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Abstract

Recent years have seen a large increase in the number of bilateral preferential trade agreements, especially between developed and less developed economies, despite the fact that the predicted welfare gains are limited. Supporters of such agreements often argue that the real benefits of such agreements to the lesser developed economies will arise through trade induced productivity gains. This study examines this argument in the context of the proposed agreement between Morocco and the EU and Egypt and the EU, using a global CGE model and econometric estimates of the impact of trade liberalisation of total factor productivity in Morocco and Egypt. The results indicate that trade induced productivity gains can substantially enhance the benefits accruing to Morocco and Egypt and make an appreciable contribution to the reduction in poverty. However the analyses also indicate that trade diversion effects may have a major impact on the results; this conclusion is contrary to much previous evidence.

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I. Introduction

Since the Barcelona Declaration of 1995, the EU and the countries of the Southern Mediterranean, referred to here as the Mediterranean and North African or MENA countries, have been engaged in a more active process of integration and trade liberalisation. Whereas prior to 1995 the relationship was primarily asymmetric, the Barcelona process envisaged trade relations becoming both more symmetric as well as deeper than heretofore. The context of these developments in the MENA countries is an explosion in the number of regional trade agreements in recent years. An analysis of such agreements and historical analysis of patterns of trade and formation of trade blocs in the post-war period suggests that RTAs can be categorised into three types: (1) *bloc creation*, (2) *bloc expansion*, (3) *market access*. (see Evans *et al*., 2006). In assessing any regional trade agreement it is important to consider the impact of policies and trends affecting both "shallow" and "deep" integration. "Shallow" integration involves the lowering or elimination of barriers to the movement of goods and services across national borders within the region. Within this context "negative" integration entails the lowering trade barriers created by national policies. In contrast "deep" integration involves establishing or expanding the institutional environment in order to facilitate trade and location of production without regard to national borders. In this context "positive" integration suggests policies designed to encourage trade and facilitate segmentation of production processes and value chains. An important component of such deep integration is Smithian trade induced technical change based on local scale economies and externalities (see Evans *et al*., 2006, for further details).

The analyses reported in this paper evaluate closer economic relations between Morocco and the EU, and Egypt and the EU. Although these agreements are primarily market access agreements, they contain some elements of deep integration; accordingly the analyses consider the impacts of both types of integration. The primary technique used is a multi-regional Computable General Equilibrium (CGE) model (Globe) (McDonald, *et al*., 2005), wherein Morocco and Egypt are separately identified regions. This method is well suited to the analysis of shallow integration.

The analysis of shallow integration is conventional; the liberalisation of trade between partners through the elimination of tariff barriers. It is noteworthy that the FTAs considered are asymmetrical because EU tariffs on manufactured imports from Morocco and Egypt have already been eliminated whilst Morocco and Egyptian protection against EU exports of

manufactures remain high The analysis of deep integration is more novel. The first element of deep integration uses econometric estimates of linkages between changes in shares of output traded and productivity (these are based on detailed firm level data set for Morocco and sectoral data for Egypt and are reported in Gasiorek *et al*., 2005 and 2006). These estimates are used in consort with the Globe CGE model to derive estimates of the impact of changes in tariffs upon trade flows between Morocco and Egypt and the EU, and consequent trade-induced technical change arising from FTA's with the EU. In the case of Morocco, the available data also allowed direct estimates of poverty impacts. The second element of deep integration considered arose from regulatory harmonisation; this was captured by notional increases in export supply elasticities for Egypt and Morocco, and import demand elasticities for the EU.

The econometric findings on productivity and trade policy reform emphasise the richness of the estimation at the micro firm-level data. The results suggest a positive relationship between exports and trade – where the size of the coefficient depended both on the sector being considered, as well as the time period. The impacts of shallow integration are small welfare gains for Morocco and Egypt, with substantive reductions in poverty for Morocco. These gains are substantially increased by the forces of deep integration. However, the results also provide evidence of some trade diversion in Morocco, and strong trade diversion in Egypt, at base levels of MFN tariffs.

The rest of this paper is organised as follows. The next section contains a brief summary of some the general research findings about RTAs and contrasts these with results for Egypt. In the third section the CGE model and data are described, along with some descriptive statistics. This is followed by a details of the experiments run and then in section 5 by a discussion of the results. The final section offers some concluding comments.

CGE Modelling of RTAs and the MENA countries

A survey of over 100 computable general equilibrium (CGE) model studies of RTAs established in the last 15 or so years by Robinson and Thierfelder (2003) found overwhelming evidence that trade creation dominates trade diversion. Broadly speaking, the studies were of multi country RTA's facilitating shallow integration arising from the removal of barriers to trade in commodities. Changes in trade barriers affecting services were usually outside of the RTA's studied or outside the analyses with CGE models considered. In Egypt, several authors have used CGE models for the analysis of Egypt's regional trading relationships using static

and dynamic, single and multi-country models of MENA countries, but not including specific modelling of Egypt's major trading partners such as the USA and the EU. This rich Egyptian literature has been surveyed recently by El-Said (2005). The findings of the static CGE models on Egypt's regional trading relations in the 1990s do not always support the general finding of Robinson and Thierfelder, that for shallow integration, trade creation dominates trade diversion. For example, Hoekman and Konan (1999) find that shallow integration under the EU-Egypt Agreement produces net trade diversion with negative welfare effects indicating some trade diversion. Hoekman and Konan also extended the analysis of shallow integration to include deep integration where trade barriers in services are removed and efficiency benefits of liberalisation of domestic and foreign capital in services are considered, producing extremely large welfare gains (see also Konan and Kim (2004)). Thus, the CGE studies for RTA's involving Egypt do not fit into the pattern found by Robinson and Thierfelder for many-country RTAs.

Compared with the welfare benefits of shallow integration for goods trade, these studies show an estimated benefit from deep integration of well over 10% of GDP. The economic mechanism that produces this very large result are the high estimated initial barriers to trade in services and liberalisation of both domestic and foreign investment in services that has large efficiency effects without any net new foreign investment. It is difficult to tell how plausible the findings on services liberalisation are without stronger micro empirical evidence. The estimated efficiency gains to services from the removal of barriers to services trade are highly speculative and the suggested benefits from lilberalisation of domestic and foreign investment without new capital inflows seems somewhat high.

The Globe CGE Model and Data

The study uses an application of the (comparative static) Globe computable general equilibrium (CGE) model (see McDonald *et al*., 2005) to the MENA region. The Globe model is a multi region descendant of the single country/region CGE model described by Dervis, *et al*., (1982), and its subsequent development as reported by Robinson *et al*., (1990) and Kilkenny (1991). The properties of this type of model are well known, and hence the description here is limited. The multi region formulation is a development of a model first developed to evaluate NAFTA (see Robinson, *et al*., 1993). The model is a member of the class of Social Accounting Matrix (SAM) based CGE models (see Pyatt, 1998), and is calibrated using a SAM representation of the GTAP v6 dataset for 2001 (see McDonald and Thierfelder, 2004).

Globe Model

The Globe model is, in effect, a series of single country/region CGE models that are linked by commodity trade. Trade is modelled following the Armington 'insight'; namely domestically produced and consumed commodities are imperfect substitutes for both imports and exports. Import demand is modelled via a series of nested constant elasticity of substitution (CES) functions; imported commodities from different source regions are treated as imperfect substitutes and hence aggregated into 'composite' import commodities that are then imperfect substitutes for their counterpart domestic commodities The 'composite' imported commodities and their counterpart domestic commodities are then combined to produce composite consumption commodities. These are the commodities demanded by domestic agents as intermediate inputs and for final demand.

Export supply is modelled via a series of nested constant elasticity of transformation (CET) functions; the 'composite' export commodities are treated as imperfect substitutes for domestically consumed commodities, and exported commodities from a source region to different destination regions are treated as imperfect 'substitutes' for each other. Total domestic commodity production is an aggregation of the 'composite' exported commodities and their counterpart domestic commodities. As such this model differs from the GTAP model through the use of CET functions for export supply; consequently domestic producers adjust export supplies in response to changes the relative prices of exports and domestic commodities, thereby moderating the terms of trade effects in this class of model.

The production structure is a two stage nest. Intermediate inputs are used in fixed proportions per unit of output– Leontief technology, while primary inputs are combined as imperfect substitutes, according to a CES function, to produce value added. The combination of aggregate value added and aggregate intermediate inputs to produce output can be by either Leontief or CES technology.

Final demand by the household is modelled under the assumption that households are utility maximisers who respond to changes in relative prices and their incomes. The utility function in the model are Cobb-Douglas; this has the advantage that with a standard, neoclassical, set of closure rules the changes in household consumption expenditure can be interpreted as equivalent variations in welfare, and hence provide useful summary measures of the welfare effects of the policy simulations. Final demand by the government and for investment is modelled under the assumption that the relative quantities of each commodity demand by these two institutions are fixed – this reflects the absence of a clear theory that

defines an appropriate behavioural response by these agents to changes in relative prices. The Globe model is formulated to allow a wide range of alternative closure rules; the alternatives used in this study are defined below when the policy experiments are specified.

Table 1 **Value Added Shares 2001** (%)

Activity	Morocco	Egypt
Cereals	5.47	3.70
Other crops	6.57	7.34
Livestock	7.75	6.00
Minerals	2.91	13.41
Food products	2.88	2.74
Textiles	5.80	3.13
Other manufacturing	4.73	3.09
Heavy manufacturing	6.64	4.46
Electricity	2.45	0.79
Gas and water	0.20	0.77
Construction	5.57	4.96
Transport and communication	21.08	23.12
Financial and other services	27.96	26.48
Total	100.00	100.00

Source: GTAP V6 dataset for 2001

In order to estimate the impact of trade reform experiments on poverty we follow the general approach presented by Lofgren *et al*., (2003), which assumes that there are household survey data available that include income sources that correspond to the income sources in the CGE model. Changes in factor income in the CGE model can then be translated into proportional changes in household incomes and then, once all household incomes are adjusted, distributional and poverty statistics are computed and compared with the pre-adjustment values to see the impact of the experiment. This techniques could be used for Morocco, despite only having access to summary information from a household survey, but there was insufficient data to apply the techniques to Egypt. Using (summary) information on the within-group income distribution, we fit a lognormal distribution to each within-group distribution, and use these estimates to generate synthetic samples, which were then used to analyzing poverty and the distribution of income.

Data

The aggregation of the global SAM used to calibrate the model has nine regions and thirteen commodities. While Morocco is a separate region in the GTAP database, Egypt is part of the

region “Other North Africa”, which consists of Egypt, Libya and Algeria. But Egypt contributes 60% GDP to this region and hence the “Egypt” experiments reported are the results for “Other North Africa”.

Table 2 **Tariff protection in Morocco 2001** (% tariff equivalents)

	USA	EU_15	Rest Eur	Mar	Tun	Rest N_Afr	Tur	Rest M_E	ROW	Mea
Morocco										
Cereals	22.8	29.3	27.4	0.0	0.0	4.5	26.7	0.0	26.3	27
Other crops	10.7	23.6	20.6	0.0	24.9	10.5	29.4	21.6	23.5	22
Livestock	18.9	28.9	15.1	0.0	0.7	1.5	25.1	30.3	24.7	27
Minerals	11.9	7.0	0.9	0.0	0.8	8.1	17.6	7.0	15.5	8
Food products	28.4	47.6	35.6	0.0	25.8	14.6	52.0	24.9	28.7	35
Textiles	34.5	39.3	34.9	0.0	20.4	21.1	35.1	10.4	37.3	38
Other manufacturing	15.9	12.4	16.2	0.0	17.5	14.6	25.9	12.2	16.8	13
Heavy manufacturing	25.7	20.3	20.2	0.0	14.2	1.8	32.3	16.6	26.7	20
Electricity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Egypt										
Cereals	2.7	2.6	5.2	0.0	0.0	0.0	1.2	0.0	2.4	2
Other crops	7.4	14.7	36.6	0.9	13.3	7.8	16.3	15.0	13.5	14
Livestock	10.5	12.9	3.9	1.3	12.5	2.8	2.8	7.4	5.2	6
Minerals	3.5	9.5	3.4	20.4	7.4	11.5	14.1	2.5	3.9	4
Food products	15.3	13.0	34.1	2.9	8.5	8.6	22.6	15.8	13.3	14
Textiles	92.5	71.0	53.6	3.1	21.4	12.3	135.2	38.1	262.8	182
Other manufacturing	10.2	13.9	14.1	1.3	11.1	11.3	19.5	9.7	16.4	13
Heavy manufacturing	7.9	16.9	16.1	2.8	10.1	8.6	21.1	9.0	17.5	15
Electricity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0

Source: GTAP V6 database.

Summary structural statistics of Morocco and Egypt are reported in Tables 1 - 4. With two exceptions, the structural characteristics of Morocco and “Egypt” are strikingly similar. Both countries have around 15% of value added in agriculture and nearly 60% in utilities, construction and services. The exceptions are minerals, which in “Egypt” account for a much large share of economic activity than Morocco, and manufactures. In Morocco, manufactures account for nearly 20% of value added and about 14% in “Egypt”. The much larger minerals

sector and smaller manufacturing sector in "Egypt compared with Morocco arises in part to the inclusion of Libya in the aggregate Other North Africa.

Table 3 **Export and Import Shares 2001** (%) (Valued fob)

From/to	USA	EU 15	Rest Eur	Mar	Tun	Rest N_Afr	Tur	Rest M_E	ROW
Exports									
USA	0.00	29.52	2.83	0.09	0.06	0.77	0.49	3.40	62.85
EU_15	11.45	54.65	9.10	0.28	0.29	0.66	0.76	2.88	19.93
Rest Eur	9.49	59.19	10.16	0.10	0.08	0.47	0.93	2.57	17.01
Mar	9.99	59.66	3.18	0.00	0.40	0.98	0.48	2.63	22.68
Tun	6.59	70.55	2.47	0.46	0.00	3.75	0.89	3.01	12.28
Rest N_Afr	15.14	58.05	2.89	0.51	0.84	0.30	2.76	3.41	16.10
Tur	12.15	52.05	6.77	0.24	0.37	2.28	0.00	7.44	18.70
Rest M_E	17.48	21.15	1.48	0.41	0.07	0.54	1.33	8.45	49.08
ROW	31.12	19.06	2.55	0.08	0.05	0.37	0.37	2.52	43.89
Imports									
USA	0.00	23.22	2.82	0.09	0.05	0.45	0.43	2.86	70.08
EU_15	10.53	55.27	8.77	0.27	0.26	0.87	0.91	1.73	21.40
Rest Eur	6.79	61.81	10.12	0.10	0.06	0.29	0.80	0.81	19.23
Mar	6.80	60.80	3.31	0.00	0.38	1.67	0.92	7.33	18.79
Tun	5.40	72.43	2.98	0.44	0.00	3.14	1.60	1.39	12.62
Rest N_Afr	17.81	43.66	4.51	0.28	0.91	0.29	2.60	2.85	27.09
Tur	10.55	46.69	8.36	0.13	0.20	2.49	0.00	6.56	25.02
Rest M_E	14.72	35.40	4.63	0.14	0.14	0.62	1.58	8.38	34.39
ROW	22.62	20.34	2.54	0.10	0.05	0.24	0.33	4.04	49.73

Source: GTAP V6 dataset 2001

The second major difference is in the height of protection (Table 2), which is in the medium to high range for Morocco and "Egypt" except in Textiles. Textiles in Morocco have the highest rate of nominal protection at 38%, and for Egypt the average tariff is at over 180%. In Morocco, the EU is a high cost source of imports for Other Manufactures and for Heaving Manufactures as reflected by the lower tariff barriers in Morocco in these sectors

compared with other import sources. In “Egypt”, the EU is the low cost supplier of Textiles especially compared with the Rest of the World (i.e., East Asian suppliers).

Another but less striking difference between Morocco and “Egypt” are the trade shares with the EU. The export shares are with the EU are about the same, but Morocco has a much higher share of imports arising from the EU (60%) compared with “Egypt” (nearly 45%) (see Tables 3). In comparison with the real Egypt, the composite “Egypt” has several biases. Compared with the real Egypt, our “Egypt” data overstates trade shares with the EU and overstates the height of tariffs. These biases between the real Egypt and our composite “Egypt” need to be borne in mind when interpreting the results. These biases and the structural differences between “Egypt” and Morocco have an important bearing on the empirical results reported below.

In addition to the transactions data from the SAM it is necessary to specify a series of substitution elasticities. We specify high substitution elasticities for imports from (and exports to) different countries/regions, which allows the model to capture trade-diversion effects from regional trade agreements—the focus of our work. Substitution elasticities between traded composites and domestic goods are in-line with estimates from other global models.

Table 4 **Factor Shares 2001** (%)

Factors	land		UnSkld		SkLab		Capital		NatRes	
Activity	**Morocco**	**Egypt**	**Morocco**	**Egypt**	**Morocco**	**Egypt**	**Morocco**	**Egypt**	**Morocco**	**Egypt**
Cereals	29.25	22.97	7.24	5.94	0.21	0.21	4.38	2.64	6.73	0.45
Other crops	32.90	44.32	8.57	11.72	0.25	0.42	5.41	5.32	37.13	5.61
Livestock	37.85	32.71	9.86	8.90	0.29	0.32	6.23	4.47	0.00	0.00
Minerals	0.00	0.00	2.20	2.93	0.95	1.35	3.69	17.39	56.14	93.94
Food products	0.00	0.00	3.90	3.35	2.34	1.68	2.17	2.98	0.00	0.00
Textiles	0.00	0.00	7.55	4.15	3.28	1.64	5.25	3.25	0.00	0.00
Other manufacturing	0.00	0.00	5.51	3.59	2.89	1.66	4.88	3.59	0.00	0.00
Heavy manufacturing	0.00	0.00	5.95	4.63	3.40	2.45	9.02	5.59	0.00	0.00
Electricity	0.00	0.00	1.27	0.47	1.87	0.59	4.08	1.23	0.00	0.00
Gas and water	0.00	0.00	0.00	0.23	0.00	0.29	0.51	1.44	0.00	0.00
Construction	0.00	0.00	8.83	9.05	4.66	4.22	2.81	2.71	0.00	0.00
Transport and communication	0.00	0.00	22.82	24.71	15.50	14.56	22.68	27.85	0.00	0.00
Financial and other services	0.00	0.00	16.30	20.33	64.36	70.60	28.88	21.55	0.00	0.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: GTAP V6 dataset for 2001

Model experiments

The formulation of the experiments involves specifying both the appropriate set of closure rules and the appropriate set of shocks. These are dealt with in turn.

Closure Rules

The model contains certain conditions that must be satisfied – government account balance, external balance, factor market balance and savings-investment equality. These closure rules represent important assumptions on the way institutions operate in the economy and can substantively influence model results.

- Land, Skilled Labour, Capital, and Natural Resources are assumed to be perfectly mobile across sectors and fully employed; hence these factor markets are treated as competitive, producing market-clearing wage and rental rates. This is also the case for Unskilled labour in the first experiment, but thereafter the wage rates for unskilled labour are fixed at institutionally determined rates, and the market is cleared from a pool of unemployed or underemployed unskilled labour. In 2000-2002 total unemployment in Morocco was estimated at 12% of the total labour force while for Egypt total unemployment was 9%. With about 70% of wage payments going to unskilled workers in both economies, this implies that unemployment amongst unskilled labour is around 16% in Morocco and 12% in Egypt. Hence the assumption of underemployed Unskilled labour appears reasonable.
- Exchange rates are assumed to flexible for all regions with the external balance cleared with fixed real balances on the current account.
- The savings-investment account is cleared by fixing the (value) share of investment in domestic final demand and allowing the savings rates for the households to adjust to clear the account. There is an interaction with the government and external accounts since both these accounts contribute to savings within a region.
- Trade liberalisation will cause reductions in tariff revenues. In this study these are replaced by equiproportionate increases in factor use taxes for all factors except unskilled labour, which faces no factor use tax. Tariff reform will change commodity prices, with complex indirect impacts on income distribution, but the

replacement tax on factors will have a direct, pro-poor impact, since unskilled workers are relatively poor.

Shocks

In specifying the model shocks, the preliminary econometric estimates of trade induced technical change had to be translated into elasticity estimates for the model. For Morocco the data made it possible to examine the relationship for different firm sizes, for which significant differences were found. The negative relationship appears to hold for small firms (less than 10 employees), but there was a positive relationship for large firms (greater than 100 employees) – such that a 10% increase in openness led to an increase in productivity of roughly 4.0%. In the case of Egypt, the estimates of the trade induced productivity links were not as significant. For Egypt on the export side, strong trade - productivity elasticities of up to 4 were found. Using a good deal of judgement, the best estimate of the trade-productivity elasticities for both exports and imports in both countries were set at 0.4 for Experiment 5.

There are 7 experiments (additional details about the experiments are provided in Appendix 1). In all experiments the basic shock was the same; the full elimination of bilateral tariffs between the EU and Morocco and the EU and Egypt. A permutation of the basic shock was included to allow for 33% and 67% cuts in MFN tariff rates. The trade shocks for Egypt were designed to capture in a stylised fashion the developments in the Egypt-EU Free Trade Agreement that were applied in 2004, and the MFN tariff cuts of roughly 33% that took place in Egypt in 2004 in fulfilment of Egypt's Uruguay Round obligations. A second shock of an additional 33% cut in the MFN tariffs for Egypt are intended to capture the effects of a possible future MFN tariff cut for Egypt currently under discussion at the WTO. The same pattern of tariff cuts were applied to Morocco to capture in a stylised manner similar trade policy changes under way in that country. These shocks are economy-wide averages that do not capture the considerable sectoral and time phasing variation in the actual application of the trade policy changes in Egypt. Full analysis of such detail would require better data for Egypt and a recursive CGE model to capture the combined effects of sectoral and time phasing differences in the application of the 2004 trade policy changes in Egypt.

- Experiment 1: This experiment has a standard neo-classical closure of factor markets, without trade induced technical change.
- Experiment 2: This experiment assumes the existence of unemployment through a fixed wage for unskilled labour, so that the level of employment of unskilled

labour can vary, and no induced technical change. Given the significant levels of unemployment in the MENA countries in the base year of over 10%, this specification aims to capture an important structural characteristic of both countries. This assumption is retained for the remaining experiments.

- Experiments 3-6: These experiments introduce trade induced technical change with a range of trade-productivity elasticities. The best estimate elasticity of 0.4 is used in experiment 5, while experiments 3 and 6 are, respectively, lower and upper bound elasticities and experiment 4 is an intermediate elasticity.
- Experiment 7: This introduced a stylised representation of deep integration through increases in the import and export elasticities between the EU and Morocco and Egypt.

The results from seven (7) experiments are reported for each FTA. While each FTA is considered separately there is a strong hub-and-spoke structure of MENA trade with the EU, so it makes little difference to the results if the FTAs are considered for each country separately or combined. Also, agricultural tariffs are relatively low, so the results are not much affected by choosing a full FTA rather than a FTA in manufactures only.

Results

Impact of trade policy change - Morocco

The results for Morocco are summarised in Table 5 below. All results are shown as % changes over base levels.

The upper panel of Table 5 details the results for exports, imports, GDP, absorption, household expenditure and real exchange rate. By choice of import and export substitution elasticities affecting the regional composition of trade, the international terms of trade hardly change in each experiment (the small country assumption holds) and are not reported. The middle panel shows impacts on factor incomes, headcount poverty, and the elasticity of the change in the headcount poverty rate with respect to percent change in total household income. Finally the bottom panel of the table shows the trade-induced changes in TFP generated by the experiments. In summary the key findings are:

Experiment M1: The Morocco-EU FTA has a strong effect on total exports and imports and leads to a depreciation of the real exchange rate of nearly 4%. Real GDP measured in base-year prices falls slightly, largely as a result of the small adverse international terms of

trade effect (not shown). A measure of the over-all welfare benefits of the Morocco-EU FTA when there is no change in foreign savings is given by the change in absorption, which equals GDP plus imports minus exports. There is a small increase in absorption (0.3%).

Table 5 **Experiment Results for Morocco** (% changes)

	Base	M1	M2	M3	M4	M5	M6	M7
Exports	1.15	11.90	14.01	14.36	16.41	18.93	23.81	24.13
Imports	1.44	11.42	13.33	13.64	15.48	17.80	22.27	22.74
GDP expenditure	3.17	-0.54	1.05	1.34	2.61	3.45	4.79	4.18
Absorption	3.46	0.29	1.85	2.12	3.37	4.26	5.72	5.26
Exports + Imports for Morocco								
Global	-	12.15	14.46	14.79	16.77	19.21	23.93	24.28
FTA	-	34.34	36.98	37.32	39.75	43.50	50.95	51.18
ROW	-	-19.84	-19.66	-19.33	-18.05	-17.58	-17.02	-16.49
Real Exchange Rate	1.00	3.91	3.73	3.66	3.12	-0.21	1.99	1.60
Disposable factor income								
Land	0.06	4.68	5.78	6.10	7.65	8.51	9.95	9.62
UnSkld	1.31	2.55	3.77	3.98	5.04	5.94	7.47	6.95
SkLab	0.45	-1.48	0.37	0.73	2.28	3.24	4.70	4.23
Capital	0.86	-0.55	1.39	1.69	3.06	4.01	5.57	5.07
NatRes	0.02	-8.00	-6.57	-6.26	-5.81	-8.11	-12.71	-8.90
Poverty								
Headcount poverty	19.04	-5.99	-10.29	-11.13	-13.29	-14.71	-17.44	-16.44
Elasticity poverty wrt income	0.00	-0.77	-0.65	-0.63	-0.46	-0.40	-0.34	-0.35
TFP								
Food	2.43	0.00	0.00	2.51	14.88	20.60	29.75	29.39
Textiles	2.37	0.00	0.00	0.25	2.24	6.02	13.61	7.89
Other Manuf	2.23	0.00	0.00	1.54	6.00	7.38	7.60	10.45
Heavy Manuf	2.10	0.0	0.0	0.5	2.9	3.0	2.1	3.0

Notes:
1) Column 1 is the base value. Experiment columns are percent change from base, except headcount poverty, which is the percentage point change from the base values.
2) The "elasticity of poverty wrt income" is the change in headcount poverty divided by the change in total household disposable income.

Since over half of Morocco's imports of manufactures are included in the FTA, one would expect significant trade diversion to occur. Within-FTA trade expands by 34%, while

trade with the rest of the world (ROW) declines by 20%. There is, however, a net increase in total trade for Morocco of 12%, so the FTA is net trade expanding. It is important to note that net trade expansion does not measure net trade creation. The cost of trade diversion is included within real imports less real exports and is not netted out.

The changes in the structure of production lead to an increase in the demand for unskilled labour, with a resulting increase in the unskilled wage of 2.55%, and an increase in returns to agricultural land. While there is a slight decline in the skilled wage, the net impact is pro-poor. The poverty head count falls by 6%.

Experiment M2: Experiment M2 repeats Experiment M1, except unskilled wages are fixed and unskilled employment can increase or decrease, depending on labour demand.

As in Experiment M1, there is a substantial increase in overall trade, but now unskilled employment increases (by 3.8%) and GDP increases (by 1.1%). The result is a larger increase in aggregate absorption than in Experiment M1 (1.9 % compared to 0.3%).

The changes production structure and increase in GDP lead to increases in all factor returns except for Natural Resources, with land and unskilled labour gaining the most. The result is a significantly larger reduction in head count poverty by just over 10%.

Experiment M3: Here we now allow for trade-induced productivity changes linked to changes in manufacturing exports, but not linked to changes in imports. With these trade-linked technical changes, the competitiveness of Moroccan industry increases by more than in the preceding experiment. The pattern of changes is overall similar to that in earlier experiments, but the GDP response is larger. Compared with Experiment M2, there is a small increase in employment of unskilled labour. There is a larger increase in exports and imports, a slightly smaller change in the exchange rate (in order to maintain external balance). The rise in aggregate absorption is also larger, due largely to the increase in GDP.

This experiment reduces headcount poverty, but only slightly compared to Experiment M2. The productivity gains are shared across all factors, and the increase in employment of unskilled labour is small. With the fixed unskilled wage, the small increase in employment does not suffice to generate much more poverty reduction.

Experiments M4 to M6: These experiments explore the impact of varying assumptions about the links between increased trade and productivity. Experiment M6 is the most dramatic, yielding very large productivity increases, especially in food and textiles. The results are generally larger increase in trade, GDP, employment, and absorption. The

employment effects lead to dramatic decreases in head count poverty, with Experiment M6 yielding a decrease of 17.4% — the most optimistic result in all the experiments.

Experiment M7 repeats Experiment 5, but adds assumed effects from elements of deep integration. The EU-Morocco FTA is assumed to lead to easier trade penetration in both directions, with increases in the trade substitution elasticities in Morocco between domestic and traded goods (both imports and exports).

Compared to Experiment M5, the results are dramatic. Trade increases a lot (exports increase 24% compared to 19% in Experiment M5). Employment, GDP, and absorption all increase by about a percentage point more than in Experiment M5, and head count poverty falls by about 1.5 percentage points more.

The results from the deep integration experiment are only slightly less beneficial than those from the optimistic trade-productivity link Experiment M6. These results emphasize the potential importance of achieving deep integration, which are also likely to be associated with increased trade-productivity links. There may well be a virtuous synergy between trade liberalisation, deep integration, and trade-productivity links. While these experiments do not explore such causal links, they do indicate that, if present, their impact would be large.

Impact of trade policy change — Egypt

In order to facilitate comparison across the results, we ran exactly the same sequence of experiments for Egypt, and the results are given in Table 6. The results are significantly different. The differences in the results stem largely from the differences in the underlying trade patterns of the Moroccan and Egyptian economies and the initial height of tariff protection. In particular, the EU is a much more important trading partner for Morocco than for Egypt and Egypt has a greater potential for trade diversion at the initial base MFN tariff levels.

From the top panel of Table 6, import liberalisation leads to much smaller net changes in trade flows across all the experiments, with exports and imports increasing between 4% and 8%, about a third of the values for Morocco. Given the very high initial protection rates in Egypt, the EU-Egypt FTA causes much more trade diversion than in the case of Morocco. The net impact on welfare is negative, with declines in GDP and absorption for the first four experiments. In the cases where the unskilled wage is fixed, the result is a decline in employment, compared to increases in Morocco. Only in Experiments E5, E6, and E7 do the increases in trade-induced productivity serve to offset the impact of trade diversion, leading to

increases in GDP. Employment only increases in Experiments E6 and E7, the most optimistic scenarios in the series.

Compared with the real Egypt, our "Egypt" calculations overstate the impact of the EU-Egypt Agreement on account of the overstated trade shares with the EU and overstate the potential welfare cost of trade diversion because of the overstatement of the height of tariffs. However, in broad terms, the EU-"Egypt" results provide a basis for a preliminary assessment of the relative size of impacts on welfare of the experiments E1 to E7 at the initial base MFN tariff levels. In a similar calculation for Egypt, Hoekman and Konan (1998, Table 3 column (1) also find a small negative welfare impact (- 0.14% of GDP) arising from the trade diversion from the Egypt-EU agreement.

Table 6 **Experiment Results for Egypt** (% changes)

	Base	**E1**	**E2**	**E3**	**E4**	**E5**	**E6**	**E7**
Exports	3.82	5.42	4.99	5.08	5.63	6.15	8.08	7.07
Imports	4.68	1.45	1.09	1.16	1.57	1.99	3.52	2.86
GDP expenditure	17.47	-0.20	-0.94	-0.74	-0.01	0.89	3.45	1.32
Absorption	18.34	-0.95	-1.66	-1.47	-0.78	0.07	2.50	0.52
Exports + Imports for Egypt								
Global	3.85	5.17	4.76	4.84	5.39	5.88	7.73	6.75
FTA	7.55	28.35	27.98	28.02	28.35	28.67	29.97	29.63
ROW	3.70	-18.99	-19.33	-19.20	-18.54	-17.77	-15.44	-17.09
Real Exchange Rate	0.00	6.57	6.15	6.20	6.13	6.33	6.35	6.32
Disposable factor income								
Land	0.00	-0.77	-1.20	-0.90	-0.04	1.33	4.99	2.02
UnSkld	0.00	-1.62	-2.11	-1.90	-1.06	-0.10	2.65	0.42
SkLab	0.00	-2.87	-3.60	-3.35	-2.41	-1.30	1.82	-0.73
Capital	0.00	-1.93	-2.83	-2.62	-1.73	-0.74	2.08	-0.21
NatRes	0.00	16.41	15.00	15.10	14.24	14.48	13.26	14.11
TFP								
Food	0.00	0.00	0.00	1.93	1.19	10.22	33.52	12.06
Textiles	0.00	0.00	0.00	0.94	11.89	17.85	44.14	23.44
Other Manuf	0.00	0.00	0.00	1.10	3.13	6.61	16.41	8.39
Heavy Manuf	0.00	0.00	0.00	0.19	0.77	1.63	2.76	1.64

Thus, the results for both Morocco and Egypt on trade diversion are worst-case; because we have only taken into account long-run tariff changes for EU-Morocco and EU-Egypt which aim to reduce import tariffs to zero, by 2016 in the case of Egypt.

MFN Tariff Cuts

However, under the auspices of the WTO, Egypt introduced changes in the MFN tariffs of roughly 33% in 2004 . To develop this line of argument, we ran two modified versions of the E5 experiment for Morocco and Egypt, cutting the base MFN tariff by 33% and 66% respectively. These and a first decomposition of absorption are shown in Table 7.

Table 7 **MFN Tariff cuts and Absorption Decomposition** (%changes)

	Morocco			
Experiment	**M2**	**M5**	**M5A**	**M5B**
absorption	1.85	4.23	4.79	5.34
q_domestic	-0.69	1.09	1.39	1.62
t_of_t	0.08	0.04	0.00	-0.03
exports	2.45	3.10	3.39	3.74
	Egypt			
Experiment	**E2**	**E5**	**E5A**	**E5B**
absorption	-1.66	0.07	1.86	5.03
q_domestic	-1.95	-0.11	1.01	2.80
t_of_t	0.07	0.04	0.02	-0.01
exports	0.22	0.14	0.83	2.24

Notes: M2 E2, M5 E5 as before, M5A, M5B, E5A, E5B have 33% and 66% cut in mnf tariffs.

The 33% cut roughly corresponds to the average cut in MFN tariffs agreed under the auspices of the WTO in 2004. In this case, the absorption measure of welfare increased from 0.07% to 1.86%. A further cut of the MFN tariff to 66% of the base level increased the absorption measure of welfare to 5.03%. These results underscore the importance for both Egypt and Morocco of accompanying an EU FTA with broader trade liberalisation. For Egypt such broader trade liberalisation, a process already taking place under the auspices of the WTO, appears so far to be driven by considerations relating to the speed of reduction of tariffs on sensitive industries, considerations already present in the differential rates of reduction of tariffs under the Egypt-EU Agreement, rather than economic efficiency ie removing trade diversion.

The net effect of the EU-FTA agreement and the WTO tariff cuts on trade diversion including transitional effects requires further study which will be greatly facilitated by the inclusion of Egypt proper in the GTAP dataset which will be available in the GTAP 7.0 dataset. If the emphases on further market assess integration between Morocco and Egypt is to shift the balance from shallow to deep integration, how far should the MFN tariff cuts go? Should they stop at some benchmark such as 33% of our base 2001 tariffs, or should they be cut to zero? Should the MFN tariffs be cut to zero over the time horizon of the cuts in the FTA tariffs with the EU of 10 years, would this facilitate or hinder deep integration?

VI. Concluding Comments

The findings of the CGE model of the Morocco-EU FTA are of interest for several reasons:

- Looking only at tariffs, shallow integration of Morocco into an EU-Morocco FTA leads to small gains for Morocco, but significant reductions in poverty.
- Applying econometrically estimated elasticities to trade-linked technical change makes the FTA much more beneficial. Sensitivity analysis concerning the nature and size of the trade-productivity links indicates that there are great potential gains from an EU-Morocco FTA.
- Further increased benefits to a Morocco-EU FTA could be achieved by deep integration involving removal of non-tariff barriers and by improving the quality and standards of domestic goods for potential export sales.
- The impact of a EU-Egypt FTA is far less favourable than for Morocco, given Egypt's very high initial levels of import protection and consequent strong trade diversion. Even with MFN tariffs cut by 33% as in the WTO agreements, the welfare improvement for Egypt from the Egypt-EU FTA is only slightly more than 1.Only with trade induced productivity change and elements of deep integration or with further cuts in the MFN tariff are the welfare gains significant.

In conclusion, if initial general protection levels are high, an RTA that only achieves lowering of border barriers to trade (shallow integration) leads to trade diversion and a loss of aggregate welfare. Where the RTA partner is initially a major trading partner, and general protection levels are moderate, trade diversion are weaker and the RTA is beneficial. With trade-productivity links and benefits from deep integration, gains from trade creation are magnified, including distributional improvements and reduction in poverty in the case of

Morocco. For Egypt, only with high estimates of TFP change, deep integration measures or MFN tariff cuts are the negative welfare effects of trade diversion offset. There is a need for further research into these links to refine the econometric estimates of TFP change, and at the micro and economy wide level to decompose the sources of welfare change into trade creation/diversion effects, terms of trade effects and productivity effects. The strong policy conclusions are:

- shallow integration with the EU in Morocco and Egypt risks either lower welfare gains or significant welfare loss through trade diversion;
- deep integration measures such as encouraging trade induced TFP change and improved quality and standards for exports have strong positive welfare benefits;
- to the extent that poverty effects could be measured, the combined effects of the Morocco FTA with the EU had strong poverty reducing benefits, in contrast with Egypt where overall welfare improvement and improved factor income distribution only came with powerful deep integration measures and further cuts in the MFN tariffs.

References

Evans, D., Gasiorek, M., Ghoneim, A., Haynes-Prempeh, H., Holmes, P., Iacovone, L., Jackson, K., Iwanow, T., Robinson, S. and Rollo, J., (2006). *Assessing Regional Trade Agreements with Developing Countries: Shallow and Deep Integration, Trade, Productivity, and Economic Performance*. Report prepared for DfID (DfID project number 04 5881).

Dervis, K., J. de Melo and S. Robinson (1982). *General Equilibrium Models for Development Policy*. New York, Cambridge University Press.

Gasiorek, Michael, Patricia Augier, David Evans and Sherman Robinson, (2005), *Analysis of the Effective Economic Impact of Tariff Dismantling (under the Euro-Med Association Agreements)* – Middle East, Contract no. CNTR 04 5801 Final Report: Report prepared for DFID by the University of Sussex and CEFII.

Gasiorek, Michael, Patricia Augier and Gonzalo Varela, (2006), 'Determinants of Productivity in Morocco and Egypt - the Role of Trade?'. Paper presented to the GTAP Conference, Addis Ababa, June.

Hoekman, B and Konan. D.E., (1999) "Deep Integration, Non-Discrimination, and Euro-Mediterranean Free Trade." *The World Bank Policy Research Working Paper*, 2130.

Kilkenny, M. (1991). 'Computable General Equilibrium Modelling of Agricultural Policies: Documentation of the 30-Sector FPGE GAMS Model of the United States', *USDA ERS Staff Report AGES 9125*.

Konan. D.E. and Karl E. Kim, (2004). 'Beyond Border Barriers: The Liberalization of Services Trade in Tunisia and Egypt', University of Hawaii.(Original June 2003, revised February 14, 2004).

Lofgren, H., Robinson, S. and El-Said. M., (2003). "Poverty and Inequality Analysis in a General Equilibrium Framework: The Representative Household Approach." In *The Impact of Economic Policies on Poverty and Income Distribution: Evaluation Techniques and Tools*, edited by F. Bourguignon and L. Pereira da Silva. World Bank and Oxford University Press, pp. 325-337.

McDonald, S., Robinson, S. and Thierfelder, K., (2005), 'A SAM Based Global CGE Model using GTAP Data', *Sheffield Economics Research Paper 2005:001*. The University of Sheffield.

McDonald, S., and Thierfelder, K., (2004), 'Deriving a Global Social Accounting Matrix from GTAP version 5 Data', *GTAP Technical Paper 23*. Global Trade Analysis Project: Purdue University.

Pyatt, G. (1998). 'A SAM Approach to Modelling.' *Journal of Policy Modelling* 10: 327-352.

Robinson, S., Burfisher, M.E., Hinojosa-Ojeda, R. and Thierfelder, K.E., (1993). Agricultural Polices and Migration in a US-Mexico Free Trade Area: A Computable General Equilibrium Analysis', *Journal of Policy Modelling*, Vol 15, pp 673-701.

Robinson, S., M. Kilkenny and K. Hanson (1990). 'USDA/ERS Computable General Equilibrium Model of the United States', *USDA ERS Staff Report AGES 9049*.

Robinson, S. and Thierfelder K., (2003).'Trade Integration and Regional Integration: the Search for Large Numbers', *Australian Journal of Agricultural and Resource Economics*, 46:4, pp585-604.

Appendix 1 Experiments

All experiments have :							
Exogenous: foreign savings, investment, government expenditure, government savings							
Lost tariff revenue replaced with factor tax except on unskilled labour							
Tariff cuts: FTA with EU_15							
Details of differentiated experiments:							
Experiments	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Factor markets							
Unskilled labour	neoclassical	wage fixed	wage fixed	wage fixed	wage fixed	wage fixed	wage fixed
other	neoclassical	neoclassical	neoclassical	neoclassical	neoclassical	neoclassical	neoclassica
TFP response elasticity							
import competing							
Food products	0	0	0	0.4	0.4	0.4	0.4
Textiles	0	0	0	0.4	0.4	0.4	0.4
Other manufacturing	0	0	0	0.4	0.4	0.4	0.4
Heavy manufacturing	0	0	0	0.4	0.4	0.4	0.4
Export							
Food products	0	0	0.07	0.07	0.4	1	0.4
Textiles	0	0	0.07	0.07	0.4	1	0.4
Other manufacturing	0	0	0.1	0.1	0.4	1	0.4
Heavy manufacturing	0	0	0.07	0.07	0.4	1	0.4
Deep integration	none	none	none	none	none	none	yes
EU15 imp. elasticities							
Food products	5	5	5	5	5	5	7.5
Textiles	5	5	5	5	5	5	7.5
Other manufacturing	5	5	5	5	5	5	7.5
MENA export elasticities							
Food products	2	2	2	2	2	2	2.5
Textiles	2	2	2	2	2	2	2.5
Other manuf.	2	2	2	2	2	2	2.5