulting lower price. The loss in producer welfare the area between the price axis and the domestic supply curve evaluated at the initial price and the resulting lower price. The loss in tax revenue is calculated as the ad valorem tax rate times the market clearing value of imports before implementation of the FTA. The net welfare effect is obtained by subtracting the loss in producer welfare and tariff revenue from the gain in consumer welfare.

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