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Preferential Trade Agreements Proliferation: Sorting out the Effects

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PREFERENTIAL TRADE AGREEMENTS PROLIFERATION: SORTING OUT THE EFFECTS

Sami Bensassi & José de Sousa & Joachim Jarreau

NON-TECHNICAL SUMMARY

Preferential trade agreements (PTA) have proliferated in the last decade with two striking features. First, from 1995 to 2010, their number increased fourfold to reach 300 PTAs in force (WTO, 2011). Second, their geographical coverage has expanded both within and between continents, and with the participation of developed and developing countries.

This proliferation implies multiple changes in terms of trade policy, and poses important theoretical and empirical challenges: A theoretical question is why do countries sign so many competing agreements, which mutually weaken their effects? Empirically, we need to disentangle the impact of a given agreement from externalities created by simultaneous PTAs and multilateral tariff reductions?

In this paper, we examine these questions using a counterfactual method that accounts for heterogeneity across PTAs, and allows estimating jointly their effect on trade creation, trade diversion, prices and real income. We apply this methodology to the recent changes of commercial policy of eight Middle East and North African (MENA) countries: Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, Tunisia and Turkey between 2001 and 2007. This region is typical of PTA proliferation. During the period under study, the MENA countries have signed and implemented agreements (1) with the European Union (EU), the EuroMED agreements, (2) between themselves, Greater Arab FTA (GAFTA) and the Agadir agreements, and (3) with countries outside the region and the EU, for example the agreement between Morocco and the USA in 2004. We estimate the impacts of these simultaneous trade barrier changes, also taking into account the effect of tariff reductions implemented by countries outside MENA.

Using data on actual tariff reductions, we estimate first the treatment effect of a given PTA taken in isolation, then its effects once concurrent trade policy changes are accounted for. Comparing these effects, we find that the concurrent trade policy changes considerably reduce, in some cases, the expected trade creation effect of a given agreement. The trade creation effect of EuroMed agreements has been considerably reduced by simultaneous integration processes of the MENA countries. This decrease is particularly noticeable for Egypt, a country which implemented large unilateral tariff reductions with non-PTA partners, during the period of implementation of its agreement with the EU. Similarly, trade creation between the Tunisia and Jordan and the EU has been absent, due to simultaneous integration processes. Overall, the impact of the EuroMED agreements on trade has been significant (above 2%) only for Algeria and Morocco, with a trade creation effect of 13.6 and 13.9%, respectively. This is due to the fact that these two countries only have reduced their tariffs relatively more with the EU than with

other trade partners. Hence, import costs from the EU have become relatively lower for these countries in comparison to competing sources, triggering a strong trade increase.

Despite small trade creation effects, we find that member countries did gain in real income from signing the EuroMed and Intra-Med PTAs; while non-member countries were adversely impacted Thus, we confirm that most countries have benefited overall from the tariff reductions implemented during our period of study, but we show that this is true only because PTAs proliferate: countries offset adverse effects of non-membership, by signing new agreements with existing PTA members. These expected losses create an incentive for countries to sign new agreements. Our results thus tend to confirm that the "domino effect" might well be one of the main reasons for the proliferation of FTA.

ABSTRACT

This paper studies the implications of Preferential Trade Agreements (PTAs) proliferation. Using counterfactual estimation, we disentangle the treatment effect of one PTA on members' trade and real income, from the externalities created by concurrent trade policy changes. Results, focusing on the MENA region between 2001 and 2007, reveal that the concurrent trade policy changes greatly weakened the trade creation effects of a PTA taken in isolation. However, countries do gain in real income from signing PTAs, even in the cases where trade creation is small; while non-members are negatively impacted. Thus, we confirm that most countries have benefited overall from tariff reductions in our period of study, but we show that this is true only because PTAs proliferate: countries offset adverse effects of non-membership, by signing new agreements with existing PTA members.

JEL classification: F13, F12, F47.

Keywords: International trade, Armington hypothesis, Counterfactual Estimation, Trade creation and diversion.

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LA PROLIFÉRATION DES ACCORDS PRÉFÉRENTIELS COMMERCIAUX: COMMENT DÉLIMITER LES EFFETS ?

Sami Bensassi & José de Sousa & Joachim Jarreau

RÉSUME NON TECHNIQUE

Les accords commerciaux préférentiels (ACP) ont proliféré ces dernières années. De 1995 à 2010, leur nombre a quadruplé pour atteindre 300 accords actuellement enregistrés à l'Organisation Mondiale du Commerce (WTO, 2011). Leur couverture géographique s'est élargie avec des accords inter- et intra-continentaux, et la participation de pays développés et en développement.

Cette prolifération implique de multiples changements de politique commerciale et pose des questions importantes : d'un point de vue théorique, pourquoi les pays signent-ils de nombreux accords parallèles, qui affaiblissent mutuellement leurs effets ? Du point de vue de l'estimation empirique, comment dissocier l'impact d'un accord donné des externalités créées par la signature simultanée d'autres accords et par les réductions multilatérales des droits de douane ?

Dans cet article, nous tentons de répondre à ces questions en proposant une méthode contrefactuelle qui (1) tient compte de l'hétérogénéité des ACP et (2) permet d'estimer l'effet des accords à la fois sur la création et le détournement de commerce, mais aussi sur les prix et le revenu réel. Cette méthode est appliquée aux récents changements de politique commerciale de huit pays (Algérie, Égypte, Israël, Jordanie, Liban, Maroc, Tunisie et Turquie) de la région Moyen-Orient et Afrique du Nord (MENA). Cette région offre un cas d'étude pertinent de la prolifération des ACP. Ainsi, durant notre période d'investigation (2001-2007), des accords ont été signés (1) entre l'UE et les pays MENA (accords euro-méditerranéens), (2) au sein de la région MENA (accords GAFTA et d'Agadir), et (3) par chacun des pays MENA avec des pays tiers (hors UE et MENA), comme par exemple entre le Maroc et les États-Unis en 2004. L'hétérogénéité de ces accords et leur multiplicité rendent notre méthode adaptée pour mesurer l'effet de leur prolifération, sachant que nous tenons également compte des réductions tarifaires observées ailleurs dans le monde.

A partir de notre méthode contrefactuelle et des politiques commerciales préférentielles et multilatérales observées, nous estimons d'abord l'effet d'un ACP donné, puis ses effets une fois pris en compte les autres changements de politique commerciale intervenus simultanément. Ces derniers réduisent considérablement les effets de création de commerce d'un ACP donné. Les processus simultanés d'intégration des pays de la région MENA réduisent souvent de plus de la moitié la création de commerce d'un ACP. Cette baisse est particulièrement frappante dans le cas de l'Égypte qui a mis en œuvre d'importantes réductions unilatérales de tarifs durant la période. La baisse est également importante pour la Tunisie et la Jordanie. Dans l'ensemble, l'impact global des accords euro-méditerranéens sur le commerce avec l'UE n'est significativement positif (supérieur à 2%) que pour l'Algérie et le Maroc, avec une création de commerce respectivement de 13,6 et 13,9%. Fait intéressant, ces deux pays sont ceux qui ont le plus réduit leurs barrières commerciales vis-à-vis de l'UE par rapport à leurs autres partenaires. Ainsi, pour ces deux pays le coût des importations en provenance de l'UE diminue relativement à celui d'autres sources, provoquant une forte hausse du commerce avec l'UE. Cela confirme l'intuition que ce sont les coûts de commerce relatifs et non absolus qui déterminent le commerce.

Si la création de commerce est faible, les gains en termes de revenu réel sont généralement positifs et importants pour la plupart des pays engagés dans des accords multiples. Ces gains incitent les pays à signer de nouveaux ACP. En outre, les pays non membres connaissent une détérioration de leur revenu réel, ce qui constitue une incitation supplémentaire à signer des ACP. Ainsi, nos résultats sont cohérents avec l'idée d'un "effet de domino" ou de contagion, favorisant la prolifération des accords commerciaux préférentiels.

RÉSUMÉ COURT

Cet article s'intéresse aux implications de la prolifération des accords commerciaux préférentiels (ACP) sur le commerce et sur le revenu réel de leurs membres. Grâce à l'utilisation d'estimations contre-factuelles, nous séparons l'effet d'un ACP donné des externalités créées par la signature d'accords concurrents et par la libéralisation multilatérale du commerce. Nos résultats s'appuient sur l'exemple de la région Moyen-Orient-Afrique du Nord qui, entre 2001 et 2007, offre un cas d'étude pertinent de la prolifération des ACP. Ils révèlent que des changements simultanés de politique commerciale réduisent les effets de création de commerce d'un accord pris isolément. Néanmoins, en signant des accords, les pays membres gagnent en termes de revenu réel et ne subissent pas les externalités négatives supportées par les pays restant en dehors des accords. Nous confirmons que la plupart des pays ont bénéficié des réductions tarifaires réalisées durant la période étudiée, mais cela n'est vrai que parce que les accords multilatéraux prolifèrent : les pays compensent les effets de la non-participation en signant de nouveaux accords.

Classification JEL: F13, F12, F47.

Mots clés : Commerce international, Hypothèse d'Armington, Estimation contre-factuelle, Création et diversion de commerce.

PREFERENTIAL TRADE AGREEMENTS PROLIFERATION: SORTING OUT THE EFFECTS[1]

Sami Bensassi* José de Sousa† Joachim Jarreau‡

1. INTRODUCTION

We investigate the implications of the proliferation of Preferential Trade Agreements (PTAs) on trade and real income of member and non-member countries.[2] This proliferation implies multiple trade policy changes and poses important challenges: why do countries sign concurrent agreements, which mutually weaken their effects? How can we disentangle the impact of a given agreement from externalities created by simultaneous PTAs and multilateral tariff reductions?

We answer those questions by proposing a counterfactual method that accounts for heterogeneity across PTAs, and allows estimating jointly trade creation, trade diversion, and prices and real income effects. Using this method we estimate first the treatment effect of a given PTA taken in isolation, and then its effects once concurrent trade policy changes are accounted for. Comparing the two, we find that the latter greatly weaken the trade creation effects of PTAs. However, despite low trade creation, we find that gains in real income are generally positive and substantial for most countries engaged in multiple agreements. Those gains provide an incentive to sign PTAs. In addition, non-PTA members are negatively impacted through a deterioration of their real income, which provides an additional incentive to sign PTAs. Thus, our results are consistent with a contagion or 'domino effect' (Baldwin, 1993) being one of the main forces behind the proliferation of PTAs.

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[2]We use the expression Preferential Trade Agreements instead of Regional Trade Agreements, since a large number of agreements are not limited to members within a single region. Two striking facts should be noted about PTAs. First, from 1995 to 2010, their number increased fourfold to reach 300 PTAs in force (WTO, 2011). Second, their geographical coverage has expanded both within and between continents, and with the participation of developed and developing countries.

Beyond these empirical results, our analysis offers some theoretical insights. We first show that the relationship between market shares and the incidence of PTAs on prices is highly non linear. Then, we show that PTA effects on trade and prices vary with pre-agreement trade levels. Finally, we document the importance of accounting for the heterogeneity of PTAs. This heterogeneity arises because of differences in the multilateral protection levels of the PTA members (e.g. in MFN tariffs), and in the depth and scope of preferential tariff reductions.

Our counterfactual method consists of three steps. We first use a multi-sector model of international trade with imperfect competition, product differentiation by country of origin (Armington assumption) and fixed supply. This endowments economy leaves specialization and variety effects out of the picture. But, although simple, this structure accounts for changes in multilateral resistance prices (Anderson and van Wincoop, 2003). Second, we parameterize the model to quantify PTA effects, which boils down to estimating sector-level elasticities of substitution in preferences. We estimate these parameters using disaggregated bilateral applied tariff panel data. For the sake of robustness, we employ three alternative methods - OLS country-year fixed-effects, double-difference and Poisson-pseudo maximum likelihood - aimed at controlling for zero trade flows, heteroscedasticity and tariff endogeneity. Finally, using the elasticity estimates and data on applied tariff changes, we compute PTA effects by counterfactual estimation. This allows us to disentangle the treatment effect of each single agreement, from the externalities created by simultaneous trade policy changes, including PTA proliferation.

The recent trade policy changes in the MENA (Middle East and North Africa) region offer us a good case study of PTA proliferation: PTAs are signed between developing countries and with developed countries.[3] The heterogeneity of the agreements and their multiplicity make our method well-suited to measure their effects. We find that PTA treatment effects on trade are often cut by more than half, due to concurrent integration processes. Most countries however benefit in real income from engaging in PTAs. This helps explain the observed pattern of PTAs.

Our paper is close to Anderson and Yotov (2011). However, it differs in two important dimensions. First, they rely on the hypothesis that the impact of a PTA on trade costs can be summarized by one parameter, whereas we rely on sector-level preference parameters and tariff changes data. This allows us to measure PTA effects much more precisely and to account for heterogeneity of PTAs. Second, their paper focuses on real income effects of PTAs implemented from 1990 to 2002.[4] They consider two counterfactual scenarios, one with no NAFTA agreement, and one without any PTA signed by Mexico. We look instead at trade and income effects of *all tariff changes* from 2001 to 2007, including both preferential and multilateral trade liberalization. Focusing on the MENA countries, we decompose the effects of tariff changes according to different integration processes: bilateral PTAs with the EU (separately and simul-

[3]This includes bilateral agreements between the European Union (EU) and each south-Mediterranean (Med) country, within-Med regional trade agreements (GAFTA and Agadir agreements), and agreements between south-Med countries and third partners.

[4]Note that what Anderson and Yotov (2011) call terms-of-trade corresponds to our definition of real income, that is, the ratio of free-on-board export prices to cost and tax-inclusive import prices (in an endowments model).

taneously); intra-regional PTAs; other PTAs signed with non-EU and non-MENA partners; and multilateral tariff reductions. This framework, which is new to our knowledge, helps to quantify the impacts of preferential and multilateral liberalization, and contributes to better understand their interaction.

Real income effects reveal that PTAs generally benefit members while harming non-members, in line with Anderson and Yotov's (2011) result that Canada loses from other PTAs if NAFTA is not implemented. This means that PTA benefit only to countries who sign enough PTAs to compensate losses from non-membership.

The use of an endowments model of trade based on Armington differentiation and Dixit-Stiglitz preferences places our paper in the so-called 'structural gravity' literature (Anderson and Yotov, 2011, Egger *et al.* 2011).[5] As noted an important difference is to rely on sector-level elasticity estimates instead of a single PTA parameter. Besides, in solving the model we allow for export prices to affect trade through countries' income, contrary to antecedents in which trade changes are computed while implicitly keeping countries' income as fixed (Anderson and van Wincoop, 2003; Anderson and Yotov, 2010; Baier and Bergstrand 2009; Egger *et al.*, 2011).

In estimating PTA effects, by relying on tariff changes, our approach is also close to Trefler (2004) and Romalis (2007) who study NAFTA and/or CUSFTA effects. Focusing on applied tariff changes allows us to account for the heterogeneity of PTAs, to mitigate trade policy endogeneity and to decompose the effects of the various concurrent agreements. In doing so, we ignore other possible components of trade agreements (e.g., non-tariff barriers), but we trade off these components against a more acute knowledge of which barrier reductions were really implemented.

This paper does not explore the determinants of trade policy. However, by providing estimates of losses to non-PTA members, it sheds light on the contagion mechanism shown by Baldwin (1993). But contrary to this author we do not model the domestic political process behind the contagion effect.

Finally, by assuming fixed endowments the model features an inelastic export supply curve, similarly to models of terms-of-trade manipulation and optimal tariffs (Broda, Limao and Weinstein, 2008, Ludema and Mayda, 2011). Therefore, as in these models, there is a positive association between market share and tariffs: countries have an incentive to set higher tariffs on imports from partner countries in which their market share is higher, while liberalizing trade in priority with those where their market share is lower.[6]

[5] Another way to estimate impacts of trade agreements is to rely on computable general equilibrium models. They are used to explore future trade pattern according to expected enforcement, extension or deepening of trade agreements. See De Rosa and Gilbert (2005) for a review.

[6] However, contrary to those models, there is no optimal positive tariff, because the gain to consumers always dominates over losses to domestic producers. This is due to the hypothesis of imperfect substitution between domestic and imported goods. Thus, issues related to negotiations over tariffs are not considered here.

The rest of the paper is as follows. In Section (2), we present the model and explores its implications for the effects of PTAs on trade and real income. In Section (3), we estimate the model parameters. Then, in Section (4), we apply our method to the EuroMed agreements in order to estimate the PTA effects. Finally, in Section (5), we conclude.

2. MODEL

We present the model and the method used for solving it, then we show its implications for the effects of preferential trade barrier reductions. We use a multi-sector model, in order to account for the variation of trade protection across sectors.

2.1. Model structure

On the demand side, consumers demand varieties of each goods class from different countries, because they perceive them as different. We assume that each good is produced with a specific factor, and each country is endowed with a fixed supply of factor. This hypothesis is one of an endowments economy. This implies that we focus on the impact of trade policy on the allocation of goods across destinations (including the domestic country), ignoring feedback effects on production and expenses.[7]

The structure of demand is assumed to be Cobb-Douglas on different goods, and Constant Elasticity of Substitution (CES) on varieties within each goods class:

$$c_{ij}^k = (p_i^k)^{-\sigma_k}.\left(\frac{\tau_{ij}^k}{P_j^k}\right)^{1-\sigma_k}.E_j^k, \quad (1)$$

where, for a given goods class k, c_{ij}^k is the demand of country j's consumers from origin i, p_i^k is the free on board (f.o.b) price, τ_{ij}^k is the iceberg trade cost on trade from i to j, P_j^k is country j's price index and σ_k is the CES elasticity. E_j^k is country j's expenditure, given by $E_j^k = \alpha_k.Y_j$, where α_k is the Cobb-Douglas parameter share of expenditure and Y_j is country j's income or GDP.

The nominal bilateral trade flow between i and j in goods class k is given by

$$X_{ij}^k = \left(\frac{p_i^k.\tau_{ij}^k}{P_j^k}\right)^{1-\sigma_k}.E_j^k, \quad (2)$$

[7] This is called the 'conditional general equilibrium' hypothesis (see Anderson and van Wincoop, 2003, Anderson and Yotov, 2010). Production and expenditure shares are taken as exogenous. Here, we will allow for production and expenditure shares to react endogenously to trade policy changes, thus taking fully into account terms-of-trade effects of tariff changes.

and the CES price index for j's consumers is:

$$(P_j^k)^{1-\sigma_k} = \sum_i p_i^k . \tau_{ij}^{k\;1-\sigma_k}. \tag{3}$$

On the supply side, each origin country i produces a quantity Q_i^k of goods class k using a specific factor L_i^k which is in fixed supply. In perfect competition this factor is paid at its marginal price which is equal to the f.o.b price of the good:

$$w_i^k = p_i^k . f_i^{k\prime}(L_i^k), \tag{4}$$

where w_i^k is the factor-specific wage in country i and f_i^k is the production technology. The quantity produced of goods class k in country i is thus given by $Q_i^k = f_i^k(L_i^k)$. In this endowments economy model, the only constraint that will define equilibrium prices and wages is market clearing, that is, each country has to sell its output of each good to internal and external buyers. This condition is expressed as:

$$\sum_j X_{ij}^k = p_i^k . Q_i^k, \tag{5}$$

which using equation (2) yields the f.o.b price of origin i

$$(p_i^k)^{\sigma_k} = \frac{1}{Q_i^k} . \sum_j \left(\frac{\tau_{ij}^k}{P_j^k} \right)^{1-\sigma_k} . E_j^k. \tag{6}$$

This price is adjusted as to equalize the fixed supply of the good with the sum of internal and external demands. Thus, it is decreasing with the quantity of the good and each bilateral trade cost, while increasing with demand for that good and price indexes in all countries.

2.2. The structural gravity equation

Anderson and van Wincoop (2003) define the aggregate of demand-weighted trade costs faced by an exporter as its 'multilateral resistance', understood as a multilateral price. This is given by

$$(\Pi_i^k)^{1-\sigma_k} = \sum_j \left(\frac{\tau_{ij}^k}{P_j} \right)^{1-\sigma_k} \frac{E_j^k}{Y_w^k}, \tag{7}$$

where Y_w^k is the nominal value of world production of good k. Using this definition, the relationship between f.o.b prices and multilateral resistances can be written as:

$$Y_i^k = p_i^k . Q_i^k = Y_w^k (p_i^k . \Pi_i^k)^{1-\sigma_k}. \tag{8}$$

Bilateral trade can thus be expressed as a function of exporter (Π_i^k) and importer (P_j^k) multilateral resistances, yielding the gravity equation for nominal trade flows:

$$X_{ij}^k = \left(\frac{\tau_{ij}^k}{P_j^k \Pi_i^k}\right)^{1-\sigma_k} . \frac{E_j^k Y_i^k}{Y_w^k}. \tag{9}$$

Next, this expression can be used to express consumption price indexes P_i^k as a function of trade costs and exporters' multilateral resistance terms Π_i^k:

$$(P_j^k)^{1-\sigma_k} = \sum_i \left(\frac{\tau_{ij}^k}{\Pi_i}\right)^{1-\sigma_k} \frac{Y_i^k}{Y_w^k}. \tag{10}$$

Equations (7) and (10) can be solved together to express the equilibrium values of multilateral resistance terms P_j^k and Π_j^k as a function of the system of bilateral trade costs τ_{ij}, and nominal production $\left(\frac{Y_i^k}{Y_w^k}\right)$ and expenditure $\left(\frac{E_i^k}{Y_w^k}\right)$ country shares.

Finally we impose equality between a country's expenditure and income: $E_j = \sum_k p_j^k . Q_j^k$, or equivalently, (manufacturing) trade balance.[8] This constraint is necessary to account for potential adverse terms-of-trade effects of trade barriers reductions; omitting it may result in over-optimistic effects from trade barriers reductions as the need of a real depreciation to maintain trade balance would disappear.[9]

2.3. Solving for multilateral resistances

The model is now fully specified. Solving it requires to solve the system of equations (7), (8) and (10), in the endogenous variables (P, Π, p, E, Y_w). Once the solution vector (P, Π, p, E, Y_w) is obtained, nominal trade flows can be determined using equation (2) and a trade cost specification (τ, including tariffs).

We use an incremental method with several steps.[10] First, the system of multilateral prices P and Π is solved for given values of countries' income $\left(\frac{Y}{Y_w}\right)$ and expenditure $\left(\frac{E}{Y}\right)$ shares, and trade costs (see eq. 7 and 10). Second, we use equation (8) to calculate export f.o.b prices (p) as a function of computed exporter multilateral prices (Π) and income shares $\left(\frac{Y}{Y_w}\right)$. Then, countries' income are computed as a function of f.o.b prices. Finally, this induces new values of countries' income and expenditure shares, which are used to update previous estimates.

[8]This condition is expressed on manufacturing income excluding tariff revenues.
[9]We thus account for long-term adjustments of the current account, and the consequences of these adjustments for real manufacturing GDP.
[10]We thank Scott Baier for his valuable advice on this procedure.

We use this incremental method to work out the impacts of trade costs changes. Starting from a given world equilibrium, a change in trade costs, such as tariffs, has an impact on multilateral resistances (P and Π). Through market clearing (eq. 5 and 6), these multilateral price changes force exporters to adjust their f.o.b prices so as to clear the world market for their variety of the good. This, in turn, modifies a country's total income (Y), which is the nominal value of total production. The second constraint, trade balance, then imposes further adjustment of export prices.

2.4. Implications of preferential tariff reductions

Here we derive the implications of the model for the effects of preferential tariff reductions on trade flows and prices. Those implications illustrate the heterogeneity of PTA effects: price and trade impacts vary importantly with pre-PTA trade levels. This implies that some agreements are bound to generate much larger effects than others, even without taking into account externalities created by parallel trade policy changes. To show this pattern and keep things simple and tractable, we study the case of a bilateral preferential tariff reduction between countries i and j. This translates into a lower bilateral trade cost (τ_{ij}):

$$d\ln\tau_{ij} = \hat{\tau}_{ij} < 0, \tag{11}$$

$$d\ln\tau_{kl} = \hat{\tau}_{kl} = 0, \forall(k,l) \neq (i,j), \tag{12}$$

where j is the tariff reducing importer country and i its preferential exporter partner. We consider a generic good shipped from i to j and delete the k superscript for simplicity. To help clarify the different effects, we make another simplifying hypothesis: we suppose here no feedback effects on the f.o.b price of the importer.[11]

Under the hypothesis of small variations in tariffs, differentiating the system of equations (6 to 10) at first order yields the following price changes:

$$\hat{P}_j = \frac{\omega_j - K.\omega_j\omega_i}{1 - K.\omega_j\omega_i}.\hat{\tau}_{ij}, \tag{13}$$

$$\hat{p}_i = -K.\frac{\omega_i - \omega_i\omega_j}{1 - K.\omega_j\omega_i}.\hat{\tau}_{ij}, \tag{14}$$

where $\omega_j = X_{ij}/E_j$, $\omega_i = X_{ij}/Y_i$ and $K\left(=\frac{\sigma-1}{\sigma}\right) \in (0,1)$, which gets close to 1 as the elasticity σ grows. These equations give us the incidence of the bilateral trade cost change on prices, which affect real income. Defining the incidence as the ratio of relative price change to relative trade cost change, equations (13) and (14) show that the incidence of a preferential tariff reduction ($\hat{\tau}_{ij} < 0$) depends primarily on the share of trade between i and j (X_{ij}) in each partner's multilateral trade.

[11] This is the limit case if the openness ratio of the importer is very large (so only a small share of output is sold domestically).

Figure (1) plots the incidence on the importer's price index (P_j) as a function of ω_i and ω_j. The importer's incidence is growing with ω_j but decreasing with ω_i. Thus, the gain from a tariff reduction ($\hat{\tau}_{ij} < 0$) for j's consumers is higher when liberalizing with large exporters (low ω_i), but lower when j's expenditure is high (low ω_j), as the exporter's price adjusts upwards.[12] Thus, the classic result that small importing countries tend to gain more from trade liberalizations holds.

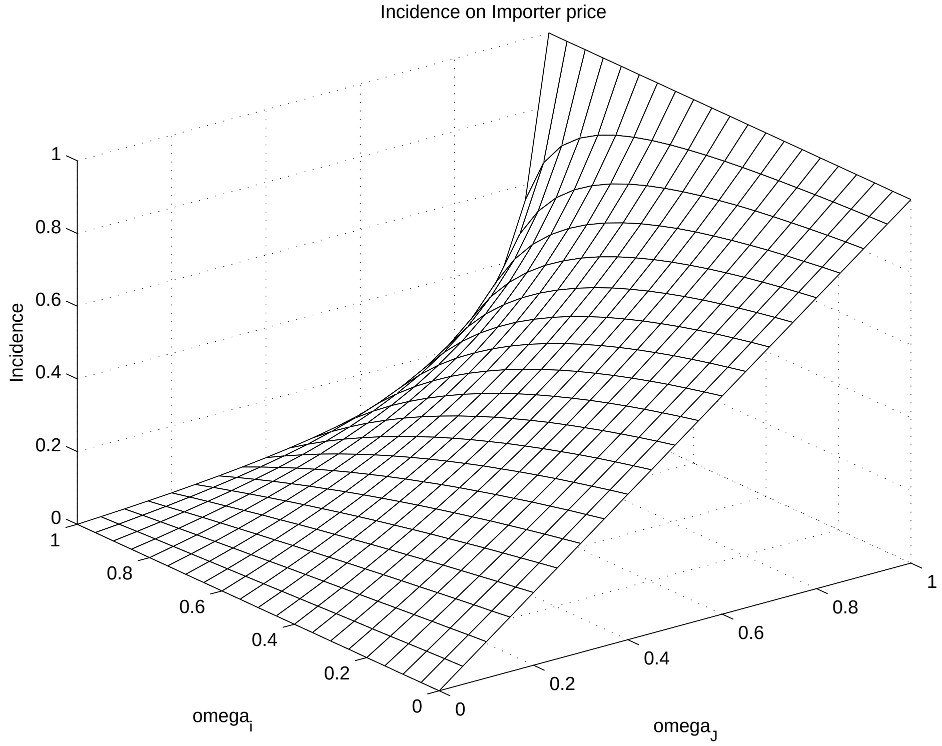


Figure 1 – Incidence on importer's price index

The incidence on the exporter's f.o.b price (p_i) is shown in Figure (2). It is negative (the figure displays the absolute value of the incidence): a reduction in bilateral tariffs results in an increase in the exporter's f.o.b price (limited pass-through), this transmission being lower than one. Thus, one observes that the incidence on the exporter's f.o.b price is increasing with ω_i in absolute value, and decreasing with ω_j.

The resulting impact on trade between the preferential partners is given by

$$\hat{X}_{ij} = (1-\sigma).\frac{1-\omega_j - K.\omega_i + K.\omega_i\omega_j}{1-K\omega_i\omega_j}.\hat{\tau}_{ij}, \tag{15}$$

[12]This result is similar to the terms-of-trade hypothesis found in the literature on optimal tariffs (e.g. Broda, Limao and Weinstein, 2008), where a country's tariff modifies the export f.o.b. price. This is due to the hypothesis of inelastic export supply.

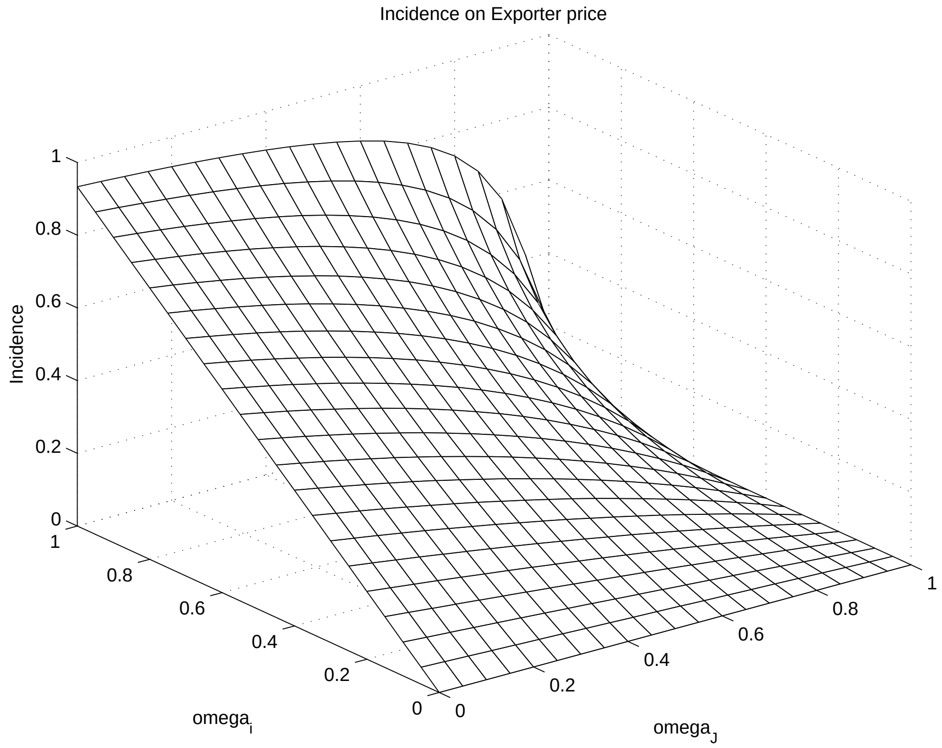


Figure 2 – Incidence on exporter's f.o.b price

and shown in Figure (3). This figure makes clear that trade creation is maximal when both ratios ω_i and ω_j are close to 0. In this case, the incidence of the PTA is minimal on prices in both countries; thus the tariff reduction translates fully into trade creation.[13]

Note that as the low (ω_i, ω_j) is not verified for most bilateral trade relationships, one needs to control for 'indirect effects' - i.e., changes in prices - in order to compute the total impact of a preferential tariff reduction (or of any trade barrier) on trade. In particular, there would be heterogeneity in trade impacts across PTAs, even if tariff reductions were equal across all PTAs (which they are not). Thus one needs to account for this heterogeneity when measuring PTA impacts.

Finally, the PTA impact on real (manufacturing) GDP[14] is displayed in Figure (4). Computing real GDP changes in this model requires taking into account changes in import and export prices in the liberalizing country, which occur as country j's f.o.b prices are forced down due to import competition and to the trade balance constraint. Thus we now lift the hypothesis of fixed export price for the importer in order to compute its change in real GDP.

[13]Notice that in Anderson and van Wincoop (2003), multilateral resistance terms are unaffected in this case, thus the 'indirect effect' - i.e., changes in prices - on trade is zero.

[14]Real (manufacturing) GDP for country j is defined as $\frac{\sum_k p_k Q_k}{P_j}$.

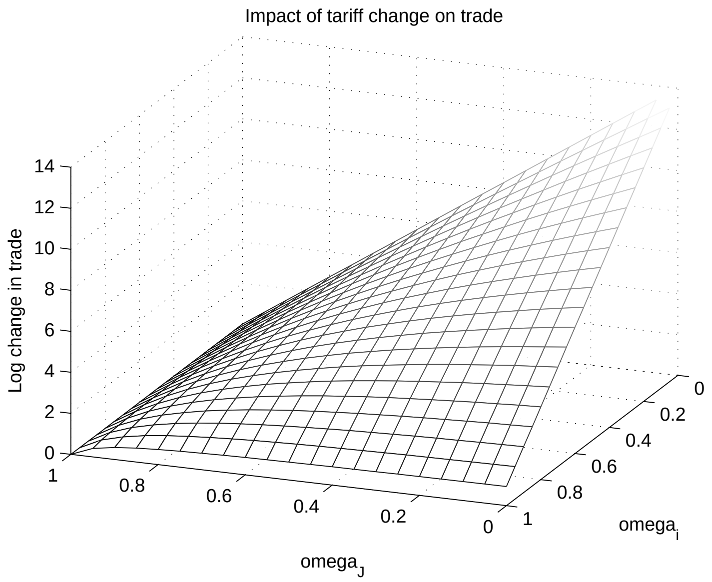


Figure 3 – Impact of tariff changes on bilateral trade flows

The figure shows that real GDP gains are always *positive* for the country liberalizing unilaterally in this model; in other words, gains for the consumers always dominate over the losses for producers. In addition, it shows that real GDP gains increase with ω_j, and decrease with ω_i. This result comes from the fact that changes in consumer prices are larger (in absolute value) than resulting changes in export prices. Thus the real GDP gain is maximized by maximizing the impact on the import price.

The negative link between ω_i and real GDP gains can be seen as a reformulation of the 'terms-of-trade hypothesis', in which tariffs enable countries to manipulate terms-of-trade. Thus, an importer j should maintain tariffs with countries for which size-adjusted exports to j are high, (i.e., high $\omega_i = X_{ij}/Y_i$) as this forces down export prices in these countries; while they should liberalize trade preferentially with exporters for which size-adjusted exports to j are low.

The estimation of the effects of PTAs, through a preferential tariff reduction, is done in two steps. In the next section (3) we estimate elasticities of substitution at sector level to parametrize the model. In the following section (4) we estimate the effects of trade policy changes.

3. Estimation of sector elasticities

Based on the structural gravity equation (9), three alternative approaches are used to estimate consistently sector elasticities. This ensures a better robustness of our results. Before presenting those methods and the results, we first describe the data and raise some estimation issues.

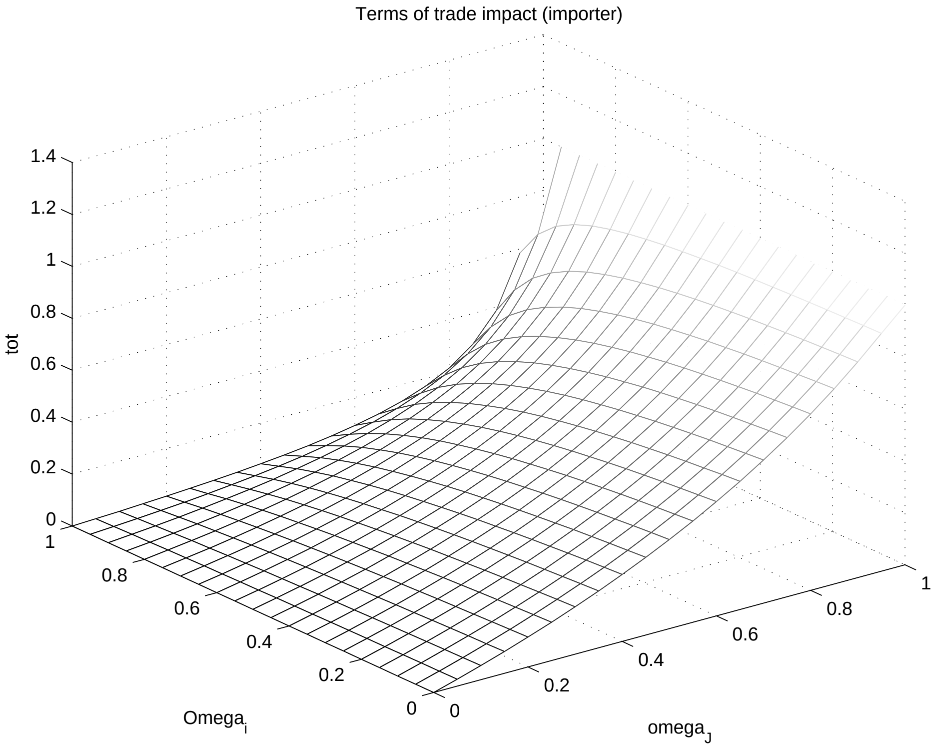


Figure 4 – Importer's real manufacturing GDP changes

3.1. Data and estimation issues

Trade We estimate the sector-level gravity equation using nominal bilateral trade values from the BACI trade database.[15] Trade data at product Harmonized System (HS)-6 digit level are aggregated at the International Standard Industrial Classification (ISIC) rev.2 level (79 sectors). We see this level of aggregation as consistent with the definition of sectors in the model.[16] All world trade is considered. However, given our focus on the MENA region, we focus on 28 countries/regions representing the main players in that region.[17] This estimation strategy, which reduces the high dimensionality of data, is common in the literature (see Anderson and van Wincoop, 2003 and Anderson and Yotov, 2010).

[15]The BACI trade data set is built by the CEPII (www.cepii.fr/anglaisgraph/bdd/baci.htm).

[16]Recall that the model assumes a Cobb-Douglas structure of demand over sectors. Estimating the model at a product level (e.g. HS-6 classification) would thus implicitly impose a substitution elasticity of 1 over HS-6 products, while the fine level of detail of this classification implies that this elasticity is certainly higher.

[17]The countries/regions are Algeria, Brazil, Canada, China, the European Free Trade Association (EFTA) countries, Egypt, the 25 European Union (EU25) countries, India, Iran, Israel, Japan, Jordan, Lebanon, Libya, Morocco, Oceania, the Rest of Africa (RoAfrica), the Rest of America (RoAmerica), the Rest of Asia (RoAsia), the Rest of Europe (RoEurope), the Rest of Middle East (RoMEast), Russia, South Africa, South Korea, Syria, Tunisia, Turkey and the USA.

Trade costs and tariffs A functional form of trade costs is needed to estimate the structural gravity equation. In line with the common practice in the literature, we assume the following log-linear stochastic form:

$$\tau_{ij}^k = (1 + \text{Tariff}_{ij}^k).d_{ij}^{\rho^k}.e^{\alpha^k \text{Contig}_{ij}}.e^{\beta^k \text{Comlang}_{ij}}.e^{u_{ij}^k}, \tag{16}$$

where Tariff_{ij}^k is the ad-valorem equivalent of tariff barriers on i's products exported to j in sector k, d_{ij} is the distance between i and j and u_{ij}^k represent unobserved bilateral trade cost determinants. We also add two dummy variables: Contig_{ij}, which is unity if countries/regions i and j are contiguous, and Comlang_{ij}, which is unity if i and j share an official language.

Data on distance, contiguity and languages are taken from the distance CEPII database.[18] Tariff data are obtained from the CEPII MacMap database (Bouet *et al.*, 2008). This data set provides a disaggregated, exhaustive and bilateral measurement of applied tariff duties for the years 2001, 2004 and 2007.[19] This comprehensive measure of applied tariff protection enables us to track *all* changes in tariff protection from 2001 to 2007, i.e. within and outside PTAs. Importantly, this allows us to observe precisely the content of PTAs, and variations across PTAs in sector coverage, extent of tariff reductions and time period of implementation. Note that running our estimates on three-year intervals enables us to obtain stable estimates, while the use of yearly data has been shown to yield unstable gravity estimates, due to delays in the adjustment to trade shocks (Olivero and Yotov, 2012). This also allows to filter out business cycle effects.

Tariff endogeneity A typical issue in estimating trade equations is the endogeneity of trade policy. However, here, this problem is significantly reduced by the use of detailed tariff data, instead of aggregate trade policy indicators such as PTA dummies. Indeed, tariff data at sector level offer considerably more variation. We exploit the fact that trade policy is decided at the aggregate level (through multilateral and preferential agreements) so that most tariff changes at sector level can be seen as exogenous from the point of view of the industry.[20] This variation in tariffs comes from differences (1) in initial pre-PTA tariff level across country pairs and sectors; (2) in coverage of PTAs (that implement partial reduction of tariffs across sectors and members); and (3) in implementation of tariff reductions over time within pairs across sectors.

The use of detailed tariff data allows us for a more direct estimation of elasticities, in contrast to studies focusing on the effect of distance or borders on trade (see e.g. Anderson and Yotov,

[18] See http://www.cepii.fr/francgraph/bdd/distances.htm.

[19] Tariffs at product level are aggregated at the ISIC-sector level using the 'Regions of Reference' method, thus weighting tariff lines by trade values for the region to which the importer belongs. This mitigates biases in simple trade-weighted aggregates (see Bouet *et al.* (2008)). Beyond *ad-valorem* tariffs, data on specific tariffs and tariff quotas are converted for each year into *ad-valorem* equivalents using unit values data for the year 2001 (see Boumellassa *et al.* 2009).

[20] This is particularly true for manufacturing sectors, as considered here, given that all considered trade agreements apply a quasi-total tariff dismantlement in manufacturing.

2011, Hummels, 1999). Here sector elasticities are directly obtained from the coefficients on tariff variables (see below), so that the knowledge of the elasticity of trade costs to distance and other variables is not needed.

3.2. Estimation method

The first conventional approach of estimating (9) is to use if the Ordinary Least Squares estimator with Country-Year Fixed Effects (OLS-CYFE). Taking logs of (9), plugging the functional form of trade costs (16) and adding time subscripts to stress the point that some of the variables are time-varying give us:

$$\begin{aligned} \ln X_{ijt}^k &= \ln \frac{Y_{it}^k}{Y_{Wt}^k} + \ln \frac{E_{jt}^k}{Y_{Wt}^k} + (1-\sigma^k).[\ln(1+\text{Tariff}_{ijt}^k) - \ln(P_{jt}^k) - \ln(\Pi_{it}^k)] \\ &+ (1-\sigma^k).(\rho^k.d_{ij} + \alpha Contig_{ij} + \beta Comlang_{ij}) + \varepsilon_{ijt}^k, \end{aligned} \quad (17)$$

where ε_{ijt}^k $[= (1-\sigma^k)u_{ij}^k]$ is the stochastic error term. We estimate this equation separately for each of our 54 manufacturing sectors. We introduce exporter-time (λ_{it}) and importer-time (λ_{jt}) fixed effects, which enables us to control fully for unobserved sector-level country shares of world production and expenditure, as well as for country multilateral prices and any other country time-varying omitted variable such as the quality of institutions. Thus our first specification is the following:

$$\ln X_{ijt}^k = \beta^k \ln(1+\text{Tariff}_{ijt}^k) + \gamma^k \ln d_{ij} + \delta^k \text{Contig}_{ij} + \eta^k \text{Comlang}_{ij} + \lambda_{it}^k + \lambda_{jt}^k + \varepsilon_{ijt}^k. \quad (18)$$

In this equation, coefficient β^k gives us directly the estimate of $(1-\sigma^k)$, while γ gives us the estimate of the product $(1-\sigma^k).\rho^k$, of which we can deduce ρ; we can similarly obtain the effects of contiguity and common language on trade costs.

A drawback of the OLS-CYFE approach is the log transformation of the trade equation (9). This causes dropping zero trade observations, creating a bias in estimators by ignoring selection to trade. Moreover, this estimator is generally inconsistent if the log-transformed error term ε_{ijt}^k is not independent on covariates (Santos Silva and Tenreyro, 2006). To address jointly these two issues we use a second approach: the Poisson-pseudo maximum likelihood (PPML) estimator. In this case, the estimator applies to the model in multiplicative form, that is (for a given sector k):

$$X_{ijt} = \exp(\beta \ln(1+\text{Tariff}_{ijt}) + \gamma \ln d_{ij} + \delta \text{Contig}_{ij} + \eta \text{Comlang}_{ij} + \lambda_{it} + \lambda_{jt} + \varepsilon_{ijt}). \quad (19)$$

Finally, as a third alternative approach, we use a difference-in-difference estimator, in the spirit of Baier and Bergstrand (2009). However, we apply this estimator at the sector level while they focus on aggregate trade and use a dummy PTA variables. We rely on the fact that endogeneity of trade policy is much less severe at the sector level than at aggregate level: the signing of a PTA is likely to be endogenous, but many tariff line changes will be exogenous (see above). This estimator is as follows: we first differentiate with respect to the most important partner of each importer.[21] The second difference is in time; having three years of data, we end up with two periods: 2001-2004 and 2004-2007. This double differencing applied to our log trade equation yields (for a given sector k)

$$\Delta(\ln X_{ijt} - \ln X_{it}^{j0}) = \beta\Delta(\ln(1+\text{Tariff}_{ijt}) - \ln(1+\text{Tarif}_{it}^{j0})) + \lambda_{jt} + \nu_{ijt}, \quad (20)$$

where Δ is the time difference operator (2007-2004 or 2004-2001) and $j0$ is the largest reference exporter to each importing country. All constant bilateral variables (distance, contiguity...) are dropped from this specification.

3.3. Results on sector elasticities

Table (A.1) in appendix A displays the estimation results. The three estimators yield coherent estimates in the expected range of values, since most elasticities are comprised between 2 and 15 (the elasticity being obtained as one minus the tariff coefficient). However, it also shows that elasticity estimates vary importantly across the three methods, and that standard errors are also quite large in some cases.[22] This imposes us to treat these estimates with caution.

In the next section, we will rely primarily on OLS estimates to compute trade cost changes over the period of study (2001-2007) and implied trade and price effects. This method yields elasticity estimates all above 1 except for one sector (ISIC 342), where the coefficient is non significantly different from 0.[23] These results are thus consistent with the model, which assume all elasticities above 1. We will use the two other sets of parameters as robustness checks for the sensitivity of our aggregate results to elasticity estimates.

4. Estimation of PTA effects

Armed with our estimates of the parameters of the model, we now apply them to carry our estimation of the effects of preferential tariff changes on trade and prices (4.2), real income, or more precisely real manufacturing GDP (4.3) for member and non-member countries in a real-world case (4.1). Our tariff data allow us to estimate these effects with a high level of precision, based on the actual content and implementation of preferential trade liberalization.

[21]This allows us to minimize the number of missing difference observations.

[22]Note that all estimation methods drop some observations resulting in a lower number of observations. The Santos-Silva and Tenreyro (2011)'s PPML estimator implements a method to drop variables and observations preventing convergence.

[23]We assume an elasticity of 0 in this sector, which is equivalent to saying that preferences are Cobb-Douglas in that sector.

4.1. Trade policy changes in the MENA region

The tariff data impose us a restriction on the period of study: 2001-2007. However, trade agreements signed in the MENA region during that period have been symptomatic of the current PTA proliferation. The three following facts are in accordance with Jagdish Baghwati's 'spaghetti bowl of PTAs'.

First, eight agreements were signed on a bilateral basis between the EU and each south-Mediterranean (Med) country.[24] These EuroMed agreements follow a 'hub-and-spoke' model with a gradual dismantlement of tariff barriers maintained by Med countries on manufacturing imports originating in the EU. As for EU import tariffs, they were already close to zero since the 1980s, as part of the Generalized System of Preferences framework. Therefore, the EuroMed agreements consist essentially in a unilateral reduction of tariff barriers in manufacturing, on the part of Med countries. As a graphical illustration, figures reported in Table (1) display the evolution of average tariff barriers applied by the 8 Med countries on EU imports. They give the general picture of trade liberalization in Med countries in the 2000s.[25]

Second, Med countries also implemented trade liberalization among themselves during the same period, with two regional PTAs.[26] In addition, Turkey also signed bilateral agreements with each Med country during the same period.[27]

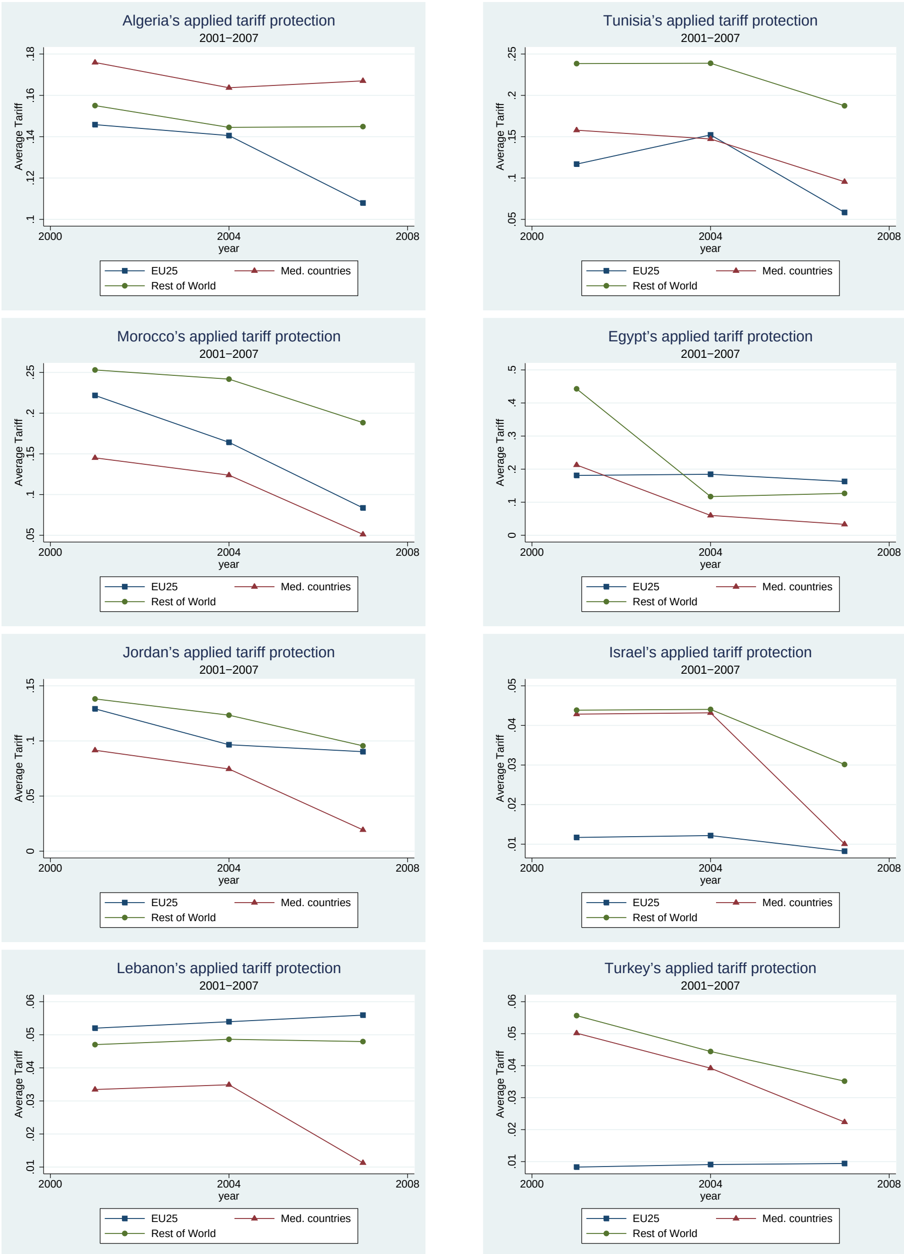
Finally, some Med countries signed agreements outside the EuroMed: e.g., Morocco signed a PTA with the US in 2004.

To sum up, multiple trade liberalization episodes occurred concurrently in the region in the 2000s. Because all Med countries are close and trade with each other, each of those agreements cannot be handled alone, isolated from the others. For instance, each bilateral EuroMed agreement modifies prices of the signing Med country, which impacts prices of its neighbors, and in turn their real manufacturing GDP. Thus, one needs to distinguish the effects of a PTA taken in isolation (i.e. the treatment effect), from externalities created by other simultaneous trade policy changes.

We measure these effects using counterfactual estimation. Thus we can single out each agreement, and ask how it would have affected prices and trade flows, if nothing else had changed in world trade policy. In turn, it makes possible to study how the effects of PTAs were modified by externalities from other trade agreements.

[24]The eight Med countries are: Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, Tunisia and Turkey. Note however that Israel and Turkey began their trade liberalization with the EU before 2001: in 2000 for Israel and in 1996 for Turkey, which entered into a custom union with the EU.
[25]Note that these graphs only display a trade-weighted average over all manufacturing sectors, thus a large part of variation across sectors and partners is not apparent.
[26]The two PTAs are: (1) the Great Arab free trade agreement (GAFTA), implemented from 1997 to 2007, which comprises all countries of the Arab League (thus the 8 Med countries); (2) the Agadir agreements, implemented in 2004-2007, including Morocco, Tunisia, Egypt and Jordan.
[27]This was mandatory for Turkey as being in a custom union with the EU.

Table 1 – Tariff protection in Med countries



Average tariffs applied by Med countries vis-a-vis the EU, other Med countries, and countries outside the EuroMed region. Trade-weighted averages over manufacturing imports (2001 trade values). Source: MacMaps data. Med countries include Algeria, Egypt, Morocco, Tunisia, Turkey, Jordan, Lebanon, Libya, Syria, and the rest of the Middle-East region.

4.2. Trade effects

4.2.1. Impact of EuroMed agreements

What have been the effects of the EuroMed agreements on trade between each Med country and the EU? Tables (2) and (3) display the results from our counterfactual estimation that tears out the effect of observed preferential tariff reductions between 2001 and 2007, from that of parallel changes. Results suggest that the failure to account for these parallel changes may lead to a typical omitted variable bias.

Bilateral preferential tariff reductions We compute here the trade impact of each bilateral EuroMed agreement abstracting from other tariff changes in the world. Results are depicted in Table (2). The total impact is displayed in column (2), and decomposed into a direct effect from the tariff change (col. 3) and an indirect effect from changes in countries' prices and income (col. 4). Results in column (2) document that the bilateral EuroMed agreements yield substantial trade creation effects. Apart from Lebanon, Turkey and Israel (see Table 1), for which the liberalizing process was largely accomplished before 2001, trade creation ranged from 14 to 39%. Nevertheless, it is worth noting that these countries suffer from negative indirect effects, related to changes in countries' prices and income specific to the bilateral agreement (col. 3), which reduce the total trade creation effect.

Table 2 – Effects of each Euro-Med agreement on EU export values (in %)

	(1)	(2)	(3)	(4)
Importing Med country	Trade value (2001) (USD million)	*Euro-Med agreement in isolation*		
		Total	Direct	Indirect
Algeria	6221.1	18.4	22.2	-3.7
Morocco	6126.7	39.2	50.0	-10.8
Egypt	6047.0	32.0	34.5	-2.5
Tunisia	6926.1	18.0	23.6	-5.7
Jordan	1696.3	15.5	17.0	-1.4
Lebanon	3052.3	-0.6	-0.7	0.1
Turkey	18659.8	0.1	-0.1	0.2
Israel	11694.3	0.1	0.1	0.0

Notes: Each country row represents a counterfactual estimation of the effects of a Med's tariff reduction on EU export values to that country. All changes are in % of 2001 trade (col. 1). Col. 2: total effect of the bilateral tariff reduction. Col. 3: *direct* trade effect, keeping all else constant. Col. 4: *indirect* effect through multilateral price changes and changes in importer's income. Lebanon, Turkey and Israel are considered aside as most of their tariff barriers on EU products were already opened prior to 2001.

General tariff reductions Table 3 shows how bilateral trade effects are additionally modified by parallel integration processes, given that in each scenario, prices and incomes evolve differently, implying different indirect effects on bilateral trade flows. The parallel integration processes considered here are:

• the EuroMed, i.e., all eight bilateral EuroMed country agreements considered simultaneously (col. 2);

• the Intra-Med, i.e., all trade agreements between Med countries such as GAFTA and Agadir agreements (col. 3);

• other PTAs, i.e. all registered agreements implying the EU or one MENA country, other than the EuroMed and Intra-Med agreements[28] (col. 3);

• multilateral opening processes. We define these as containing all tariff reductions applied by any importer to a non-PTA partner (col. 4).

Table 3 – Effects of concurrent trade policy changes on EU export values (in %)

	(1)	(2)	(3)	(4)	(5)	(6)
Importing country	Bilateral effect	*Impact of parallel agreements:* EuroMed	Intra-Med	Other PTAs	Multilat.	Global effect
Algeria	18.4	-4.3	-1.3	-2.8	-4.6	13.6
Morocco	39.2	-11.1	-6.8	-10.6	-16.8	13.9
Egypt	32.0	-3.0	-2.6	-2.8	-31.2	1.3
Tunisia	18.0	-6.1	-4.0	-4.7	-12.8	-0.5
Jordan	15.5	-1.9	-1.8	-6.7	-11.7	-1.9
Lebanon	-0.6	-0.3	-0.0	-1.6	-0.6	-1.3
Turkey	0.1	-0.1	-0.0	-1.0	-3.7	-4.2
Israel	0.1	-0.4	0.0	-1.9	-3.1	-4.3

Notes: Each Med country row represents counterfactual estimations of various tariff reductions on EU exports to that country. All changes are in % of 2001 trade value. The tariff reductions considered are: Col. 1: total effect of the bilateral tariff reduction only (see col. 2 of Table 2). Col. 2-5: additional impacts of parallel tariff reductions: other EuroMed's (col. 2); Intramed (col. 3); all PTAs implying the EU or one Med country, others than the EuroMed and Intramed agreements (col. 4); multilateral tariff reductions (i.e., to non-PTA partners) (col. 5). Col. 6: global effect. Lebanon, Turkey and Israel are considered aside as most of their tariff barriers on EU products were already opened prior to 2001.

Column (2) illustrates strikingly the fact that the signature of other EuroMed agreements reduces the trade creation effect of a given bilateral EuroMed agreement (shown in column 1). Other integration processes, within the Med region (col. 3) or between Med and other countries (col. 4), also exert important trade diversion on EuroMed flows. In addition, multilateral tariff reductions implemented by some of these countries again reduce the trade creation effect of bilateral agreements (col. 5). This effect is particularly striking in the case of Egypt, a country which implemented important unilateral reductions of tariffs in the period; it is also large for Morocco, Tunisia and Jordan.

[28] Source: Baier and Bergstrand (2007), WTO, and Frankel (1997). See http://jdesousa.univ.free.fr/ for the corresponding code.

Column (6) depicts the total trade change resulting from all world tariff reductions observed in the data. Thus, this case includes all processes taken into account in columns (2) to (5), but also all changes in tariffs applied by non-Med countries.[29] Comparing columns (1) to (6) shows how different the treatment effect of a PTA on trade, taken in isolation, may be from the trade change implied by all parallel tariff changes. The externalities created by parallel integration processes are not negligible. In case of Egypt, Tunisia and Jordan, the combined diversion effects of preferential and multilateral liberalizing processes brings trade creation close to or below zero. Overall, the global impact of EuroMed agreements on bilateral trade has been significantly above zero for only 2 countries out of eight: Algeria and Morocco. Interestingly, figures in (1) show that these 2 countries are the ones that have reduced their trade barriers *relatively more* vis-a-vis the EU than with the rest of their partners. Thus, only for these two countries has the cost of EU imports become cheaper relatively to other origins, causing a surge in trade. This confirms the intuition that relative, not absolute, trade costs matter for trade flows.

4.2.2. Redistributing trade flows in the region

The above results show the need to consider the concurrent and simultaneous trade policy changes to infer how a given PTA affects trade. We now ask how each Med country has re-distributed its trade among its partners, as a result of its trade policy. In other words, which PTA has been effective in creating trade, and which has not?

Tables (4) and (5) depict how trade creation effects from signed PTAs compete with diversion effects of parallel PTAs and tariff reductions, as well as how each country has redistributed its trade among its partners (col. 8). The general conclusion is consistent with the above results: in most cases PTAs promote trade between partners; but the increase is often drastically reduced by diversion effects due to parallel tariff reductions. As a result, some PTAs do fail to increase trade. On the other hand, trade generally decreases with non-PTA partners, due to trade diversion. In some notable cases, however, tariff reductions with non-PTA partners yield a net trade increase.[30]

[29]Note that the total global effect (col. 6) is not the sum of col. 2 to 5, for three reasons. First, col. 2 already includes the indirect impact of the PTA agreement itself (see col. 4 of Table 2). Second, col. 6 includes tariff changes not accounted for in col. 2 to 5 and applied between non-Med, non-EU countries. Finally, all changes are computed in percentage of initial (2001) values and thus do not form a sequence adding up to the overall process in col. 6.

[30]This can be due to MFN reductions, consolidation margins reductions, or MFN tariffs applied to new WTO members (such as China in 2001).

Table 4 – Redistributing trade in the Med region

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Partner country	Trade value	Bilat. tariff change (%)	Trade creation	Trade diversion			Global trade change
				EuroMed	Intra-Med	Med-RoW	
Algeria's imports							
PTA partners							
EU25	6224.4	-3.9	17.9		-0.9	-4.0	13.9
Egypt	36.8	-3.7	32.9	-8.3		-14.8	18.0
Jordan	43.3	-9.6	33.3	-3.7		-3.3	30.2
Lebanon	18.4	-1.9	9.9	-11.0		-23.7	-8.9
Tunisia	75.0	-1.1	2.3	-10.0		-9.9	-10.2
non PTA partners							
Canada	55.7	-0.5	-0.5	-2.9	-0.4		-1.6
China	216.3	-0.6	0.7	-3.0	-0.7		0.2
India	40.2	-0.8	1.1	-3.9	-0.9		-1.9
Turkey	412.4	-0.6	2.5	-7.9		-2.9	-5.3
USA	932.9	-0.7	0.2	-2.5	-0.7		-1.1
South Africa	34.7	-0.3	-0.7	-2.4	-0.7		-3.2
Tunisia's imports							
PTA partners							
EU25	6928.7	-6.1	17.1		-4.1	-14.5	-0.6
Algeria	104.5	-1.0	0.9	-2.2		-16.8	-14.0
Egypt	49.0	-19.4	24.1	-3.4		6.2	29.7
Jordan	10.0	-11.0	43.8	-6.1		-15.9	27.5
Lebanon	6.9	-14.4	68.9	-15.4		-35.4	34.5
Morocco	65.0	-14.9	54.3	-5.9		-18.9	35.8
Turkey	119.4	-2.8	4.6	-7.9		-14.0	-15.1
non PTA partners							
Canada	18.8	-4.2	3.4	-6.7	-4.0		-3.5
China	145.8	-3.9	1.9	-6.2	-3.3		-4.2
India	53.4	-4.4	2.2	-5.6	-4.8		-7.2
USA	295.5	-4.7	4.9	-6.1	-3.0		-2.7
South Africa	6.5	-4.5	-0.2	-7.8	-4.7		-10.6
Morocco's imports							
PTA partners							
EU25	6130.2	-14.7	38.6		-6.6	-22.3	13.9
Egypt	44.0	-11.8	54.4	-13.7		-39.8	16.9
Jordan	3.8	-15.5	34.9	-8.9		-21.4	10.7
Lebanon	7.8	-13.1	98.6	-39.6		-64.2	36.6
Tunisia	39.3	-15.0	53.5	-14.9		-31.1	20.6
Turkey	99.5	-14.6	54.3	-15.5		-28.1	17.4
USA	276.9	-10.4	23.8	-8.5	-5.2		13.7
non PTA partners							
Canada	25.2	-5.9	-0.2	-12.3	-7.2		-13.4
China	323.1	-6.7	0.7	-8.7	-4.7		-8.2
India	82.3	-10.7	6.3	-10.2	-5.4		-5.5
South Africa	23.8	-5.1	5.5	-8.6	-7.0		-4.5

Notes: Col. 2: Trade values (2001) in bn.$. Trade effects in %. Col. 3: average bilateral tariff change (trade-weighted). Col. 4: direct and indirect effect of bilateral tariff reductions. Col. 5-7: indirect effect of each integration process on bilateral trade flows. Col. 8: total trade change accounting for all world tariff changes.

A more detailed look reveals the following points:

• Trade diversion due to EuroMed agreements is severe for Med countries; this is because they all buy a large part of their total imports from the EU. Therefore, the incidence of EuroMed agreements on their price indexes has been high.

• Tariff reduction with non-PTA partners is also an important source of trade diversion. Most countries have reduced their tariffs multilaterally while reducing bilateral protection with preferential partners, thus decreasing the margin of preference given to them.

• Again, the gap between trade creation from bilateral tariff reductions (col. 4), and global trade changes induced by all trade policy changes (col. 8), highlights the need to control for the latter when estimating PTA treatment effects on trade.

Table 5 – Redistributing trade in the Med region (Cont'd)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Partner country	Trade value	Bilat. tariff change (%)	Trade creation	Trade diversion			Global trade change
				EuroMed	Intra-Med	Med-RoW	
Egypt's imports							
PTA partners							
EU25	6048.2	-1.3	31.1		-2.8	-28.9	1.1
Algeria	2.6	-8.0	18.6	-1.7		-13.2	5.3
Jordan	28.4	-9.1	33.9	-2.7		-30.0	9.1
Lebanon	24.5	-21.5	62.3	-6.2		-51.3	17.8
Morocco	30.9	-10.0	24.7	-0.8		-16.3	8.8
Tunisia	26.7	-9.5	46.7	-3.5		-35.4	16.6
Turkey	347.9	-80.6	60.3	-8.7		-53.5	10.4
non PTA partners							
Canada	85.3	-3.2	-8.9	-2.8	-2.5		-8.9
China	883.9	-200.6	27.3	-10.2	-21.8		18.4
India	324.9	-21.4	8.6	-3.5	-3.7		4.9
USA	2397.1	-3.5	2.2	-2.4	-1.6		-0.4
South Africa	33.7	-36.9	8.0	-0.9	-7.3		9.2
Jordan's imports							
PTA partners							
EU25	1696.6	-3.9	14.5		-2.3	-15.5	-2.3
Algeria	21.8	-1.0	4.3	-1.0		-13.5	-5.6
Egypt	55.3	-6.7	18.0	-2.3		-12.8	6.0
Lebanon	32.0	-8.3	28.0	-2.8		-19.0	13.4
Morocco	12.4	-8.0	10.6	0.2		-5.0	4.3
Tunisia	5.4	-5.0	18.9	1.2		6.7	32.1
Turkey	126.1	-4.9	20.4	-4.2		-21.2	-1.6
USA	310.1	-3.3	1.7	-1.7	-2.6		-1.3
non PTA partners							
Canada	22.0	-3.9	1.8	-2.2	-3.4		0.4
China	332.3	-5.7	1.8	-1.6	-2.4		0.6
India	82.7	-4.0	1.9	-1.9	-2.4		-0.9
South Africa	22.2	-4.0	2.5	-1.8	-5.3		-3.0

Notes: Trade values (2001) in bn.$. Trade effects in %. Col. 3: average bilateral tariff change (trade-weighted). Col. 4: direct and indirect effect of bilateral tariff reductions. Col. 5-7: indirect effect of each integration process on bilateral trade flows. Col. 8: total trade change accounting for all world tariff changes.

4.3. Real income impacts

We now examine the impacts on real manufacturing income (GDP) of countries in order to identify the gains and losses from observed preferential liberalization.[31] As just documented trade creation between PTA members is often greatly reduced by the parallel trade policy changes. This does not imply that gains are absent for countries signing PTAs; contrary to trade creation, real income impacts are not characterized by negative externalities, so that gains from multiple agreements tend to add up. In addition, multiple liberalization processes reduce the losses from tariff distortions, which is also beneficial to the liberalizing country.

Table (6) displays real manufacturing GDP changes from three concurrent integration processes involving Med countries: EuroMed PTAs (col. 2), intra-Med PTAs[32] (col. 3), and all other processes between one Med country and non-EuroMed countries (col. 4). Moreover, the effect of all tariff changes implemented in the world from 2001 to 2007 are computed in column 5 (including tariff changes between non-EU, non-Med countries, which were turned off in columns 1-4).[33] Unsurprisingly, results reveal that preferential trade liberalization benefits members and harms non-members. This is a general result in this model as members of an agreement benefit from cheaper imports (lowering their price index) while mill export prices rise due the improved market access into the partner's market.[34] The magnitude of the effects then vary with tariff reductions and trade levels prior to liberalization.

In the case of the EuroMed agreements (col. 2), all member countries gain in real manufacturing GDP, while all non-members lose. The same holds true for the intra-Med integration. In particular, the EU stands to lose if it stays out of the regional Med integration process. Interestingly, countries engaged in trade liberalization with some Med countries (such as the USA, China, Brazil, India) mitigate their losses from regional integration (Col. 4).

Table (6) and column (5) in particular indicate why countries tend to sign multiple agreements (PTA proliferation) despite the low resulting effects in terms of trade creation. Multiple agreements tend to weaken each other's effect on trade, but this is not true for GDP impacts, so that gains add up for a country engaged in parallel processes of integration. This is a first element to understand PTA proliferation.

More importantly, by decomposing the effects of different integration processes, Table (6) shows that these gains are only obtained because countries mitigate adverse effects of non-membership by signing new agreements. This is evocative of the contagion or 'domino' effect

[31] Real manufacturing GDP is given by the value of total sales over consumers' price index; in this endowments model changes in real GDP boil down to changes in the ratio of export mill prices to consumers' price index.
[32] Comprising regional agreements such as the GAFTA and Agadir processes.
[33] Table (B.2) in appendix (B) displays real manufacturing GDP impacts of the EuroMed agreements signed between the EU and each of its south-Med partner countries, decomposing the effects of each bilateral agreement in this 'hub-and-spoke' structure.
[34] Recall that real income impacts displayed here do not include tariff revenues changes. In this context trade barriers act as a purely frictional cost on trade and lowering tariff raises unambiguously a country's income.

(Baldwin 1993) behind the proliferation of PTAs: implemented PTAs create a strong incentive for non-members to sign new PTAs.

Table 6 – Real manufacturing GDP changes from EuroMed and Intra-Med liberalization processes (in %)

(1)	(2)	(3)	(4)	(5)
Country	EuroMed	Intra-Med	Med-RoW	Global
EuroMed countries				
Algeria	0.447	0.068	0.985	0.638
Egypt	1.168	3.205	9.378	10.312
Jordan	0.337	1.537	3.224	4.142
Morocco	1.548	1.627	4.735	6.665
Tunisia	0.764	1.555	3.486	4.696
EU25	0.120	-0.008	-0.087	0.315
Lebanon	0.148	0.719	0.335	0.430
Turkey	0.183	0.275	1.484	1.090
Israel	0.073	0.007	1.806	1.498
Other countries/regions				
Brazil	-0.024	-0.008	0.076	1.550
China	-0.024	-0.016	0.092	1.819
EFTA	-0.015	-0.006	0.066	-0.446
USA	-0.011	-0.004	0.007	0.233
Canada	-0.031	-0.022	-0.039	-0.680
Iran	-0.013	-0.037	-0.530	-13.819
India	-0.014	-0.010	0.448	10.871
Japan	-0.043	-0.038	0.018	0.297
Korea	-0.039	-0.041	0.035	1.146
Oceania	-0.024	-0.042	0.040	0.189
RoAmerica	-0.020	-0.018	0.108	2.678
RoAsia	-0.012	-0.010	0.041	1.911
RoMEast	0.282	0.576	-0.220	3.297
Russia	-0.012	-0.006	0.020	1.071
RoAfrica	-0.033	-0.071	0.201	3.864
RoEurope	-0.025	-0.008	0.077	1.711
SouthAfrica	-0.008	-0.002	0.028	1.276

Notes: Real manufacturing GDP changes from EuroMed PTAs (Col. 2); Intra-Med PTAs (Col. 3); 'Med-RoW' process encompassing all tariff reductions observed from 2001 to 2007 (except EuroMed and IntraMed PTAs) (Col. 4); all observed tariff changes in the period (Col. 5). Countries and regions are defined in the text.

4.3.1. Substitution between integration processes

Countries signing PTAs in the region tend generally to gain in real income. But how does signing one PTA modify a country's incentive to engage in other preferential or multilateral integration processes in the future? Is there some path dependency in the expected sequence of agreements to be signed? This is an important question in the literature, where the debate over whether PTAs lead to global free trade is disputed (see Freund and Ornelas, 2010). In our study, we observe that Med countries liberalize their trade with the EU, between themselves, and with the rest of the World. We ask here if each of these integration processes should be viewed as substitutes or complements, from the viewpoint of the liberalizing country.

Table (7) looks at the substitution between tariff reduction with the EU and countries outside the region ('Rest of the World'). The two processes appear as substitutes for the liberalizing countries. More precisely, the gain from liberalizing trade with the EU (col. 2) decreases dramatically, once Med countries reduce trade protection with the 'Rest of the World' (col. 3). Conversely, gains from liberalizing with RoW partners are much less affected by integration with the EU.

Table 7 – Liberalize with the EU vs. the World (Real GDP changes in %)

(1)	(2)	(3)	(4)	(5)
Country	*Liberalize with the EU*		*Liberalize with the RoW*	
	without RoW	with RoW	without EU	EU
Algeria	0.449	0.004	1.020	1.014
Egypt	1.159	0.003	9.478	8.596
Morocco	1.661	0.013	4.992	4.633
Jordan	0.298	0.004	3.450	3.541
Tunisia	0.875	0.008	3.754	3.646

Notes: Real manufacturing GDP changes from trade liberalization with: (i) the EU, starting before (col. 2) or after (col. 3) tariff reductions with non-EuroMed countries; (ii) the RoW countries, starting before (col. 4) or after (col. 5) tariff reductions with the EU.

This table suggests that preferential liberalization is dominated by the multilateral option, in the sense that the gains from preferential liberalization virtually disappear once a country has engaged in multilateral (or quasi-multilateral) liberalization.[35] This comes from the fact that a multilateral liberalizing has a bigger incidence on Med countries' prices and trade: it redistributes trade away from the EU and reduces the EU share of imports. After this, granting preference to EU exporters becomes less beneficial for consumers.

Similarly, Table (8) looks at substitution between liberalizing trade with the EU versus within the Med region, from the viewpoint of Med countries. Here also, real GDP gains from one integration process diminish after engaging in a concurrent process. This is more true for gains from integrating with the EU (col. 2), which diminish sharply after intra-Med integration (col. 3). Thus, again, the most discriminatory liberalizing option (with the EU) appears to be dominated by the less discriminatory option (within the Med region, involving more partner countries).

These results shed some light on the question of the dynamics of PTAs and their proliferation. They go against the hypothesis of stumbling blocks, whereby a country engaging in preferential liberalization should lose interest in multilateral liberalization. The contrary is true here: liberalizing in a less discriminatory manner (i.e., with a larger number of partners) remains attractive even after preferential liberalization; while countries engaging in multilateral liberalization should lose interest in preferential arrangements.

[35]Note that we consider here tariff reductions by each Med country with all countries except the EU and other Med partners, as a proxy for multilateral liberalization. So, this 'multilateral option' also includes bilateral preferential tariff reductions (such as the Morocco-US, Jordan-Canada PTAs), on top of multilateral reductions implemented by these countries.

Table 8 – Liberalize with the EU vs. within Med region (Real GDP changes in %)

(1)	(2)	(3)	(4)	(5)
Country	*Liberalize with the EU*		*Intra-Med liberalization*	
	without intra-Med	with intra-Med	without the EU	with the EU
Algeria	0.449	0.005	-0.042	-0.053
Egypt	1.159	0.008	3.186	2.743
Morocco	1.661	0.015	1.558	1.412
Jordan	0.298	0.003	1.498	1.436
Tunisia	0.875	0.007	1.547	1.486

Notes: Real manufacturing GDP changes from trade liberalization with: (i) the EU, starting before (col. 2) or after (col. 3) tariff reductions with non-EuroMed countries; (ii) the RoW countries, starting before (col. 4) or after (col.5) tariff reductions with the EU.

However, this seems at odds with the reality of trade policy negotiations, with multilateral talks on a standstill while numerous preferential agreements continue to be signed. This is suggestive of what is missing in the model. First, political considerations may contribute to the countries' interest in signing agreements with specific partners. Second, the terms-of-trade hypothesis states that countries have an incentive to maintain positive tariffs in order to manipulate world prices. In that case, multilateral liberalization requires solving a collective action problem ("terms-of-trade prisoner's dilemma"), which requires a negotiation instrument, which is the raison d'etre of the WTO (Bagwell and Staiger, 2011). By contrast, such considerations are absent of our model, in which the gains to consumers from liberalizing trade always dominate over the losses to domestic producers.

4.4. Robustness checks

We assess here how much of our results on PTA effects depend on the used estimator (OLS-CYFE, PPML and double-difference). These results rely on the values obtained from the sector-level demand elasticities. Despite the variation of those elasticities (see Section 3), we show that our PTA effects are quite stable across the estimation methods. This is because our results are based on the sum of sector-level effects combining elasticity estimates with detailed information on tariff changes. Moreover, final results do not rely exclusively on those estimates but also for a large part on tariff data.

Table (9) compares the results of the trade effects of the EuroMed agreements, using elasticity estimates from the three methods.[36] Trade changes are highly correlated. Across all country pairs, global trade changes (resulting from all tariff changes in the data over 2001-2007) obtained from OLS with country-year fixed-effects and double-difference methods are correlated at 91%. The correlation is 61% for OLS-CYFE and PPML results. The correlation is higher when focusing on a particular agreement: for instance, for the EU-Tunisia agreement the correlation is 94% for OLS-CYFE and double-difference results and 90% for OLS-CYFE and

[36]Note that for expositional convenience the top panel of Table (9) for OLS-CYFE results has been decomposed into two tables: col. (2-5) in Table (2) and col (3 and 6-9) in Table (3).

PPML.

Thus, despite variations in magnitude, the results on PTA effects are stable and qualitatively similar. Direct, indirect and total effects have the same sign across the 3 methods for most countries, except in some cases where the effect is around 0.

Table 9 – Trade effect of EuroMed agreements: Robustness checks (in %)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Country	Trade value	*Bilateral agreement*			*Indirect impact of*			Global
	2001 (m. $)	Total	Direct	Indirect	EuroMed	Intra-Med	Med-RoW	effect
OLS country-year fixed-effects results								
Algeria	6221.1	18.4	22.2	-3.7	-4.3	-1.3	-2.8	13.6
Morocco	6126.7	39.2	50.0	-10.8	-11.1	-6.8	-10.6	13.9
Egypt	6047.0	32.0	34.5	-2.5	-3.0	-2.6	-2.8	1.3
Tunisia	6926.1	18.0	23.6	-5.7	-6.1	-4.0	-4.7	-0.5
Jordan	1696.3	15.5	17.0	-1.4	-1.9	-1.8	-6.7	-1.9
Lebanon	3052.3	-0.6	-0.7	0.1	-0.3	0.0	-1.6	-1.3
Turkey	18659.8	0.1	-0.1	0.2	-0.1	0.0	-1	-4.2
Israel	11694.3	0.1	0.1	0.0	-0.4	0.0	-1.9	-4.3
Double-difference results								
Algeria	6221.1	12.7	15.5	-2.8	-3.4	-0.5	-1.1	9.7
Morocco	6126.7	31.2	40.4	-9.2	-10.0	-4.2	-9.5	10.3
Egypt	6047.0	25.3	28.1	-2.8	-3.5	-1.8	-9.0	0.4
Tunisia	6926.1	14.3	20.0	-5.8	-6.6	-2.6	-5.2	0.1
Jordan	1696.3	11.4	13.8	-2.4	-2.0	-1.8	-5.3	-1.1
Lebanon	3052.3	-0.7	0.2	-0.8	-0.7	-0.7	-0.9	-0.9
Turkey	18659.8	-0.2	-0.1	-0.1	-0.4	-0.1	-0.7	-3.5
Israel	11694.3		-0.1		-0.6	-0.2	0.1	-3.5
PPML results								
Algeria	6221.1	5.3	6.4	-1.0	-1.1	0.3	0.1	4.7
Morocco	6126.7	26.5	39.3	-12.9	-12.9	-2.7	-5.7	15.9
Egypt	6047.0	21.8	31.8	-10.0	-10.0	-1.4	-12.4	3.4
Tunisia	6926.1	11.8	19.0	-7.2	-7.2	-1.2	-2.7	6.1
Jordan	1696.3	5.7	6.9	-1.2	-1.2	-0.5	-2.2	-0.5
Lebanon	3052.3	0.9	0.7	0.2	0.2	0.2	0.2	0.4
Turkey	18659.8	0.2	-0.0	0.3	0.2	0.7	-0.4	-0.9
Israel	11694.3		-0.0		-1.0	-0.9	-0.9	-4.1

Notes: Col. 2: Trade values (2001) in bn.$. Results in the first panel are computed using sector-level elasticities obtained by OLS-CYFE estimation. Results from the two other panels are obtained with coefficients from the double-diff and PPML estimation.

5. Conclusion

In this paper we have proposed an innovative and rigorous method for the estimation of the trade, price, real manufacturing GDP of Preferential Trade Agreements. This method addresses a number of issues inherent to this exercise. In particular, the estimation is based on the real content of trade agreements, thus accounting for differences in content, depth, and time implementation of implemented PTAs. By dissociating the estimation of sector-level demand elasticities, based on total world trade, from the computation of counterfactual PTA effects, this method allows to mitigate the endogeneity problem in the measurement of PTA effects. Using counterfactual estimation, we measure separately treatment effects of one agreement on trade and prices from externalities due to concurrent preferential agreements and multiple trade policy changes.

Applying this method to the case of trade agreements in the EU-MENA region, we show the importance of accounting for indirect effects in the estimation of PTA impacts, when multiple agreements are implemented concurrently. The effect of a bilateral agreement, taken in isolation, differs widely from the actual trade change occurring as a result of multiple trade policy changes. Econometric estimation of PTA effects with gravity equations alone does not distinguish between these two effects. In contrast, our method, based on counterfactual estimation, does. Moreover, we are able to study the impact of the different agreements on a given trade relationship, and thus to quantify precisely diversion effects. We show that trade diversion is important, and may revert the expected trade creation effect from signing a PTA.

Turning to PTA impacts on real GDP of countries, we show that most trade agreements yield important gains to members, even in those cases where trade creation is limited. This helps explain the proliferation of agreements, as countries stand to gain from engaging in multiple agreements even if trade creation with each partner will be limited. In addition, losses to non-members creates another incentive for joining existing agreements or engaging in new ones. Finally, we examine the preferential vs. multilateral opening options for a set of countries and find that gains from multilateral liberalization are not diminished after engaging in preferential liberalization, which goes against the hypothesis of preferential agreements as 'stumbling blocks' to multilateral liberalization.

REFERENCES

Anderson, J. and van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. *American Economic Review*, 93(1):170–192.

Anderson, J. and Yotov, Y. (2010). The changing incidence of geography. *American Economic Review*, 100(3):2157–86.

Anderson, J. and Yotov, Y. (2011). Terms of trade and global efficiency effects of free trade agreements, 1990-2002. *NBER Working Papers # 17003*.

Bagwell, K. and Staiger, R. (2011). What do trade negotiators negotiate about? empirical evidence from the world trade organization. *American Economic Review*, 101(4):1238–1273.

Baier, S. and Bergstrand, J. (2009). Bonus vetus ols: A simple method for approximating international trade-cost effects using the gravity equation. *Journal of International Economics*, 77(1):77–85.

Baldwin, R. (1993). A domino theory of regionalism. *NBER working paper #4465*.

Boumellassa, H., Laborde, D., and Mitaritonna, C. (2009). A picture of tariff protection across the world in 2004 macmap-hs6, version 2. Working Papers 22, CEPII research center.

Bouët, A., Decreux, Y., Fontagné, L., Jean, S., and Laborde, D. (2088). Assessing applied protection across the world. *Review of International Economics*, 16(5):850–863.

Broda, C., Limao, N., and Weinstein, D. (2008). Optimal tariffs and market power: the evidence. *American Economic Review*, 98(5):2032–2065.

DeRosa, D. and Gilbert, J. (2005). Predicting trade expansion under ftas and multilateral agreements. *Peterson Institute for International Economics, WP05-13*.

Egger, P., Larch, M., Staub, K., and Winkelmann, R. (2011). The trade effects of endogenous preferential trade agreements. *American Economic Journal: Economic Policy*, 3(3):113–43.

Freund, C. and Ornelas, E. (2010). Regional trade agreements. *Annual Review of Economics*, 2:139–167.

Hummels, D. (1999). Toward a geography of trade costs. *GTAP Working Papers # 1162, Purdue University*.

Ludema, R. and Mayda, A. (2011). Do terms-of-trade effects matter for trade agreements? theory and evidence from wto countries. *mimeo*.

Olivero, M. and Yotov, Y. (2012). Dynamic gravity: Theory and empirical implications. *Canadian Journal of Economics*, 45(1):64–92.

Romalis, J. (2007). Nafta's and cusfta's impact on international trade. *Review of Economics and Statistics*, 89(3):416–35.

Santos Silva, J. and Tenreyro, S. (2006a). The log of gravity. *Review of Economics and Statistics*, 88(4):641–658.

Santos Silva, J. and Tenreyro, S. (2006b). Poisson: Some convergence issues. *Stata Journal*, 11(2):215–225.

Trefler, D. (2004). The long and short of the canada-u.s. free trade agreement. *AER*, 94(4):870–95.

WTO (2011). *World Trade Report*. World Trade Organization, Geneva.

APPENDIX

A. Estimation of sector elasticities

Table A.1 – Sector elasticities estimates

	OLS-CYFE			Double-Difference			PPML		
Sectors ISIC	Coeff.	std. error	Obs.	Coeff.	std. error	Obs.	Coeff.	std. error	Obs.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
151	-1.66	0.45	2,199	-1.72	0.67	1,984	-0.35	0.39	2,468
152	-1.45	0.46	1,893	-1.01	0.55	1,612	-0.93	0.43	2,468
153	-1.40	0.30	1,822	-0.98	0.45	1,525	-1.18	0.21	2,468
154	-1.78	0.44	2,109	-1.80	0.55	1,859	-0.77	0.37	2,468
155	-0.44	0.21	1,778	-0.36	0.27	1,466	-1.60	0.66	2,439
160	-0.74	0.42	1,379	-0.83	0.58	1,043	-1.86	0.50	2,410
171	-2.11	1.10	2,072	-2.07	1.49	1,815	-2.59	1.22	2,468
172	-2.92	0.59	2,148	-1.24	0.42	1,914	-4.43	1.16	2,468
173	-0.76	0.77	1,949	0.23	0.72	1,673	-6.04	1.38	2,468
181	-1.29	0.68	2,129	-0.40	0.65	1,872	-2.63	1.23	2,468
182	-3.59	1.75	1,088	-8.92	2.99	796	-4.03	2.33	2,383
191	-5.00	1.36	2,006	-11.34	2.42	1,737	-3.62	1.96	2,468
192	-1.14	1.08	1,876	-2.87	1.80	1,571	0.42	1.39	2,468
201	-8.33	2.57	1,512	-7.51	2.76	1,179	-12.14	2.56	2,381
202	-3.26	1.30	2,024	-3.11	1.78	1,739	-3.73	1.90	2,468
210	-10.44	1.53	2,092	-7.92	1.69	1,844	-7.84	2.06	2,468
221	-11.95	1.99	2,101	-8.72	2.27	1,858	-5.80	3.62	2,468
222	-8.15	1.43	1,946	-11.03	2.20	1,668	-5.68	1.86	2,440
232	-3.55	1.96	1,937	-0.86	1.96	1,634	2.11	1.73	2,468
241	-9.42	1.87	2,234	-5.04	1.73	2,026	0.86	1.80	2,410
242	-1.98	0.78	2,270	-1.98	0.79	2,074	3.08	0.84	2,468
243	-6.89	2.27	1,578	-7.60	2.84	1,225	-14.01	2.56	2,354
251	-6.78	1.19	2,077	-4.21	1.01	1,773	-0.17	1.03	2,410
252	-8.95	1.32	2,206	-5.75	1.51	1,991	-4.69	1.20	2,468
261	-3.74	1.35	2,085	-0.98	1.97	1,825	-1.48	2.19	2,468
269	-3.75	0.97	2,125	-4.17	1.53	1,875	-5.61	1.69	2,468
271	-5.41	2.25	2,069	-4.20	2.30	1,799	1.49	2.02	2,468
272	-15.65	2.10	2,059	-4.31	2.28	1,761	-0.41	3.35	2,468
281	-10.35	1.78	1,883	-8.25	2.64	1,582	-6.34	1.96	2,468
289	-4.29	1.12	2,216	-4.14	1.82	1,991	-5.59	1.25	2,468
291	-8.51	1.74	2,215	-8.32	3.02	1,989	-6.56	2.26	2,468

Continued on next page

	OLS-CYFE			Double-Difference			PPML		
Sectors ISIC	Coeff.	std. error	Obs.	Coeff.	std. error	Obs.	Coeff.	std. error	Obs.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
292	-6.98	2.74	2,206	-11.05	4.02	1,977	-9.05	3.51	2,468
293	-5.54	1.32	1,942	-7.50	2.07	1,658	-1.66	2.38	2,410
300	-2.38	2.98	2,046	0.08	4.87	1,778	7.32	4.88	2,468
311	-7.73	1.95	2,041	-7.37	2.95	1,764	-4.65	2.14	2,440
312	-6.29	1.72	2,018	-6.15	1.87	1,738	-5.22	1.38	2,438
313	-10.16	1.76	1,832	-5.58	2.64	1,507	-5.95	1.51	2,410
314	-5.41	1.42	1,988	-4.40	1.80	1,710	-2.46	1.59	2,410
315	-4.93	1.01	1,975	-7.14	1.98	1,684	-4.04	1.69	2,468
319	-6.06	1.63	1,973	-1.94	2.77	1,679	-5.28	1.98	2,410
321	-0.59	2.66	1,884	0.13	4.27	1,579	-9.45	3.50	2,438
322	-1.26	0.84	1,914	-1.98	1.02	1,612	0.53	0.76	2,410
323	-5.30	1.28	1,961	-4.15	1.89	1,680	0.23	2.49	2,468
331	-8.55	2.67	2,145	-13.08	3.14	1,896	3.05	1.92	2,468
332	-1.56	1.50	1,813	-4.24	2.10	1,512	15.86	3.48	2,440
333	-3.94	1.98	1,662	-6.21	2.31	1,347	-3.41	2.50	2,410
341	-3.19	0.99	1,879	-1.48	1.19	1,575	-5.73	1.37	2,438
342	0.16	1.51	1,579	-4.67	2.14	1,237	-4.70	2.51	2,410
343	-11.27	1.23	2,082	-10.86	1.76	1,815	-7.63	1.95	2,410
352	-10.61	3.34	1,086	-11.31	8.42	743	-33.92	5.17	2,242
353	-8.92	3.45	1,563	-5.42	5.09	1,230	1.57	4.85	2,382
359	-3.78	1.27	1,610	-9.57	2.29	1,288	3.61	1.55	2,381
361	-6.10	0.95	2,066	-3.39	1.25	1,809	-7.84	1.87	2,468
369	-3.42	1.04	2,176	-4.39	1.42	1,939	-3.61	1.39	2,468

Notes: Estimation of sector-level CES demand elasticities based on equation (18), for manufacturing sectors. Heteroscedasticity-robust standard errors are reported in parentheses. OLS-CYFE and PPML estimators use importer-year and exporter-year fixed-effects. The double-difference estimator uses exporter-year fixed effects. The table reports coefficients obtained on the tariff variable, which corresponds to the factor $1-\sigma$ in the model. R^2 are in the range of 0.6-0.86 for OLS-CYFE, 0.27-0.69 for double-difference, 0.71-0.99 for PPML.

B. Decomposition of real income effects of the EuroMed process

Table (B.2) displays real manufacturing GDP impacts of the EuroMed agreements signed between the EU and each of its south-Med partner countries, decomposing the effects of each bilateral agreement in this 'hub-and-spoke' structure. It shows that each Med country liberalizing with the EU benefits from an improvement in real GDP (diagonal of the table). But, at the same time, for each bilateral agreement, non-member countries in the region are negatively impacted. Non-member countries face a classic diversion effect, which forces their export prices down. In addition they face costlier imports from the EU following the given agreement. This helps explain why PTAs tend also to be Regional Trade Agreements involving all countries in a region: each country faces a loss if some agreements are signed in the region without its participation.

Table B.2 – Real manuf. GDP changes of EuroMed agreements (in %)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Country	Bilateral agreements					Whole EuroMed
	EU-Algeria	EU-Egypt	EU-Jordan	EU-Morocco	EU-Tunisia	process
Algeria	*0.478*	-0.005	-0.004	-0.012	-0.003	0.447
Egypt	-0.010	*1.210*	-0.009	-0.033	-0.012	1.168
Jordan	-0.013	-0.021	*0.415*	-0.055	-0.017	0.337
Morocco	-0.010	-0.043	-0.009	*1.604*	-0.008	1.548
Tunisia	-0.004	-0.055	-0.006	-0.014	*0.840*	0.764
EU25	0.007	0.019	0.008	0.032	0.018	0.120

Notes: For aggregation, export (f.o.b) prices at sector level are weighted by sector shares of total exports (proxy for sector production share) of 2001; sector-level import price indexes are weighted by expenditure shares. Col. 2-6: Real manufacturing GDP changes resulting from each bilateral EuroMed agreement; Col. 7: the whole EuroMed process.

When all EuroMed agreements are signed (col. 7), all countries in the region gain in real GDP, with gains ranging from 0.36% for Jordan to 1.61% for Morocco; while the EU gains 0.15%. Thus for each country, positive effects from the bilateral agreement dominates over diversion effect from the other EuroMed agreements.

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