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Getting the Most from the Euro-Med Agreement: A Moroccan Perspective.

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ABSTRACT

As a moderate North African Arab state, Morocco has ratified preferential free trade agreements with both the EU and the USA. However, the potential importance of improved agro-food market access with the EU has been largely ignored in Morocco-EU Association Agreement (MEAA). Indeed, in comparison with the depth of the agro-food reforms in the Morroco-US agreement, the MEAA is largely incomplete. Accordingly, as a first objective we employ a modified computable general equilibrium (CGE) model to assess the potential for further long run trade and growth in Morocco through agro-food tariff abolition. Moreover, we investigate whether there is an economic incentive for such an EU countermovement to restore competitive parity with the US. As a further aim, we examine the trade inhibiting implications of non-tariff barrier (NTB) trade costs (e.g., red tape, licensing laws etc.), which have hitherto largely escaped reform. Thus, we estimate NTB trade cost tariff equivalents (TEs) employing a theoretically consistent gravity specification. TEs are implemented into our CGE model to measure the trade and growth impacts from NTB removal in agro-food and across all Moroccan-EU trade. Whilst agro-food liberalisation yields disappointing results for Morocco, the potential for development led policies through elimination of NTBs is highly appealing.

Keywords: Morocco; Agro-Food Trade; NTB Trade Costs; Computable General Equilibrium; Gravity Modelling.

JEL classification: F1, F12, F15, F17

Getting the Most from the Euro-Med Agreement:

A Moroccan Perspective.

1. Introduction

After many years of inward looking economic policies, Morocco is embracing market orientated export led growth through simultaneous regional and preferential free trade agreements (PFTAs).[1] In addition to the Arab Free Trade Area (AFTA),[2] Morocco has bilateral trade liberalisation commitments with countries in North Africa (Algeria, Guinea, Mauritania), the Middle East (Iraq, Libya and Turkey), the European Free Trade Association (EFTA) and its principal trading relation, the European Union (EU).[3] In the case of the latter, trade relations are under the auspices of the 'Morocco-EU Association Agreement' (MEAA) as part of the Euro-Mediterranean Partnership, which involves a series of all encompassing bilateral co-operation agreements between the EU and the countries of the Middle East and North Africa (MENA).[4] Implemented in 2000, the MEAA promises free trade in industrial products by 2012, although it has been noted (Alvarez-Coque, 2002) that the majority of trade covered in this agreement already has favourable access conditions from previous accords,[5] while progress in services, agriculture and investment is partial at best.

As a moderate Arab state Morocco also enjoys close ties with the United States (US). In return for supporting the US led coalition in the wake of the Iraqi invasion of

[1] PTFAs are permitted through GATT article XXIV as an exception to the Most Favoured Nation (MFN) principle.
[2] Morocco along with ten other Arab states signed the AFTA in 1998. AFTA is committed to the gradual elimination of tariffs (over ten years) on the majority of trade between Arab nations.
[3] The EU sponsored free trade area initiative (the 'Agadir Agreement') between Egypt, Jordan, Morocco and Tunisia also symbolises Morocco's advanced relations with the EU in creating a proposed Euro-Mediterranean free trade area by 2010.
[4] Association Agreements have also been negotiated with Algeria, Egypt, Israel, Jordan, Lebanon, The Palestinian Authority and Tunisia.
[5] The 1976 Trade and Cooperation Agreement granted Morocco non-reciprocal duty free access for industrial products whilst Morocco agreed to a Most Favoured Nation status on its EU imports.

Kuwait and its hard-line policy on 'global terror',[6] Morocco was bestowed the status of non-NATO ally. In July 2004, Morocco became only the second Arab country after Jordan, and the first in North Africa, to sign a PFTA with the US. Like the MEAA, the Morocco-US Agreement (MUSA) is part of a broader Middle East Free Trade Area initiative to promote goodwill and economic stability in the region, whilst equally serving as a defensive countermovement by the US to restore trade competitive parity with the EU (Galal and Lawrence, 2003).[7] This agreement has been received apprehensively within certain quarters of the EU, notably Morocco's ex-colonial power and single largest trading partner, France,[8] which may well strengthen Morocco's negotiating position as the EU bids to maintain political and economic influence within the area.[9]

2. Welfare impacts of EU-Moroccan Trade.

Standard economic analysis reveals that for a small 'price-taking' economy (such as Morocco) forming a free trade area (FTA) with a partner, markets with trade diversion effects are *potentially* welfare decreasing,[10] whilst trade creation effects in other markets are *unambiguously* welfare improving. However, this conclusion is complicated by 'second best' (Lipsey and Lancaster, 1956) market considerations, where the correction of certain market imperfections (i.e., tariffs) while leaving others untouched (i.e., price mark-ups) may not necessarily improve social welfare. This issue

[6] Whilst Morocco did not support the recent invasion of Iraq, its own policy on terrorism has strengthened considerably since the suicide bombings in Casablanca in 2003.
[7] Beghazi *et al.* (2002) note that following the MEAA, the overall trade weighted tariff advantage favouring the EU (vis-à-vis the US) was estimated to be 3.3% in 2001.
[8] French Foreign Trade Minister, Francois Loos, suggested that Morocco should not expect to have PFTAs with the EU whilst courting the attentions of the US. The EU, however, has done something similar to the US by signing a PFTA with Mexico.
[9] This line of reasoning certainly applied to Mexico. After entering the NAFTA, Mexico also struck a bilateral accord with the EU.
[10] Generally, the larger the difference in non-distorted prices between the chosen free trade partner and the rest of the world, the smaller (larger) is the size of the efficiency triangle gains (tariff revenue losses) on formation of the FTA.

is pertinent to Morocco, where firms have thrived behind highly protective tariff barriers, which in tandem with poorly functioning competition policies, has given rise to dominant firms with considerable market power. Furthermore, the theoretical analysis abstracts from structural change, such as the potential loss of government revenue in Morocco from tariff elimination (Abed, 1998), the impacts of foreign competition on displaced labour and the investment inducing effects on capital accumulation and ultimately domestic growth.

With improvements in computational power and the development of globally consistent trade databases, computable general equilibrium (CGE) models have become the standard tool of analysis in the international trade policy literature (e.g., (Hertel *et al.*, 1998; Hertel, T.W. *et al.*, 2001; Mabugu, 2001; Anderson *et al.*, 2001).[11] Given their comprehensive coverage of regions and sectors, these models are particularly useful in summing trade diversion and creation effects across import markets, whilst being flexible enough to incorporate 'modern' trade theory extensions such as imperfect competition and capital accumulation effects.

A specific search of the CGE related international trade literature reveals two EU-Morocco studies (Rutherford *et al.* 1997; Elbehri and Hertel, 2003). Calibrating a static CGE model to a 1991 database for Morocco, Rutherford *et al.* (1997) assess the impacts of eliminating tariff protection on *all* Moroccan-EU trade. Their estimates suggest that Morocco could gain approximately 1.5 percent of GDP, whilst the addition of a unilateral removal of Moroccan tariffs on all trade increases the gain to 2.6 per cent of GDP through reduced trade diversion costs. Further sensitivity experiments examining changes in (factor) supply elasticities produce a range of gains of between

[11] CGE has also been employed in other fields of investigation such as environmental policy (Perroni and Wigle, 1997), taxation (Wehrheim, 1998), tourism (Sinclair and Stabler, 1997) and transport economics (Oosterhaven and Knapp, 2000).

1.2-2.3% of GDP for the former case, with corresponding gains of 2.3-3.4% of GDP in the latter case.

In a more recent study, Elbehri and Hertel (2003) examine the issue of second best markets using detailed concentration ratio data for Morocco. In accordance with the MEAA, the authors evaluate the impact of (i) removing tariffs on manufacturing trade between the EU and Morocco, as well as assessing a multilateral simulation involving (ii) an additional 30 percent cut (comparable to what was achieved in the Uruguay Round) in all tariffs for Morocco, the EU and the ROW. Moreover, given the impact on the exchequer from the reduction in Moroccan tariffs, the authors assume that macro adjustment measures in Morocco through endogenous consumption tax changes are implemented to maintain revenue neutrality.

The results of their long run simulations in (i) show that terms of trade losses from tariff reductions by Morocco lead to aggregate welfare *losses* of between US$16million (0.1%GDP) and US$400 million (1.3%GDP)[12] depending on assumptions pertaining to free entry and exit of firms from the manufacturing industries.[13] Morocco actually benefits under the multilateral reform scenario (between US$415million (1.3%GDP) and US$528million (1.7%GDP)), largely due to greatly reduced terms of trade. Indeed, with EU and ROW tariff reductions, the increase in Moroccan exports to offset Moroccan requires much smaller reductions in export prices.

3. Aims

3.1 Agricultural Trade Reforms

[12] In order to maintain balance of payments and offset the influx of imports from Moroccan tariff removal, Moroccan exports must increase which means a fall in export prices.

[13] Freedom of entry and exit improves allocative efficiency through rationalisation of imperfectly competitive firms from inefficient/protected industries.

In Morocco, as in many MENA members, agriculture is the most heavily protected sector and provides the bulk of the income for the rural poor. Accordingly, free agricultural access is critical for continued economic development (De Rosa, 1996) and as a means of attracting further investment, thereby countering the 'hub and spoke' effects from the EU's separate Association Agreements. For Morocco, the agricultural conditions of the current MEAA provide limited benefit (Alvarez-Coque and Batista, 1994; Grethe and Tangermann, 2000) in that access is restricted to specific EU agricultural markets (e.g., olive oil, fruit and vegetables, wine, fish etc.) through tariff concessions and accompanied by quantitative limits (i.e., tariff rate quotas), seasonal constraints and 'entry prices'.[14] The remainder (majority) of EU produce (i.e., cereals, dairy and livestock) remains protected under most favoured nation status.[15]

Unfortunately for Morocco (and other MENAs), deeper agricultural market access has been hampered for various reasons. Firstly, the degree of trade asymmetry between the EU and Morocco (see Table 1 below) grants the EU a stronger negotiating position given Morocco's greater dependence on EU markets.[16] Furthermore, with the slow pace of internal CAP reform, the EU is not in any haste to further assimilate MENA agricultural markets. For example, Morocco (along with Turkey and Israel) is a principal exporter of 'typical' Mediterranean products (i.e., fresh fruit and vegetables, tomatoes, citrus products and olive oil), thereby presenting a direct 'threat' to the growing areas of the Southern EU (Alvarez-Coque, 2002). Finally, EU policy makers are unlikely to make bilateral trade deals before the outcome of the Doha Development Round of talks on further multilateral trade commitments.

[14] See Alvarez-Coque (2002) for a full discussion of these mechanisms.
[15] As stated by Alvarez-Coque (2002), the extent of trade protection in the MEAA is consistent with multilateral rules under article XXIV of the 1994 GATT agreement which permits ten percent of trade to be excluded from tariff liberalisation.
[16] Although as suggested earlier, the balance of negotiating power may have swung partially in favour of Morocco.

Due to these factors, the EU favours 'reciprocity' in agricultural trade concessions rather than unilateral goodwill. For example, the EU has agreed to increase Moroccan tomato quotas if Morocco opens up its markets to EU wheat. Given such high domestic subsidies in the EU, this could lead to disastrous consequences for Moroccan wheat producers and further threaten food stability in the region.[17] As a result, there is much debate about the timing and depth of reciprocal tariff liberalisation, where pressure groups such as Oxfam (2004) are suggesting asymmetrical liberalisation (i.e., quicker EU agricultural tariff liberalisation) to allow MENA countries such as Morocco time to adjust to market forces whilst protecting their food security and rural development needs.[18]

Accordingly, the first objective of this study is to examine the long-run potential for further welfare gains to Morocco from free agricultural and food trade. A Comparison of the policy scenarios in Rutherford *et al.* (1997) and Elbehri and Hertel (2003) suggests that agricultural reform would yield welfare improvements to Morocco, although compared with the current EU deal, it is not clear how large these gains would be. Moreover, in light of Morocco's trade deal with the US, what is the long run cost to the EU in stalling on deepening the current Morocco Association Agreement to include all agricultural trade?[19]

3.2 Non Tariff Barrier (NTB) Trade Costs

The focus of previous multilateral trade rounds negotiations has centred largely on reducing formal (i.e., import tariffs, export subsidies) barriers to trade, whilst non-

[17] The agriculture sector is heterogeneous with relatively prosperous irrigated regions, whilst in contrast rainfed zones have a high variance of rainfall with many suffering from regular droughts.

[18] Oxfam (2004) also mentions the structural problems facing many small MENA farmers in accessing international markets. Thus, there is a danger that even in the advent of agricultural market liberalisation, the distributive gains between larger and smaller farmers could be significant. We do not examine this proposition in the current analysis.

[19] In both Rutherford *et al.* (1997) and Elbehri and Hertel (2003), no results are presented for the EU region to which we can compare.

tariff market segmenting policies (i.e., health and safety regulations, competition laws (particularly in services), technical standards (e.g., licensing and certification regimes, environmental standards), quantitative restrictions and 'red tape' procedures (e.g., customs clearance)) in partner countries continue unchallenged. A review of a number of trade restriction measures such as the IMF's trade restrictiveness index (TRI), the World Bank's Overall Trade Restrictiveness Index (OTRI) and the Heritage Foundation's 'Freedom Index' (IMF, 2005), suggests that Morocco does appear to liberally employ non-tariff trade impediments to protect domestic production. Accordingly, an important empirical question in the context of the MEAA is the potential benefit from greater harmonisation or recognition of regulatory policy regimes between the member governments.

Due to their inherent complexity in design, a number of CGE studies (Harrison *et al.*, 1996; Baldwin *et al.*, 1997; Vaittenen 2002; and Keuschnigg *et al.*, 2002) incorporate border effects as 'best-guess' uniform percentage reductions in 'iceberg-costs' (Samuelson, 1954)[20] on affected bilateral trade routes. However, given the pervasiveness and variation in sectoral NTBs, a uniform percentage cost reduction is a rather crude measure resulting in potentially significant bias. A more refined form of measurement is the gravity model approach (Hoekman, 1995; Anderson and Wincoop, 2001; Kume *et al.*, 2001, Park, 2002), which estimates bilateral trade by commodity based on (*inter alia*) the product of the size of both countries corrected for distance and formal trade barriers (tariffs, subsidies). The 'border cost' estimates are approximated either from regression residuals or dummy variables estimates and tariff equivalents are derived.

[20] The concept of an iceberg cost was developed by Samuelson (1954), who suggested that some fraction of a commodity can be conceived of as 'melting' away as a necessary cost of transportation over a unit of distance. This construct is equally applicable to other forms of trade costs such as NTBs, which inhibit the 'effective' flow of goods and services from one region to another.

In the context of Morocco, the gravity work of Park (*op. cit.*) supports the trade restrictiveness measures cited above, where Moroccan NTB tariff equivalent barriers in services trade are considerable ranging between 25% for communication services and 87% for construction.[21] Equally, other studies (Lejour *et al.*, 2001; Philippidis and Carrington, 2005) examining NTB costs on EU single market accession, derive NTB equivalents and implement them within a CGE model to evaluate NTB eliminations on trade flows, growth and real income changes. To our knowledge, no equivalent CGE studies exist under the Association Agreements. Thus, in this study, we employ a gravity specification to estimate and implement NTBs between Morocco and the EU into the CGE model specification, thereby assessing the benefits of harmonising regulatory policy regimes between the member governments.

4. Gravity Specification

4.1 Background and Theoretical Foundation

To quantify non-tariff trade barriers, one may employ either a direct or indirect approach. Direct measurement involves collecting information (e.g., government documents, personal interviews with industry 'experts') on existing regulations and procedures to construct an index. Statistical or subjective approaches may be used to aggregate or weight the data in order to build a composite indicator. In contrast, indirect non-tariff barriers may be 'conjectured' from border price distortions or discrepancies between actual trade and 'potential' frictionless trade (Deardoff and Stern, 2004).

In the context of this study, the use of direct measurement to capture specific sector (e.g., yogurts, cheese, confectionary etc.) non-tariff protection regimes would appear more problematic given the broad sectoral definitions (e.g., 'dairy') employed in

[21] Impediments to trade of a non tariff nature (i.e., licensing, health and safety standards, technical standards, 'red tape') are largely the preserve of the services sectors. Due to their complex and varied nature, they are not quantified in the GTAP database. This omission is rectified in this study.

the CGE model. Moreover, direct measurement only captures explicit and/or recognized policies, and not all possible sources of restrictions to trade. For these reasons, we favour the use of an indirect approach.

As noted above, one possible indirect estimation is to compare observed border price distortions. This technique can be employed for homogeneous goods merchandise trade although where there are ‘additional’ sources of (perceived) product differentiation, such as origin, quality or marketing elements, it becomes considerably more problematic to separate prices differences based purely on anti-competitive trading practises. Indeed, in the realm of services trade where ‘differentiation’ is the norm, estimating border price differences as a proxy for non-tariff barriers to trade would be extremely difficult to implement.

Accordingly, in this paper we employ the gravity method of indirect estimation, which provides a benchmark for trade under frictionless conditions. Since the early works of Tinbergen (1962), the gravity model has largely been used to explain trade flows. In its simplest form, trade between a pair of countries i and j (X^{ij}) is a positive function of their economic ‘size’ and a negative function of distance. A common weakness of the model was its lack of theoretical rigour, although a number of authors (Anderson, 1979; Bergstrand, 1989, 1990; Deardorff, 1998, Anderson and van Wincoop 2003) have refined the empirical implementation based on a homothetic constant elasticity substitution (CES) Armington structure (varietal differentiation by region of origin) consistent with the assumption of monopolistic competition.[22]

Thus, under the assumption of costless or free trade, prices across countries are identical. Let us consider a multi-country framework with C countries, denoted as i,j = 1,…,C; and N varieties are available. Let y_k^i denote the production of variety k in

[22] See chapter 5 of Feenstra (2003) for a comprehensive review of the theoretical and empirical development of the gravity equation.

country i. The GDP in each country is then[23] $Y^i = \sum_{k=1}^{N} y_k^i$ while world GDP is $Y^W = \sum_{k=1}^{N} Y^i$. Under the assumptions above, the exporter country will sell its variety in proportion to the importer's GDP:

$$X_k^{i,j} = \frac{Y^j}{Y^W} y_k^i = s^j y_k^i \qquad [1]$$

Summing over all products we get:

$$X^{ij} = \sum_{k=1}^{N} X_k^{ij} = s^j \sum_{k=1}^{N} y_k^i = s^j Y^i = \frac{Y^j Y^i}{Y^W} = s^i Y^j = X^{ji} \qquad [2]$$

and accordingly, the total bilateral trade between countries i and j is:

$$X^{ij} + X^{ji} = 2\frac{Y^j Y^i}{Y^W} \qquad [3]$$

which is the simplest derivation of the gravity equation, showing that total trade between i and j is directly proportional to the product of their GDP's.

Anderson and van Wincoop (2003) relax the assumption of costless trade to include transport costs or tariffs. As a result, prices of each variety k are no longer equal across countries:

$$P_k^{ij} = T_k^{ij} P_k^i \qquad [4]$$

where P_k^{ij} is the cost including freight (c.i.f.) price of variety k, exported from country i to country j; P_k^i is the free on board (f.o.b.) price of variety k, in country i; and T_k^{ij} is an 'iceberg cost' (Samuelson, 1952) which states the number of units of variety k that must be shipped to country j in order for one unit to arrive.

According to the specialization assumption above, each country i produces N^i

[23] Under the assumption of free trade, prices across countries are identical; normalizing prices to unity, y_k^i actually measures the value of production of product k in country i.

unique varieties ($k=1,..,N^i$). As a consequence, the consumption of variety k in country j (C_k^{ij}) equals the exports to j coming from the only producing country i. The CES utility function for consumers in country j (U^j) is then (where σ is the elasticity of substitution across varieties):

$$U^j = \sum_{i=1}^{C}\sum_{k=1}^{N^i}(C_k^{ij})^{(\sigma-1)/\sigma} \qquad [5]$$

The sub-index k of C_k^{ij} can be dropped assuming that all varieties k imported from country i are sold at the same price P^{ij} in country j, as a result of a transport cost equal across categories (T^{ij}), and accordingly the utility function is simplified to:

$$U^j = \sum_{i=1}^{C} C^{ij(\sigma-1)/\sigma} \qquad [6]$$

A representative consumer of country j maximizes U^j subject to the budget constraint:

$$Y^j = \sum_{i=1}^{C} N^i P^{ij} C^{ij} \qquad [7]$$

where Y^j is aggregate expenditure and income in country j. From the restricted maximization the demand for each product C^{ij} is obtained:

$$C^{ij} = \left(\frac{P^{ij}}{P^{j*}}\right)^{-\sigma}\left(\frac{Y^j}{P^{j*}}\right) \qquad [8]$$

where P^{j*} is an overall index of prices in country j:

$$P^{j*} = \left(\sum_{i=1}^{C} N^i \left(P^{ij}\right)^{1-\sigma}\right)^{\frac{1}{1-\sigma}} \qquad [9]$$

Combining the relation between the value of exports from country i to j:

$$X^{ij} = N^i P^{ij} C^{ij} \qquad [10]$$

with the demand function in [8] a more general gravity equation is derived:

$$X^{ij} = N^i \, Y^j \left(\frac{P^{ij}}{P^{j*}} \right)^{1-\sigma} \qquad [11]$$

To simplify the estimation of [11] the unknown number of varieties that each country i produces is substituted by $N^i = \dfrac{Y^i}{P^i \, \bar{y}}$, where $\bar{y}$ is fixed firm output derived from zero-profit conditions. Moreover, given the relationship in [4], the price in country j (P^{ij}) is equal to T^{ij} P^i. Substituting these expressions into expression [11] and simplifying gives:

$$X^{ij} = \frac{Y^i \, Y^j}{P^{i\sigma} \, \bar{y}} \left(\frac{T^{ij}}{P^{j*}} \right)^{1-\sigma} \qquad [12]$$

In Anderson and van Wincoop (2003) this treatment is simplified further by imposing the market clearing condition that the value of firm output in country (or variety) i (f.o.b. prices P^i) equals consumer expenditure in destination country j:

$$P^i y^i = \sum_{j=1}^{C} C^{ij} \, P^{ij} \qquad [13]$$

and assuming that trade costs between partners i and j are symmetric: $T^{ij} = T^{ji}$. In this way, an implicit solution for the unknown price P^i in [13] is obtained $\tilde{P}^i$:

$$\tilde{P}^i = \frac{\left(\dfrac{Y^i / Y^W}{N^i} \right)^{\frac{1}{1-\sigma}}}{\tilde{P}^{i*}} \qquad [14]$$

which, when substituted in [9] leads to the overall price index:

$$(\tilde{P}^{j*})^{1-\sigma} = \sum_{i=1}^{C} \frac{Y^i}{Y^W} \left(\frac{T^{ij}}{\tilde{P}^{i*}} \right)^{1-\sigma} \qquad [15]$$

Substituting [14] into the gravity equation [12] a new specification for the gravity equation is obtained:

$$X^{ij} = \frac{Y^i Y^j}{Y^W} \left(\frac{T^{ij}}{\tilde{P}^{i*} \tilde{P}^{j*}} \right)^{1-\sigma} \qquad [16]$$

Therefore, the theoretical foundation of the gravity equation expresses exports between two countries i and j as a function of the product of their GDP's and their overall price indexes, which Anderson and van Wincoop (2003) term 'indexes of multilateral resistance' as they depend on the trade costs (see equation [15]).

To ease estimation, the expression in [16] is linearized taking logs leading to the estimating gravity equation:

$$\ln X^{ij} = \alpha + \ln Y^{i} + \ln Y^{j} + (1-\sigma)\ln T^{ij} + (\sigma-1)\ln \widetilde{P}^{i*} + (\sigma-1)\ln \widetilde{P}^{j*} \qquad [17]$$

where α collects the effect of $\ln Y^{W}$.

In the theoretical outline above, 'iceberg costs' (T^{ij}) are a quantitative frictional measure in delivering one unit of a product from one region to another. Empirically, this definition has incorporated not only transportation costs, which is usually proxied by distance ($Dist^{ij}$), but also other sources of unobservable costs caused by, for example, currency risk, health and safety costs, red tape procedures and paperwork etc. Such non-tariff barriers (NTB) can be approximated either employing dummy variable estimates or the residuals of the gravity regression.

The dummy variable approach consists of modelling T^{ij}, usually hypothesized as a log-linear relationship (Anderson and van Wincoop, 2003):

$$\ln T^{ij} = \rho \ln Dist^{ij} + \ln \tau^{ij} \qquad [18]$$

where ρ is a parameter and τ^{ij} is the bilateral trade barrier, which may be an international border (McCallum, 1995; Anderson and van Wincoop, 2003); a monetary union (see Rose and Stanley (2005) for a full review); or a preferential trade agreements(see Kandogan (2003) for a full review). In Anderson and van Wincoop, (2003) this is modelled as:

$$\tau^{ij} = \tau^{1-D^{ij}} \qquad [19]$$

where D^{ij} is a dummy variable that takes the value 1 when regions i and j belong to the same country, trade agreement or currency union, and 0 otherwise; and τ-1 is the non-tariff-barrier equivalent. Substituting [19] into [17], the gravity equation becomes:

$$\ln X^{ij} = \alpha + \ln Y^{i} + \ln Y^{j} + (1-\sigma)\rho \ln Dist^{ij} + (1-\sigma)\ln \tau\,(1-D^{ij}) + (\sigma-1)\ln \tilde{P}^{i*} + (\sigma-1)\ln \tilde{P}^{j*} \qquad [20]$$

Estimating equation [20] for the parameter γ (equals $(1-\sigma)\ln\tau$) provides an estimate of the 'average' impact of the dummy variable $(1-D^{ij})$ on trade, from which it is possible to calculate an 'average' NTB tariff-equivalent estimate of the trade barrier:[24]

$$(\tau - 1) = \exp\left(\frac{\gamma}{1-\sigma}\right) - 1 \qquad [21]$$

Alternatively, other gravity studies (Wall, 1999; Park, 2002; Harrigan and Vanjani, 2003; Deardorff and Stern, 2004) a residual based method is employed which accounts for all of the parameters of the estimated gravity equation. This method compares actual and potential trade flows with respect to a free-trade benchmark, where it is assumed that the gravity equation provides a prediction of potential trade under frictionless conditions. Then, the discrepancies between actual ($\ln X_A^{ij}$) and predicted trade ($\ln X_P^{ij}$) are taken to be indicative of trade barriers:

$$\ln X_A^{ij} - \ln X_P^{ij} = (1-\sigma)\ln \tau^{ij} \qquad [22]$$

Over this general definition, Francois (1999) and Park (2002) introduce two modifications: first, for each country j, they calculate a tariff-equivalent over all its trade partners. Thus, for each country j, actual (M_A^{j}) and predicted (M_P^{j}) imports aggregating over all countries $i \neq j$ are calculated:

[24] Note that if D^{ij} were defined as 1 when regions i,j belong to different countries, trade agreements or currency unions, the estimated coefficient γ would be $(\sigma-1)\ln \tau$, and the tariff-equivalent: $(\tau - 1) = \exp\left(\frac{\gamma}{\sigma-1}\right) - 1$

$$M_A^j = \sum_{i=1}^{C} X_A^{ij} \quad \text{and} \quad M_P^j = \sum_{i=1}^{C} X_P^{ij} \qquad [23]$$

where X_p^{ij} are the anti-logs of the predicted estimates of the gravity equation. Moreover, these studies normalize the difference between actual and predicted trade relative to a free-trade benchmark (τ^b), where the greatest positive difference between actual and predicted trade is chosen as benchmark: $\tau^b = \text{Max}\left(\left|\frac{M_A^j}{M_P^j}\right|\right)$. Combining these modifications with equation [22] leads to:

$$\ln\left(\frac{M_A^j}{M_P^j}\right) - \ln\left(\tau^b\right) = -\sigma \ln \tau^j \qquad [24]$$

and solving for the tariff-equivalent (τ^j) of the NTB imposed by country j is:

$$(\tau^j - 1) = \exp\left(\ln\left(M_A^j / M_P^j\right) - \ln\left(\tau^b\right)\right)^{-1/\sigma} - 1 = \left(\frac{M_A^j / M_P^j}{\tau^b}\right)^{-1/\sigma} - 1 \qquad [25]$$

In the final model specification, we favour the residual based approach for two reasons. Firstly, unlike the dummy-based method, the residual-based method is more general, as it provides an estimate of all potential NTB barriers on trade rather than NTBs solely related to the dummy in question. Moreover, the residual approach is flexible it that it allows the estimation of bi-directional NTB barriers between specific trade partners (i,j), rather than the 'average' NTB cost estimates provided in the dummy specification.

4.2 The empirical gravity equation and data and results

The theoretical based gravity equation has been extended in the empirical literature to improve the treatment of transportation costs. For example, Bergstrand, (1985) and Thoumi (1989) include 'shared borders' and 'landlocked' dummies in their models, whilst recent studies (Garman *et al.*, 1998; Limao and Venables, 1999, Martinez-Zarzoso and Nowak-Lehman, 2003) incorporate the importance of infrastructure in facilitating trade between partners. Other authors include cultural or historical linkages that may favour international trade, such as a common language and/or ex-colonial ties (e.g. Frankel et al., 1995; Rose and van Wincoop, 2001; Park, 2002), whilst Arnon *et al.*, (1996) and Martinez-Zarzoso and Nowak-Lehman, (2003) examine the Linder effect, that is, the hypothesis that countries with similar per capita incomes trade more prolifically.

In light of these developments in the literature, the empirical gravity specification estimated in this study is:

$$\begin{aligned} x^{ij} &= \alpha + \beta_1\, gdp^{i} + \beta_2\, gdp^{j} + \beta_3\, sqinc^{ij} + \beta_4\, Pr^{i} + \beta_5\, Pr^{j} + \beta_6\, Infr^{i} + \beta_7\, Infr^{j} \\ &+ \beta_8 dist_{i,j} + \beta_9\, Cont_{i,j} + \beta_{10}\, Lang^{ij} + \beta_{11}\, Mt^{j} + \beta_{12} Xs^{i} + \varepsilon^{ij} \end{aligned} \qquad [26]$$

where:

x^{ij} : logarithm of exports from country i to country j

gdp^{i} : logarithm of GDP in country i

gdp^{j} : logarithm of GDP in country j

$sqinc^{ij}$: logarithm of square difference of per capita GDPs in countries i and j

Pr^{i} : level of prices indicator in country i with respect to US

Pr^{j} : level of prices indicator in country j with respect to US

Infri : infrastructure indicator in country i

Infrj : infrastructure indicator in country j

$dist^{ij}$: logarithm of distance between country i and j

$Cont^{ij}$: dummy variable that takes value 1 when countries i and j share a common border and 0 otherwise

$Lang^{ij}$: dummy variable that takes value 1 when countries i and j share a common language, and 0 otherwise

Mt^{j} : import tariff rate (%) imposed by the importer country j (negative values imply that country j subsidizes imports)

Xs^i : export subsidy rate (%) imposed by the exporter country i (negative values imply that country i impose a tariff on exports)

To estimate the model, US dollar value data on bilateral exports comes from version 6 of the GTAP database, benchmarked to 2001. The countries included in the analysis are: the (pre-enlargement) members of the EU, the recent 10 EU accession members, Bulgaria and Romania; the US, Canada, Alaska, Argentina, Brazil, Chile, Columbia, Mexico, Peru, Uruguay, Venezuela and Morocco. The rest of countries are aggregated as: Central America, rest of Andean Pact, Rest of Caribbean, Rest of South America, Rest of FTAA, Middle East, Rest of North Africa, and Rest of the World. Therefore, in total there are 9 composites and 38 individual countries, making a total of 2170 observations. To reduce the proportion of unexplained trade attributable to non-tariff barriers, we following Baier and Bergstrand (2001) by including GTAP bilateral import tariff data, which we have supplemented with export subsidy data from the same source.

To generate consistency with the bilateral trade data, we employ GDP values at current prices (2001) for each country in the sample from the GTAP database. Employing current price GDP data is also considered to better proxy export supply and import demand potential (Gros and Gociarz, 1996). GDP coefficients are expected to be positive and close to unity, as suggested by the theory (Anderson and Wincoop, 2003). For example, on the supply side higher regional income indicates greater economic activity and therefore greater availability of goods for exportation; while on the demand side, a higher income is positively related with the propensity to import. Given the Linder hypothesis, it is anticipated that the larger the differences in per capita income, the less likely is trade between the partner countries.

In equation [17] the price indexes are not observable. Anderson and van Wincoop (2003) first estimate a specific trade cost function (T^{ij}) in terms of distance and unknown trade barriers and use these estimates to derive implicit price indexes in [15] which are used in the estimation of the gravity equation [17] using non-linear least squares. Alternatively, other authors have employed standard estimation techniques (e.g., OLS) to proxy prices indexes using GDP's deflators (eg. Bergstrand 1985, 1989; Baier and Bergstrand, 2001) or wholesale price indexes (eg. Park, 2002).[25] Finally, it is possible to replace the price indexes by country specific fixed effects, particularly when panel data are employed (eg. Matyas, 1997; Jakab *et al.*, 2001; Kurihara, 2003; Egger and Pfaffermayr, 2003).[26]

To avoid some of the drawbacks recognized by the literature on using aggregate price indexes, such as the different base period of indexes across countries and movements in exchange rates which make difficult to compare price levels across countries, we have built a relative price indicator. Employing IMF (2005) data, we collect US dollar equivalent purchasing power parities (PPP) for 2001 in each country. Subsequently, exchange rates or foreign currency units per dollar are collected for the same period (http://www.oanda.com/convert/fxhistory). The ratio of the PPP to th exchange rate provides an index of the level of prices in each country with respect to the US.

The infrastructure indicators are calculated in a similar way to Limao and Venables (1999) and Martinez-Zarzoso and Nowak-Lehman (2003) as the per capita

[25] However, Feenstra (2003) notes that a drawback of using published aggregate price indexes is the difficulty of comparing price levels across countries where index base periods differ. Moreover, Anderson and Wincoop (2003,p.16) note that employing price indices that necessarily include *non-tradable* items and nominal exchange rates do not accurately represent real tradable price differences between partner countries.

[26] When cross-section data are used, the degrees of freedom reduce drastically, and only one specific effect (dummy variable) for each country can be included, either when the country is an importer or an exporter, but not for specific pairs of trade partners as this would lead to a number of dummy variables equal to the number of observations.

ratio of the total network of highways and railways for each country in the sample. Population, highway and railway data was taken from the World Bank's economic indicators and the CIA Factbook. It is expected that an efficient infrastructure network (lower transport costs) will impact favourably on trade (Bougheas et al., 1999).

The distance data for each of the countries in the sample are great circle distances between capital cities. For the composite regions, an arbitrary capital was selected (see appendix 1.1). As a direct proxy for transport cost, the expected parameter sign in the regression is negative. Contiguity and common languages dummies were assigned for each of the sample countries and consistent with other literature, are expected to positively affect trade. Finally, Ordinary Least Squares (OLS) is applied in the estimation, and White's consistent covariance matrix estimator is used to avoid the possible bias of OLS standard errors due to heteroskedasticity.

Results of the gravity equation estimation are shown in Table 2. The Adjusted R^2 range between 0.599 in other agricultural products sector and 0.933 in services, with a majority of sectors with an Adjusted R^2 higher than 0.74. Therefore, the gravity equation more than adequately explains bilateral trade across a wide range of individual industries. A Condition Number under 100 indicates that multicollinearity amongst explanatory variables is not a serious problem.

Incomes of exporter and importer countries are all positive, significant at 1%, and with parameter estimates close to unity, as predicted by economic theory. A Linder effect is found to be significant in 8 out of 22 sectors: the square difference per capita income is negative and significant at 5% in food sectors, raw materials and utilities. However, this variable is positive and significant in textiles and light manufacturing sectors, implying that in these industries, trade increases when there are greater differences in factor endowments, proxied by per capita incomes.

The effect of the relative price indicators is mixed across sectors and depends on whether it is the exporter's or importer's price: the exporter's price is significant in all but three of the sectors and a negative effect predominates (13 sectors); the importer's price, on the other hand, is significant in 14 sectors, while positive effects predominate (10 sectors). Infrastructure indicators are positive and significant as expected in most of the sectors (18 sectors). Distance has a highly significant and negative impact on trade in all sectors, with coefficients close to unity, while contiguity of the countries favour trade significantly, in particular, in the agrofood related sectors. Interestingly, in the services sector, the negative impact of distance is minimum while contiguity has a negative effect which is in agreement with Lejour *et al.* (2001) results. Apart from trade in utilities and services sectors, countries which share a common language trade more.

Finally, bilateral routes which impose non-zero import tariffs and export subsidies significantly affect trade. Surprisingly, the tariff coefficient is positive suggesting that greater tariff barriers are consistent with higher bilateral trade flows. Given the cross sectional nature of the data, we speculate that this is a spurious relationship, where many regions which trade heavily (particularly the EU) also levy significant tariffs. The subsidy results are also slightly ambiguous. Whilst the majority of the sectors have positive coefficient estimates for subsidies, a number are also negative. Once again, we suggest that this is a spurious outcome as in the case of the tariff estimates.

4.3 Calculation and Implementation of NTBs

The tariff equivalents of NTBs are calculated from the residuals or the differences between actual and predicted trade employing equation [25]. However, we extend the model to calculate bi-directional NTBs on imports by sector between *specific* pairs of partner countries. Thus, in the context of this paper, we calculate bi-directional sectoral NTBs between Morocco and the EU regions (EU15 and EU12). Moreover, to simulate the enlargement of the single market in the baseline, we estimate NTB costs between the EU15 and the EU12. The benchmark is calculated as above, although instead of calculating the ratio of actual and predicted total imports of a country j over all its trading partners as in equation [23], we repeat the procedure but only on trade between those countries of interest. Thus, to calculate the NTB equivalents when the EU15 imports from EU12:

$$M_A^{EU12/EU15} = \sum_{j=1}^{15}\sum_{i=1}^{12} X_A^{ij} \quad \text{and} \quad M_P^{EU12/EU15} = \sum_{j=1}^{15}\sum_{i=1}^{12} X_P^{ij} \qquad [27]$$

Reference to equation [25] shows that the derivation of tariff equivalents requires sectoral elasticity of substitution estimates, which are taken from the GTAP database (Dimaranan and McDougall, 2005). The extrapolated tariff equivalent values of the NTB for each sector from the underlying sectoral regressions are provided in Table 3. Examining the results from the regression suggest that NTB tariff equivalents in agriculture and food sectors are relatively high compared with non-food sectors. This result concurs with other gravity based tariff equivalent studies of Columbian-NAFTA trade (Bussolo and Roland-Holst, 1998), european enlargement (Lejour *et al.*, 2001) and borrowed NTB tariff equivalent estimates in Monteagudo and Watanuki (2003), whilst similar tariff equivalent peaks in beverages and tobacco are also found in Chemingui and Dessus (2004) study of NTB protection in Syria.

In the standard GTAP treatment, NTB trade costs are not incorporated explicitly within the database. To simulate their removal without altering the benchmark data, we follow the approach employed in Hertel *et al.*, (2001) who distinguish between 'observed' and 'effective' prices and quantities of trade.[27] Thus, the 'effective' import price (PMS^E) of good *i* from exporting region *r* to importing region *s* is a function of the observed import price (PMS^O) divided by an exogenous technical coefficient (*AMS*), which captures changes in bilateral trade efficiency such as removal of NTBs:

$$PMS^{E}_{i,r,s} = PMS^{O}_{i,r,s} / AMS_{i,r,s} \qquad [28]$$

An increase in AMS captures reductions in trade costs by reducing the effective price of good *i* in importing region *s* from a given exporter *r*. Since efficiency enhancement (i.e., NTB removal) reduces trade costs, in true 'iceberg cost' fashion, it also increases the effective quantity of export goods from region *r*. Thus, in the GTAP model, the effective quantity of exports is the product of observed exports and the technical coefficient:

$$QXS^{E}_{i,r,s} = QXS^{O}_{i,r,s} \times AMS_{i,r,s} \qquad [29]$$

Note, that since the effective and observed *values* are identical in the benchmark data, there are no changes in producer revenues and therefore recalibration of the benchmark database is not necessary.

5. CGE Data Aggregation and CGE Modelling Baseline Assumptions

To examine the long run potential resource and welfare impacts of the removal of agricultural tariff barriers and non-tariff trading costs, we employ the Global Trade Analysis Project (GTAP) model and accompanying version 6 database (Dimaranan and McDougall, 2005).[28] In the standard GTAP framework, conventional neo-classical behaviour (utility maximisation, cost minimisation) is assumed, whilst regional utility is aggregated over private demands (non-homothetic), public demands and savings

[27] A full description of the exact implementation of bilateral import augmenting technical change is provided in Hertel *et al.* (2001).
[28] The model description here is brief. For a fully detailed discussion of the model see Hertel (1997).

(investment demand). Production is characterised employing a perfectly competitive, constant-returns-to-scale technology, and bilateral trade flows are modelled using the Armington (1969) specification to allow for imperfect substitution between heterogeneous products. To apportion investment expenditures across regions, a fictitious agent, known as the global bank, collects global investment funds (regional savings) and disburses them across regions such that changes in expected rates of return are equalised. Given the long run closure, we assume full employment in all factor markets (wages are fully flexible) and free entry and exit of firms in imperfectly competitive sectors.

The GTAP database, currently in its sixth incarnation, represents a significant advance on version 5 in terms of (*inter alia*) broader regional coverage (87 regions), improved trade and demand elasticity estimates and significant refinements to the support and protection data. Our 22 sector disaggregation covers Morocco's main production and trade (both import and export) activities.[29] The 15 manufacturing sectors (including six food processing) are characterised as Cournot oligopolistic,[30] whilst services and agricultural sectors are assumed perfectly competitive.[31] Concentration ratio data are employed to calibrate manufacturing sector firm numbers in all regions.[32] The choice of regional aggregation reflects Morocco's key trading partner, the European Union (EU15 and EU12 regions – see also below), its recent agreement with the USA[33] and a residual region (Rest of the World – ROW).

[29] The sectors are: Crops, vegetables and fruit, livestock, other agriculture, raw materials, meat products, vegetable oils and fats, dairy, sugar processing, other food processing, beverages and tobacco, textiles, wearing apparel, wood, paper and publishing, chemical products, metal products, motor vehicles, light manufacturing, other manufacturing, utilities, other services.

[30] Given long run closure, we assume free entry/exit of firms from imperfectly competitive sectors.

[31] We refrain from using this assumption in services sectors since data on services concentration ratios for the chosen sectors was not forthcoming. Moreover, the potential bias of introducing arbitrary firm numbers in these sectors could be considerably larger (particularly in removing trade costs) than assuming a perfectly competitive paradigm.

[32] See appendix 1.2 for a discussion of the oligopolistic sector modelling assumptions.

[33] After the EU27, Morocco's largest single country trade partner is the USA.

To conduct an assessment of the long run impacts of Moroccan-EU trade reform, baseline shocks are employed in each of the five regions on productivity, growth, skilled and unskilled labour endowments and population (Jensen and Frandsen, 2003, World Bank, 2005) to project the world economy to 2015.[34] The baseline scenario also includes trade policy shocks to export subsidies and import tariffs to capture both the Uruguay Round (UR) and a stylised Millennium Round (MR) outcome,[35] and the elimination of all tariffs under the Moroccan-US and Moroccan-EU bilateral agreements. In the MUSA, all tariff are eliminated on bilateral trade. To characterise the MEAA, all non-food manufacturing tariffs are eliminated whilst for food manufacturing industries, we follow the approach of Elbehri and Hertel (2003) where only that portion of the EU (Moroccan) tariff that protects EU (Moroccan) *non-agricultural* inputs is eliminated. Given that the non-agricultural input content in EU food processing sectors is considerably higher than in Morocco, as a proportion of the total import tariff, the EU undergoes greater cuts in the baseline compared with Morocco.

Importantly, over the eleven year time horizon of the baseline the EU is set to enlarge to 27 members given the scheduled inclusion of Bulgaria and Romania in 2007. Accordingly, all tariff and subsidy barriers are removed between the EU15 and EU12 regions. In addition, derived trade costs estimates from our gravity specification are eliminated following the iceberg costs approach (see section 4.3) to characterise the

[34] The Millennium Round (MR) talks are scheduled to conclude in 2005, to be implemented from 2006 at the earliest. Assuming a similar implementation time period as the Uruguay Round (10 years) for developing countries, this would imply completion of the MR reforms in 2015. Moreover, 95% of trade between Morocco and the USA will be tariff free by 2013. The pace of some of the agricultural reform under MUSA is a little slower due to staged reductions in tariff rate quotas, although here it is assumed that all protection is eliminated by 2015. The EU-Moroccan Association Agreement in industrial products will conclude in 2012.

[35] Given the benchmark year of 2001, the developed country protection has been fully implemented under the UR. For developing countries (Morocco and trade weighted part of the ROW), we assume a linear time path proportion of protection has been removed, where for import tariffs dirty tariff shocks are employed using data from Harrison *et al.* (1995). In addition, further tariff reductions under the MR are assumed to be 30% for all partners following Elbehri and Hertel, (2003). Finally, we assume that export subsidy expenditure is eliminated on all routes under the MR.

formation of the single market. Given the focus on Morocco, CAP support mechanisms are not explicitly modelled (i.e., quotas, CAP budget). On the other hand, we have endeavoured to represent the evolution of CAP support to reflect WTO and internal reform considerations. Thus, all output subsidies in the EU are removed to reflect the removal of Amber Box support, whilst the representation of the single farm payment follows Jensen and Frandsen (2004), in that we remove all input subsidy wedges and reinsert them as *uniform* hectare premiums in all land using sectors in the EU15. In the case of the EU12, we impose the same uniform headage premiums payments as calculated for the EU15.[36]

Finally, since there are significant tariffs on, *inter alia*, agro-food production (especially in Morocco), we assume that both Moroccan and EU governments pursue a compensatory tax policy (i.e., tax neutrality) to offset the tariff (and therefore welfare) losses to the exchequer from full elimination of import trade barriers.

6. CGE Simulation Design and Results

6.1 Scenario Design

Against the 'background' shocks of the baseline scenario, we examine three alternative scenarios examining successively deeper reforms on Moroccan-EU bilateral trade. In scenario 1, we examine the impacts of full removal of primary agricultural bilateral tariffs and the remaining portion of the EU (Moroccan) tariff that protects EU (Moroccan) *agricultural* inputs in food processing sectors.[37] Scenario 2 builds on scenario 1 in that we remove all NTB trade costs on agro-food trade between the two

[36] Given accession of an additional 12 members to the EU15, the increase/decrease to the EU27 common external tariffs (CETs) to reproduce the original EU15 CETs are calculated before the 30% Millennium round cut.
[37] Given that the agricultural input content in Moroccan food processing sectors is considerably higher than in the EU, as a proportion of the remaining import tariff, Morocco's tariff cuts are considerably greater than in the EU.

partners. Finally, Scenario 3 examines complete abolition of tariff and NTB trade costs. The focus of the results is on Morocco, whilst regional impacts are reported for both Morocco and the EU27.

6.2 Results

6.2.1 EU-Moroccan Trade relations

With a 76% and 56% share of primary agricultural and food processing sectors respectively, the EU dominates Moroccan agro-food export trade. In particular, 'vegetables, fruits and nuts', 'other agriculture' (mainly fishing) and 'meat processing' exports to the EU account for 78%, 94% and 75% of Morocco's totals respectively. As a source of imports, the EU plays less of a role, accounting for only 36% and 39% of agricultural and food sector imports respectively, although Morocco relies heavily on imports of EU livestock and dairy imports. Finally, aggregating across all trading sectors shows that the EU accounts for approximately 60% of Morocco's trading activity.

Table 1 shows agro-food trade and protection data for Morocco and the EU27 in 2001. In the first three columns of data we present Moroccan exports, imports and sectoral trade balances with the EU27 respectively. A cursory glance at the data reveals that Morocco has trade surpluses in primary agricultural ($US0.236bn) and food ($US0.331bn) trade. A closer examination of the individual sectors reveals a large trade deficit in the crops sector (which includes cereals, oilseeds and sugar), whilst Moroccan exports of vegetables, fruits and nuts oilseeds are in healthy surplus. In the food processing sector, the largest surplus appears in the 'other food' processing sector which includes traditional Moroccan exports of canned vegetables, fruits and fish (Elbehri and Hertel, 2003). The final two columns show the structure of protection in both regions, where in comparison to the EU, Moroccan import protection is significantly higher across agro-food product categories, with Moroccan meat products, dairy production and 'typical produce' (i.e., vegetables and fruit) most heavily protected. In the EU, primary agricultural import barriers are very low or even zero with the exception of 'vegetables and fruit'. In processed food sectors, EU protection is more evident, especially in 'meat products' and 'vegetable oils and fats' sectors.

6.2.2 Scenario 1 vs. Baseline

Columns 2 and 3 of Table 4 show Morocco's aggregate sectoral trade balances in the 2001 benchmark and changes in Moroccan sectoral trade balances from abolition of all agro-food import protection between the EU27 and Morocco. Examining the Moroccan primary agricultural trade balances, only 'vegetables and fruit' show real improvement ($US0.052bn.) as (i) it is the only EU primary agricultural sector with significant protection on Moroccan imports and (ii) Morocco has considerable export trade with the EU27 in this sector ($US0.400bn, see Table 1). In 'crops' and 'livestock' sectors, trade balances worsen as Moroccan import demand responds to the removal of high agricultural Moroccan tariffs on EU imports. Worryingly, from the perspective of Morocco, the deterioration in the 'crops' trade balance is estimated to fall below -$US1bn as a result of full tariff elimination, whilst also accounting for 118% of the deteriorating change in the primary agricultural trade balance. In 'other agriculture' which primarily includes fishing activities, EU import protection is zero and Moroccan imports are small ($US0.003bn). Thus, a unilateral removal of Morocco's import tariff only leads to insignificant negative changes to the trade balance.

Changes in output in primary agricultural sectors reflect conditions in domestic and foreign markets. With the exception of the 'vegetables, fruit and nuts' sector, primary agricultural bilateral tariff removal is close to a unilateral tariff removal by Morocco. Accordingly, in 'vegetables, fruit and nuts' export led growth stimulates domestic output increases of 3.6% above the baseline. By contrast, in 'crops' and 'other agriculture' sectors, import substitution reduces domestic demands and sectoral outputs. This result (particularly in the crops sector) certainly supports the assertion by Oxfam that core subsistence sectors could suffer from a bilateral tariff elimination deal.[38]

In the 'livestock' sector, output increases despite the deterioration in the trade balance since intermediate input (domestic) demands from the expanding downstream 'meat products' sector rise. Indeed, in the food processing sectors, domestic output changes are complicated by the response of imperfectly competitive rationalisation effects to tariff removal. As noted above, many Moroccan (food) manufacturing industries are highly concentrated after many years of tariff protection. Accordingly, tariff elimination is likely to yield significant rationalisation effects. Morocco's meat processing sector is unusually characterised by the fact that export demand is considerably larger than domestic demand. Thus, with EU elimination of tariffs increased export demand has larger than normal impacts on Moroccan sector output,[39] which leads to increases in output per firm (see Table 4). The extent of the fall in the domestic mark-up from the large increase in firm numbers,[40] increases the export competitiveness of the sector thereby improving the trade balance by $US0.456bn.

In 'dairy' and particularly 'other food' processing sectors Moroccan import tariffs are relatively high compared with the EU. Thus, on bilateral tariff elimination Moroccan trade balances deteriorate -$US0.068bn and -$US0.019bn in 'dairy' and

[38] See also appendix 2.
[39] Note that the large percentage increase in meat product output of 159% in Table 4 is calculated from a small base flow. The meat products sector in Morocco is the smallest of the food processing sectors in the aggregation.
[40] We assume free entry and exit of firms in the long run. See appendix 1.2 for further details of the characterisation of imperfectly competitive sectors.

'other food' sectors respectively. With increased import substitution, domestic sales also fall resulting in contracting output and increased mark-ups relative to the baseline. In 'vegetable oils and fats', the structure of bilateral protection between the EU and Morocco greatly favours the latter, where EU export demand on bilateral abolition results in strong (11%) sectoral and per firm output growth. Finally, in 'sugar processing' and 'beverages and tobacco', there is relatively greater tariff parity between both the EU and Morocco. However, bilateral tariff removal appears to marginally benefit these sectors' trade balances and outputs compared with the trade diversion losses facing Morocco in the baseline from formation of the European single market.

Regional Gains[41]

Despite large inter-sectoral effects in Moroccan agro-food sectors from complete liberalisation of agro-food trade with the EU27, welfare estimates in Table 5 column 2, suggest that Morocco *gains only marginally* from agro-food liberalisation by $US0.067bn, or a per capita income real income gain of 0.14 per cent above the baseline.[42] Allocative efficiency is measured as the money metric change in the usage of a taxed/subsidised (higher valued/lower valued) resource or product from elimination of a given market distortion (e.g., import tariff).[43] In the context of this simulation, whilst tariffs are falling they still lead to simultaneous increases in imports (*ceteris paribus*) resulting in cumulative increases in allocative efficiency. Accordingly, a positive allocative efficiency estimate is a measure of pareto improvement in resource

[41] For a full discussion of EV welfare decomposition, see McDougall (2003).

[42] The aggregate percentage real income gains are presented as per capita given the non-homotheticity of the private utility function in the GTAP model structure.

[43] Thus, a tariff on a product implies an 'under-efficient' usage of resources as the economy is producing/consuming less compared with free undistorted market forces. Conversely, a subsidy encourages over-production (i.e., more than under free market conditions) and therefore is a waste of resources.

allocation.[44] Thus, EU-Moroccan agro-food tariff elimination results in an allocative efficiency gain of $US0.045bn for Morocco.

With the interaction of countrys/regions in the CGE model (all domestic markets clear), the global balance of payments must net to zero (i.e., one region's balance of trade surplus must be compensated by another region's balance of trade deficit). This 'closure' condition implies that total savings and imports must equal total investment and exports.[45] Under long run closure, investment is directly determined by fixed savings rates respecting the long run empirical observation that domestic saving finances domestic investment (Francois *et al.,* 1996). Thus, import increases from *unilateral* tariff liberalisation require export increases to restore trade balance which implies significant reductions in export prices, which, *Ceteris paribus*, would lead to a terms of trade (ToT) loss. However, however, given reciprocal elimination of EU import tariffs on protected agro-food sectors, the required reduction in Moroccan export prices to stimulate export demands is muted, resulting in a marginal ToT gain of $US0.008bn to Morocco.

Employing standard economic partial equilibrium analysis, opening up imperfectly competitive sectors to trade competition through a unilateral abolition of tariff barriers leads, *ceteris paribus*, to a rationalisation of firms in the industry whilst output of incumbent firms increases.[46] With industry fixed costs now spread over greater production units at the firm level, average cost and output price under zero long run profit assumptions will fall. In Table 5, the pro-competitive estimates presented are

[44] Note that the implementation of a private consumption tax replacement scheme to offset lost tariff revenues has a dampening effect on allocative efficiency in that compensatory increases in private consumption taxes reduce private demands.
[45] In a CGE model, the closure or split of exogenous/endogenous variables, determines the macroeconomic assumptions underlying the model. In this closure, this is merely a formalisation of the fact that the current and capital accounts must balance (i.e., balance of payments is zero).
[46] This analysis is complicated in a general equilibrium specification, since it is possible that industry output may also decline as primary resources are diverted to sectors which are more trade competitive. Thus, as well as rationalisation in the number of firms, it is possible in some sectors that incumbent firms may also reduce the scale of their output.

aggregate efficiency gains across all industry firms from scale increases. In Morocco, pro-competitive effects are slightly positive ($US0.004bn), where improvements in oligopolistic food sectors (except 'dairy' and 'other food') from increased per-firm output of $US0.011,[47] offset aggregate non-food sector output per firm contractions (-$US0.007) as resources are diverted toward the food sectors relative to the baseline.

The projections costs measure the money metric or real income value contributions of exogenous projections in population, factor endowments and productivity.[48] In Morocco, the contribution of all three projections increases as the values of primary factors, production and real income rise relative to the baseline in response to agro-food tariff elimination.

Examining the welfare impacts in the EU27 in Table 5 reveals that an agro-food tariff free deal with Morocco would also benefit the EU27. In other words, the real long run cost of allowing the Morocco-US bilateral deal to go unchallenged is estimated to be $0.234billion, although as Table 5 shows, as a proportion of EU27 real income, the gain is negligible (+0.0 per cent of GDP).[49] The main areas of gain are the allocative efficiency effects ($US0.184bn) from elimination of EU27 tariffs (particularly 'meat products' tariffs) and terms of trade gains ($US0.052bn). In the EU27, projections increases in EV are dominated by rising productivity and endowments contributions as production and primary factor values increase relative to the baseline.

As noted in section 4.3, the treatment of trade costs follows Samuelson's (1954) 'iceberg costs' approach. In theoretical terms, the trade costs are equivalent variation value estimates of an upward shift in the marginal value product of an input. In GTAP,

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[47] Overall, Moroccan food processing output expands 7.4% compared with the baseline (see Table 4). Most of the food processing gain comes from representative output per firm increases in the highly concentrated (i.e., significant fixed costs) sugar processing sector.

[48] Note in the case of population, real income changes are measured as per capita values multiplied by population to gain a national equivalent variation estimate.

[49] Moreover, concerns that EU vegetables and fruit sectors could be seriously affected by comparative advantage in Morocco are not supported in these results (estimated output reduction (not shown) of only 0.2 per cent), whilst crops output in the EU rises 0.8 per cent from free market access to Morocco.

the definition of such ‘inputs’ may be broadened to include primary factors, intermediate inputs, or even inputs (purchases) to final demands. Thus, a positive trade cost efficiency estimate is attributed to greater trade possibilities from improved import ‘efficiency’. Note, that unlike tariff cuts, there is no loss in revenue to the importing country from the ‘removal’ of trade costs. Indeed, the welfare impacts are unambiguously positive as trade cost removal lowers the effective price of products on all affected bilateral routes in the importing country.

In scenario 1, Table 5 shows non-zero trade costs in the EU27 given the elimination of additional non-tariff trade barriers on formation of the single market (i.e., EU15 becomes EU27). The negative trade cost estimate *relative to the baseline* represents reduced trade cost efficiency from formation of the European single market due to trade diversion to Morocco from bilateral elimination of agro-food tariff eliminations.

6.3 Scenarios 2 and 3

Table 3 also presents regional welfare impacts from removal of agro-food NTB trade costs (scenario 2) and *all* NTB trade costs (scenario 3) between Morocco and the EU27. That Morocco’s EV gains rise considerably under scenarios 2 and 3 reflects the importance of the EU27 as a trading partner. In scenario 2, the opportunity cost estimates of non-tariff barriers to trade (i.e., trade costs) in Morocco are estimated to be $US0.458bn relative to the baseline, whilst in scenario 3 these gains are magnified approximately six-fold to $US2.713bn. Accordingly, in aggregate EV terms Morocco’s long run per capita real income gains are estimated to be 3.3% above the baseline ($US1.501bn) in scenario 2, whilst complete removal of all trade barriers could yield a long run per capita real income gain to Morocco of 12.23% ($US5.945bn).

As a result of enhanced import trade between Morocco and the EU27 from abolition of trade costs, allocative efficiency rises in both regions. In Morocco, under conditions of scenario 2 and 3, allocative efficiency increases \$US0.283bn and \$US0.950bn respectively. Moreover, the increased level of trade induced economic activity in scenario 2 bids up Moroccan factor prices (not shown) resulting in greater terms of trade gains (\$US0.706bn). A similar, albeit magnified, result occurs in scenario 3 leading to even greater terms of trade gains (\$US0.757bn).

In the imperfectly competitive sectors, the removal of food processing trade cost barriers results in reductions in aggregate pro-competitive effects of -\$US0.043bn. Food sector gains (\$US0.163bn) are outweighed by reductions in non-food sectors (-\$US0.206bn) as resources are diverted toward food sector activities. Removal of all trade costs benefits both food and non-food sectors. Indeed, given high benchmark concentration and mark-ups in 'chemical products', 'motor vehicles' and 'other manufacturing' sectors, increased scale effects lead to significant pro-competitive effects from these sectors. Finally, projections costs in Morocco are dominated by population projections. Thus, increased exogenous population contributions to *aggregate* EV reflect successively increasing *per capita* real income gains.

Finally, as in Morocco, the largest EU27 welfare gains are from allocative efficiency and NTB trade costs reductions, resulting in aggregate EV gains of \$US2.898bn and \$US3.548bn respectively, or per capita real income gains of 0.03% and 0.04% in scenarios 2 and 3 respectively.

7. Conclusions

In recent years, the vacuum left by the failure of the ongoing multilateral trade talks to reach agreement has been filled by a more bilateralist or regionalist stance to free trade. The US has aggressively pursued such a stance in recent years, signing numerous bilateral treaties whilst also pushing to create regionalist free trading areas such as a Free Trade Area of the Americas (FTAA) and a Middle East Free Trade Area (MEFTA) initiative. As a counterbalance to US dominance in global trading relations, the EU have followed suit and are currently negotiating bilateral trade and/or association agreements with (*inter alia*) the Gulf Cooperation Council (Bahrain, Qatar, Kuwait, Oman, Saudi-Arabia), Mercosur (Argentine, Brazil, Paraguay and Uruguay), and the Mediterranean littoral countries and Syria. In addition, the EU plans to conclude regional trade liberalisation agreements, the so-called Economic Partnership Agreements, with the ACP-countries.

Whilst the benefits to poorer trading nations outside of the multilateral framework are marginal at best, Morocco has successfully negotiated trade agreements with both players.[50] Indeed, the depth of the US-Moroccan trade agreement is typical of the new US threat to EU political and economic influence within the Middle East and North Africa. In the context of Morocco, the association agreement with the EU falls significantly short of the US trade deal within the sphere of agro-food trade. Thus, in this paper we examine the potential additional impacts of extending the existing Morocco-EU association agreement (examined in Elbehri and Hertel, 2003) to include the agro-food trade liberalisation. A further aim of the paper is to deepen the reform scenario to measure the welfare impacts of NTB removal between the EU and Morocco. Indeed, removal of non-tariff trade costs have been largely untouched within the multilateral forum, whilst to our knowledge this is the first study of this type applied to Morocco.

[50] Israel and Jordan also have bilateral FTAs with the US.

To measure NTBs, we estimate potential trade employing a residual based theoretically consistent gravity model, which allows for a comprehensive range of cultural, geographical, per capita income and infrastructure dummy variables consistent with recent gravity studies in the literature. The model results shows that the explanatory power of the model (adjusted R^2) is greater than 0.74 for a majority of sectors, while most of the explanatory variables are highly significant and affect trade consistently with the theory. Comparing potential trade estimates from the gravity model with actual trade flows, we derive NTB tariff equivalents across each of the sectors which are subsequently implemented within the CGE model to calculate trade and welfare impacts.

The results of the agro-food liberalisation scenario suggest that Morocco's potential trade and growth gains are limited. We suggest that the trade diversionary impacts on Moroccan agro-food markets from expansion of the EU to twenty-seven members and the inclusion of multilateral tariff reductions under a stylised Millenium Round outcome in our baseline, greatly reduces Morocco's 'additional' gains. Furthermore, whilst Morocco's specialisation in 'typical' Mediterranean vegetables, fruits and nuts products reaps gains, the crop sector which sustains many of the rural poor contracts. The latter result supports initiatives by Oxfam to introduce asymmetrical liberalisation measures. In the case of the EU27, the gains are negligible suggesting that the Moroccan-US agro-food package is of little cost to the EU. Indeed, on the basis of these long run estimates, it would be difficult for EU policy makers to justify agricultural liberalisation measures given the political sensitivity of lowering trade barriers to foreign competition in these products.

In contrast, further experiments examining the impact removing Moroccan-EU NTB trade costs in agro-food (scenario 2) and all (scenario 3) sectors yields significant real income gains to the Moroccan economy. The removal of agro-food NTB tariff equivalents yields per capita real income gains of 3.3% above the long run baseline, whilst this result is estimated to climb to 12.2% on removal of all trade costs. Interestingly, the model estimates that the potential real income gains from the dismantling/harmonisation of all NTB costs with the EU could be $US2.713bn.

To some extent the magnitude of these gains is to be expected given the size of the NTB tariff equivalents extrapolated from the gravity model and 'additional' welfare enhancing pro-competitive effects from the liberalisation of highly concentrated manufacturing industries in scenario 3. However, such results should be regarded as upper bound estimates since the dismantling of such costs would realistically apply to all Euro-Mediterranean Partnership members thereby diluting (trade diversion) the welfare gains to Morocco. Furthermore, it should be noted that a neo-classical long run multi-region CGE representation has little to say about the structural challenges (fiscal balance, exchange rate volatility, frictional movements in labour) that face Morocco in the short to medium term. Indeed, the results of these simulations should be treated with caution in that they do not shed light on the degree of welfare distribution or poverty alleviation from a modified bilateral deal. Notwithstanding, if the inferred NTB estimates from the econometric specification are to be believed, the long term potential for trade-led development policies in Morocco of this nature is considerable whether they be negotiated within a multilateral or bilateral forum.

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9. Appendix

1.1 Values of gravity variables in the composite regions

To calculate distances from a composite to an individual country, arbitrarily a capital city of the aggregated area was selected. The selections made are: for North Africa, Tunis in Tunisia; Middle East, Riyad in Saudi Arabia; Central America or CACM, Guatemala city (Guatemala); Rest of Andan Pact, Quito (Ecuador); Rest of Caribbean, Habana (Cuba); Rest of Free Trade Area of America or CARICOM, Kingston (Jamaica); Rest of North America, Juneau (Alaska); Rest of South America, Asunción (Paraguay); Rest of the World, Nairobi (Kenya).

To calculate the internal distances of the composites, an average of all the bilateral distances between capitals is calculated. In the Rest of the World composite, a country/ capital in each continent has been selected, and then, an average of the bilateral distances between these selected countries is calculated. These selected capitals (countries) were: Beijing (China) for Asia; Nairobi (Kenya) for Africa; Bern (Switzerland) for Europe; and Canberra (Australia) for Oceania.

To choose a value for the contiguity ($cont_{ij}$) variable when at least one of the countries involved is a composite, a value of 1 is assigned if there is a common border either with all the countries within the composite or with the country with the highest GDP of the composite. The common language variable ($lang_{ij}$) when at least one of the trade partners is a composite, takes value 1 when the country shares any of the languages spoken by the composite.

The quantitative variables, exports, GDP variables, population (used for per capita indicators) and infrastructure indicators, are aggregated across the countries within the composites to calculate the overall composite value. The price index for composites, are averages of the individual price indexes across the countries involved in the composite.

1.2 The composition of costs, mark-ups and free entry/exit of firms in imperfectly competitive industries.

Due to a lack of data, all firms are assumed symmetric (i.e. the same cost and technology structure and face the same demand conditions) and treated as a micro-scaled version of the industry.

(i) Mark-ups

In imperfectly competitive industries, each firm possesses market power to mark-up output price (P) over marginal cost (MC) leading to short-run profits. A symmetric firm´s profit function is:

$$\Pi_i = PQ_i - TC_i \qquad \text{(A1)}$$

where: Π_i is profit; P is *industry* price; Q_i is firm output; and TC_i is total costs. The decision to employ the Cournot assumption of quantity as a strategic variable was considered to be more appropriate in characterising perishable food markets, which are the main focus of this study, whilst Elbehri and Hertel (2003) also justify Cournot on the grounds of relatively higher industry concentration and less emphasis on firm level product differentiation which relies more on price as a strategic variable. Under Cournot assumptions, firms maximise profit subject to output changes, where each symmetric firm conjectures the output responses of rivals to changes in its own output. Taking the derivative $\left(\partial \pi_i / \partial Q_i\right)$, and manipulating the resulting first order conditions gives firm´s mark-up:

$$MARKUP_i = \frac{P - MC_i}{P} = \frac{\Omega_i}{N}.\left|\frac{1}{\varepsilon}\right| \qquad \text{(A2)}$$

Ω_i is the conjectural variation parameter characterising changes in industry output (T) with respect to changes in firm output (Q_i); N is the number of firms in the industry; multiplied by the *absolute* value of the inverse elasticity of demand for the industry tradable. Under the assumption of symmetry, 1/N is equivalent to Q_i/T. Thus, we can derive the Cournot conjectural variation elasticity:

$$\frac{\Omega_i}{N} = \frac{\partial T}{\partial Q_i}\frac{Q_i}{T} \qquad \text{(A3)}$$

In this paper, standard Cournot-Nash equilibrium is used, where Ω has a value of 1. Thus, firm 'i' believes that all rivals' outputs remain fixed. Note that the value of N is updated by changes in the number of firms entering/leaving the imperfectly competitive industry (see below). Further, the differentiation of mark-ups from region 'r' across foreign and domestic bilateral routes ('s') is a function of endogenous changes in the absolute value of the inverse elasticity of domestic (r=s) and foreign (r≠s) demand. The aggregate industry mark-up in region 'r' is a weighted sales share of each of the bilateral sales mark-ups to regions 's' (r=s, r≠s).

(ii) Calibration of firm numbers

Following Elbehri and Hertel (2003), the Cournot mark-up condition can also be derived as:

$$\frac{P - MC_i}{P} = \frac{H}{\varepsilon} \qquad \text{(A4)}$$

where H is the Herfindahl index of concentration which is the sum of the squared market shares of all n firms in the industry, and ε is the inverse elasticity of demand for the industry tradable. Comparing equations (A4) and (A2) and assuming a standard Cournot-Nash conjectural variation value (Ω) of 1, reveals that H = (1/N). Thus, borrowed Herfindahl concentration data for Morocco (Elbehri and Hertel, 2003), and extrapolated data for the EU15 and the ROW (Haaland and Tellefsen, 1994) are used to calibrate benchmark firm numbers. Since the EU is now a composite of 27 members (rather than 15) and the ROW composite does not include EU accession members and the USA, we extrapolate firm numbers following Augier and Gasiorek (2000) as the ratio of sector production to firm numbers. In the case of the USA, Herfindahl data is taken from the US Census Bureau (2001).

(iii) The structure of costs

Examining expression (A2), with constant returns to scale in production yielding constant average variable costs (equal to marginal costs), and long run zero profits in each imperfectly competitive sector, a mark-up of 0.3 implies average variable and fixed cost components constitute 70% and 30% of the output price (or average total cost) respectively. Thus, the composite (i.e., domestic and foreign) mark-up for each imperfectly competitive sector apportions *total* fixed and variable costs as fractions of total industry costs.

(iv) Entry/exit of firms/varieties

Long run profit is eliminated through entry/exit of firms (product variants) and is largely a function of (i) endogenous mark-up effects and (ii) changes in average fixed (and therefore total) costs due to changes in output per firm (scale effects), where (i) and (ii) combined are known as pro-competitive effects. Thus, a fall in the mark-up will signal, *ceteris paribus*, falling profits and therefore an exodus of firms from the industry (or *vice versa*). In linear terms (denoted by lower case letters), industry market clearing is given as:

$$qo_{i,r} = qofm_{i,r} + n_{i,r} \qquad \text{(A5)}$$

In the absence of changing industry output ($qo_{i,r}$), a reduction in firm numbers ($n_{i,r}$), will signal an increase in output per firm ($qofm_{i,r}$) which is also consistent with the reduction in the mark-up (or *vice versa*).

10. Tables

	Trade flows ($US 2001 millions)			Bilateral import tariff (% ad valorem rate)	
	Morocco - EU	EU – Morocco	Sector Balance	Morocco - EU	EU – Morocco
Crops	62.4	313.9	-251.6	1.4	27.6
Vegetables, Fruit & Nuts	399.8	14.1	385.7	11.2	41.8
Livestock	24.0	15.5	8.5	0.3	30.7
Other Agriculture	97.0	2.9	94.0	0.0	19.6
Meat Products	11.0	16.6	-5.6	92.2	151.8
Vegetable Oils & Fats	1.4	20.8	-19.3	47.5	13.5
Dairy	2.4	71.9	-69.6	10.9	58.1
Sugar Processing	9.1	1.1	8.0	11.6	36.5
Other Food Processing	507.3	72.7	434.5	1.1	34.0
Beverages & Tobacco	8.1	24.3	-16.2	14.9	24.3
Agriculture	583.2	346.5	236.7	-	-
Food	539.2	207.4	331.8	-	-
Total Trade	6900.4	7059.6	-159.2	-	-

Table 1: Moroccan – EU27 Trade relations.
Source GTAP version 6 Beta data.

Table 2. Estimation of the gravity equation

Sector		α	gdpi	gdpj	sqincij	Pri	Prj	Infri	Infrj	distij	Contij	Langij	Mtj	Xsi	$\overline{R}^2$	Condition Number
Crops	Coefficient	-39.419	1.487	1.012	-0.009	**-3.168**	0.120	0.016	**0.282**	**-0.918**	**1.311**	**0.558**	**0.077**	**0.073**	0.724	80.725
	std error	1.089	0.026	0.029	0.015	0.195	0.197	0.042	0.045	0.059	0.235	0.163	0.009	0.010		
	p-value	0.000	0.000	0.000	0.577	0.000	0.542	0.699	0.000	0.000	0.000	0.001	0.000	0.000		
Vegetables, fruits and nuts	Coefficient	-32.744	**1.224**	**0.856**	0.002	**-2.057**	**0.694**	-0.059	**0.400**	**-0.651**	**1.510**	**0.519**	**0.058**	**-0.168**	0.676	81.782
	std error	1.055	0.027	0.028	0.018	0.218	0.189	0.044	0.043	0.058	0.237	0.160	0.005	0.075		
	p-value	0.000	0.000	0.000	0.932	0.000	0.000	0.187	0.000	0.000	0.000	0.001	0.000	0.026		
Livestock	Coefficient	-29.116	**0.980**	**1.075**	**-0.025**	**-1.548**	0.176	**0.331**	**0.162**	**-0.909**	**1.473**	**0.259**	**0.046**	**0.474**	0.762	80.469
	std error	0.822	0.023	0.022	0.013	0.176	0.156	0.035	0.036	0.046	0.185	0.123	0.008	0.210		
	p-value	0.000	0.000	0.000	0.064	0.000	0.257	0.000	0.000	0.000	0.000	0.035	0.000	0.024		
Other agricultural products	Coefficient	-33.756	**0.992**	**1.037**	**-0.038**	**-0.802**	**0.928**	-0.002	**0.219**	**-0.776**	**1.054**	**0.585**			0.599	77.283
	std error	1.121	0.037	0.030	0.017	0.261	0.193	0.065	0.044	0.066	0.282	0.183				
	p-value	0.000	0.000	0.000	0.029	0.002	0.000	0.981	0.000	0.000	0.000	0.001				
Meat	Coefficient	-25.669	**0.882**	**0.858**	-0.005	**0.411**	**0.410**	**0.447**	**0.160**	**-0.463**	**2.091**	**0.851**	**0.050**	**-0.012**	0.762	80.469
	std error	0.956	0.025	0.026	0.018	0.184	0.168	0.033	0.040	0.060	0.240	0.163	0.004	0.003		
	p-value	0.000	0.000	0.000	0.772	0.025	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
Vegetable oils and fats	Coefficient	-31.952	**1.111**	**0.926**	**-0.023**	-1.021	-0.082	**0.217**	**0.080**	**-0.817**	**1.526**	**0.384**	**0.077**	**-0.064**	0.715	82.273
	std error	1.031	0.026	0.025	0.017	0.160	0.161	0.035	0.036	0.056	0.274	0.176	0.009	0.153		
	p-value	0.000	0.000	0.000	0.168	0.000	0.611	0.000	0.027	0.000	0.000	0.029	0.000	0.674		
Dairy	Coefficient	-26.263	**0.902**	**0.926**	**-0.058**	0.209	**0.405**	**0.486**	-0.062	**-0.696**	**1.707**	**0.493**	**0.029**	0.001	0.735	81.405
	std error	0.940	0.022	0.024	0.014	0.152	0.169	0.029	0.039	0.051	0.232	0.154	0.003	0.005		
	p-value	0.000	0.000	0.000	0.000	0.170	0.017	0.000	0.115	0.000	0.000	0.001	0.000	0.793		
Sugar	Coefficient	-32.707	**1.111**	**0.954**	**-0.071**	**-1.784**	0.141	**0.153**	0.037	**-0.849**	**1.284**	**0.373**	**0.044**	0.000	0.661	83.333
	std error	1.089	0.025	0.028	0.020	0.202	0.188	0.042	0.042	0.063	0.258	0.171	0.004	0.003		
	p-value	0.000	0.000	0.000	0.000	0.000	0.454	0.000	0.373	0.000	0.000	0.030	0.000	0.875		

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Sector		α	gdpi	gdpj	sqincij	Pri	Prj	Infri	Infrj	distij	Contij	Langij	Mtj	Xsi	$\overline{R}^2$	Condition Number
Other food products	Coefficient	-27.587	**1.092**	**0.915**	**-0.026**	**-1.253**	0.144	-0.015	**0.266**	**-0.853**	**1.435**	**1.342**	**0.028**	**0.130**	0.741	80.885
	std error	0.823	0.024	0.024	0.013	0.196	0.161	0.044	0.038	0.048	0.166	0.131	0.005	0.032		
	p-value	0.000	0.000	0.000	0.048	0.000	0.371	0.735	0.000	0.000	0.000	0.000	0.000	0.000		
Beverages and tobacco	Coefficient	-22.933	**0.874**	**0.780**	**-0.037**	**0.295**	**1.186**	**0.296**	**0.227**	**-0.520**	**1.362**	**1.659**	**0.023**	**0.556**	0.730	80.489
	std error	0.882	0.022	0.023	0.015	0.175	0.158	0.037	0.036	0.050	0.206	0.140	0.003	0.132		
	p-value	0.000	0.000	0.000	0.015	0.092	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
Raw materials	Coefficient	-34.542	**1.333**	**1.134**	**-0.032**	**-2.132**	**-0.905**	**0.126**	**0.424**	**-1.037**	**0.954**	**0.657**	**0.080**	**-0.162**	0.727	80.166
	std error	1.064	0.030	0.028	0.014	0.177	0.189	0.043	0.045	0.057	0.221	0.173	0.021	0.031		
	p-value	0.000	0.000	0.000	0.026	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000		
Textiles	Coefficient	-25.497	**1.144**	**0.977**	**0.037**	**-1.029**	**-0.615**	**0.245**	**0.104**	**-1.435**	**0.319**	**0.450**	**0.013**	**0.018**	0.802	82.766
	std error	0.778	0.021	0.021	0.014	0.121	0.154	0.029	0.037	0.045	0.167	0.115	0.006	0.008		
	p-value	0.000	0.000	0.000	0.009	0.000	0.000	0.000	0.005	0.000	0.055	0.000	0.037	0.026		
Wearing apparel	Coefficient	-24.585	**1.080**	**0.946**	0.011	**-2.084**	**0.363**	**0.105**	**0.095**	**-1.261**	**0.311**	**0.302**	-0.007	**-0.027**	0.789	82.401
	std error	0.798	0.021	0.021	0.013	0.127	0.150	0.029	0.034	0.043	0.169	0.120	0.005	0.010		
	p-value	0.000	0.000	0.000	0.411	0.000	0.016	0.000	0.006	0.000	0.065	0.012	0.134	0.010		
Word products	Coefficient	-23.622	**0.971**	**1.010**	0.007	**-0.331**	**0.522**	**0.388**	**0.170**	**-1.274**	**0.699**	**0.676**	**0.024**	**0.111**	0.728	81.249
	std error	0.971	0.025	0.026	0.016	0.145	0.183	0.032	0.043	0.052	0.200	0.149	0.009	0.021		
	p-value	0.000	0.000	0.000	0.668	0.023	0.004	0.000	0.000	0.000	0.000	0.000	0.006	0.000		
Paper & publishing	Coefficient	-26.083	**1.034**	**0.953**	-0.011	**1.163**	**-0.348**	**0.226**	**0.075**	**-1.136**	**1.051**	**1.002**	**0.016**	**0.276**	0.816	79.846
	std error	0.754	0.019	0.019	0.012	0.131	0.136	0.030	0.036	0.044	0.174	0.120	0.007	0.033		
	p-value	0.000	0.000	0.000	0.355	0.000	0.010	0.000	0.035	0.000	0.000	0.000	0.035	0.000		
Chemical products	Coefficient	-25.558	**1.076**	**1.013**	0.008	0.193	**-1.262**	**0.338**	0.019	**-1.104**	**0.677**	**0.995**	**-0.031**	**-0.051**	0.835	80.473
	std error	0.665	0.021	0.020	0.011	0.132	0.149	0.038	0.042	0.039	0.144	0.107	0.010	0.015		
	p-value	0.000	0.000	0.000	0.445	0.143	0.000	0.000	0.643	0.000	0.000	0.000	0.001	0.001		

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Sector		α	gdpi	gdpj	sqincij	Pri	Prj	Infri	Infrj	distij	Contij	Langij	Mtj	Xsi	$\overline{R}^2$	Condition Number
Metal products	Coefficient	-29.404	**1.203**	**1.090**	0.014	**-0.526**	-0.205	**0.398**	-0.003	**-1.370**	**0.713**	**0.723**	**0.022**	0.049	0.800	80.981
	std error	0.820	0.024	0.022	0.012	0.148	0.165	0.039	0.046	0.048	0.173	0.124	0.010	0.056		
	p-value	0.000	0.000	0.000	0.231	0.000	0.214	0.000	0.941	0.000	0.000	0.000	0.026	0.378		
Motor Vehicles	Coefficient	-30.606	**1.215**	**0.974**	-0.005	**0.753**	**0.439**	**0.270**	**0.078**	**-1.141**	**0.783**	**0.460**	**0.039**	**0.238**	0.769	80.649
	std error	0.918	0.025	0.027	0.012	0.163	0.181	0.039	0.047	0.054	0.188	0.135	0.008	0.055		
	p-value	0.000	0.000	0.000	0.674	0.000	0.016	0.000	0.095	0.000	0.000	0.001	0.000	0.000		
Light manufacturing	Coefficient	-25.965	**1.131**	**1.023**	**0.032**	**0.717**	**-0.636**	**0.443**	**0.144**	**-1.248**	**0.353**	**0.822**	**0.036**	**-0.050**	0.820	79.584
	std error	0.762	0.021	0.023	0.013	0.130	0.158	0.034	0.046	0.044	0.163	0.115	0.012	0.023		
	p-value	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.002	0.000	0.031	0.000	0.003	0.031		
Other manufactures	Coefficient	-30.730	**1.092**	**1.005**	0.018	**0.339**	0.129	**0.230**	**0.083**	**-0.979**	**0.538**	**0.862**	0.010	**0.129**	0.816	81.743
	std error	0.751	0.020	0.021	0.012	0.128	0.149	0.031	0.035	0.042	0.152	0.108	0.007	0.032		
	p-value	0.000	0.000	0.000	0.115	0.008	0.389	0.000	0.017	0.000	0.000	0.000	0.145	0.000		
Utilities	Coefficient	-17.999	**0.634**	**0.949**	**-0.040**	**-0.396**	-0.073	**0.503**	**0.441**	**-0.474**	**1.051**	**-0.786**			0.611	76.761
	std error	1.046	0.026	0.026	0.016	0.150	0.155	0.032	0.035	0.057	0.278	0.136				
	p-value	0.000	0.000	0.000	0.013	0.008	0.640	0.000	0.000	0.000	0.000	0.000				
Services	Coefficient	-22.784	**0.804**	**0.877**	-0.004	**0.559**	**0.473**	**0.213**	**0.153**	**-0.162**	**-0.339**	**-0.104**			0.933	76.757
	std error	0.317	0.008	0.008	0.005	0.051	0.051	0.012	0.013	0.017	0.069	0.051				
	p-value	0.000	0.000	0.000	0.434	0.000	0.000	0.000	0.000	0.000	0.000	0.042				

Importer	Exporter	Crops	Vegetables, fruits and nuts	Livestock	Other agricultural products	Meat	Vegetable oils and fats	Dairy	Sugar	Other food products	Beverages and tobacco	Raw materials
Morocco	EU15	12.2	93.7	113.1	28.3	52.5	22.6	19.0	92.6	83.0	297.8	26.5
Morocco	EU12	0	164.9	267.5	140.5	47.7	78.1	10.1	108.9	91.4	357.1	0
Eu15	Morocco	22.8	0	59.0	0	55.0	143.5	60.2	29.1	11.3	403.0	20.1
EU12	Morocco	34.9	0	64.2	11.5	142.2	58.1	50.3	32.0	49.6	730.4	2.4
EU15	EU12	48.6	115.5	150.2	93.6	29.3	83.9	54.9	134.1	99.1	242.7	26.1
EU12	EU15	94.2	53.1	141.1	56.8	31.6	35.1	62.6	102.2	89.0	314.3	30.3

Importer	Exporter	Textil	Wearing appliances	Wood	Paper	Chemical	Metal	Motor	Light manufacturing	Other manufactures	Utilities	Services
Morocco	EU15	0.9	5.0	35.1	34.4	22.2	23.3	56.6	18.4	35.4	67.1	56.7
Morocco	EU12	42.4	47.1	9.2	17.1	28.8	9.9	44.7	21.1	52.5	106.2	55.6
Eu15	Morocco	1.6	0	17.9	2.0	12.8	21.6	31.9	5.8	25.3	144.3	18.2
EU12	Morocco	16.0	16.6	50.3	28.8	54.4	51.8	34.9	4.5	40.6	161.0	24.2
EU15	EU12	29.4	24.4	24.2	21.2	29.0	25.7	21.0	10.2	32.4	70.9	37.7
EU12	EU15	24.3	21.8	41.0	31.9	25.4	24.7	46.1	20.8	37.9	62.1	40.1

Table 3. NTB's tariff-equivalents

	Trade bal. ($US 2001 millions)		Percentage changes in domestic market sectors.				
	2001 Benchmark	change	Sales	Prod.	Output per firm	Markup	Firms
Crops	-832.5	-247.9	-4.2	-4.0	-	-	-
Veget. & Fruit	460.3	51.9	0.4	3.6	-	-	-
Livestock	21.8	-14.4	1.4	1.4	-	-	-
Other Agric.	99.2	-0.2	-0.4	-0.3	-	-	-
Meat Prod.	-20.1	155.7	-64.6	159.1	114.9	-66.3	44.2
Veg. Oils & Fats	-140.0	13.9	3.1	10.8	8.9	-5.8	1.9
Dairy	-64.8	-67.9	-21.1	-17.7	-0.4	1.4	-17.3
Sugar Prod.	-48.8	3.5	0.6	0.8	1.3	0.5	-0.5
Oth. Food Prod.	734.3	-19.3	-0.7	-0.4	-1.1	0.1	0.7
Bev. & Tobac.	-63.6	1.5	0.1	0.1	0.7	0.4	-0.6
Agriculture	-251.1	-210.6	-0.8	-0.1	-	-	-
Food Prod.	397.0	387.4	-1.8	7.4	-	-	-
Total	-331.0	-7.5	-	-	-	-	-

Table 4: Experiment 1: Estimated Impacts on Morocco from Agro-food FTA compared with the baseline.

	Scenario 1: Agric tariff removal		Scenario 2: Remove all Agricultural tariffs and NTBs		Scenario 3: Remove all Agricultural tariffs and *all* NTBs	
	Morocco	**EU27**	**Morocco**	**EU27**	**Morocco**	**EU27**
EV	67.0	233.5	1581.3	2897.8	5944.8	3547.8
EV (% of national income)	0.14	0.00	3.30	0.03	12.23	0.04
Decomposition:						
Allocative efficiency	45.0	184.0	283.3	2656.0	950.0	2298.6
Terms of Trade	8.5	52.5	728.6	-478.2	769.3	-90.0
Pro-competitive Effects	4.1	-7.6	-43.0	84.8	754.1	-2.4
Of which:						
Food sectors	*11.3*	*-1.8*	*163.1*	*-41.1*	225.8	-31.0
Non food sectors	*-7.2*	*-5.7*	*-206.1*	*125.9*	528.3	28.6
Trade costs	0.0	-7.0	458.2	639.1	2713.4	1365.2
Projections costs	9.4	11.6	154.2	-3.9	758.0	-23.6

Table 5: Aggregate Welfare Impacts on Morocco from Agro-food FTA compared with the baseline.