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Trade Impacts of Selected Free Trade Agreements on Agriculture: The Case of Selected North African Countries

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Abstract

The objective of the study is to examine the impact of free trade agreements (FTA) with agricultural trade flow in general and dairy, vegetable, live animals, meat and sugar in particular. To achieve the objective the paper employs gravity model through compiling panel data. The study focuses on selected North African countries (Algeria, Egypt, Morocco and Tunisia) as reporting countries and the rest of the world as partner countries. Accordingly, the study finds that being a member of trade agreement (FTA) is positively associated with aggregate agricultural trade flow. In fact, trade agreement could increase agricultural trade flow by around 39 percent in trade volume (USD). Further, the study finds the potential of trade creation. In fact, the trade agreement with EU created a market for former Soviet countries (Latvia and Lithuania). Notably, due to the trade accord, the countries start exporting commodities such dairy and vegetable products. However, despite the results, the disaggregate agriculture fails to have a similar association. For instance, vegetable trade flow is positively influenced by FTA while live animals trade is affected negatively by FTA. Therefore, it requires vigilance when making a conclusion regarding the effect of FTA on disaggregates agriculture trade flow.

Keywords

Agriculture, panel data, gravity model, trade flow.

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Introduction

There have been several types of research regarding the effect of trade agreement (TA) on the economy. More specially, the previous study includes the TAs effect on the volume of trade, economic growth, well-being, foreign directed investment (FDI), environment, prices, industries, and agriculture sector. However, the debate on the effect of a trade agreement to the economy remains controversial. In fact, the finding seems to differ based on the studies use of methodology, data, region and countries, and commodities considered. For instance, the impact of the trade agreement on agriculture differs depending the area and countries (Svatoš et al., 2014; Smutka, and Burianová, 2013). Therefore, the impact of the trade agreement on agriculture receives considerable attention in the case of developing countries. Developing countries are concerned because they heavily depend on agriculture, and developed countries tend to protect the agriculture sector (Svatoš et al., 2010; Svatoš and Smutka, 2009) through subsidy and import barriers (Hoekman and Olarreaga, 2004).

Hence, taking into account the prominent of the agriculture sector in creating employment, input to other industries, and saving and generating foreign currency, many developing countries used to protect their agriculture sector through high tariff. Consequently, exploring the impact of trade agreements on both exports and imports of agriculture is vital. However, surprisingly the area is relatively unexplored, despite the relevance of the issue to low-income countries.

Therefore, this paper aspires to add an input, to this relatively unexplored empirical literature. Accordingly, the research is conducted with the objective of providing a policy input to policy and decision maker through identifying the causal effect of trade agreement and agriculture. Further, the paper aims to contribute to the existing empirical literature through examining the effect of the trade agreement on the agricultural

exports and imports of Algeria, Egypt, Morocco, and Tunisia. The selection of the countries is based on the relevance of agriculture sector to their respective economy and the fact that this study is relatively unexplored in the region make it a valuable addition to the literature. Additionally, the similarity of countries in culture, religion, language, and geography make them a natural control and treatment countries in examining the effect of trade policy.

The next section discusses the key theoretical and empirical issues in the influence of the trade agreement on some macroeconomic variables and agriculture trade flow. Next to the practical and theoretic issues, gravity model specification and data will be discussed. Following methodology and data, the empirical result from gravity model will be analysed. In the last section, policy implication and conclusions will be discussed.

Review of literature

There are several empirical papers trying to examine the effect of trade agreement. One from them is (Grant and Lamber, 2008) using modified gravity model examines the effect of regional trade agreements (RTA) on agricultural trade flow. Unlike the traditional gravity studies, which applies aggregate data, in this study the authors take separate data for agriculture and non-agriculture trade flow, conceding the effect could be different based on the type of products. Accordingly, the authors examine if trade agreement increases agricultural trade flow more than non-agricultural products. Further, the study examines whether phases in the RTA agreement have a significant impact. The ex-post finding shows that there is an evidence confirming trade-flow of agriculture increasing more than non-agriculture. Further, it is evident it could take several years for a trade agreement to take an effect on agricultural trade flow.

In a similar vein, (Sun and Reed 2010) through employing both Poisson Pseudo-Maximum-Likelihood (PPML) and gravity model they examine the effect of free trade agreements (FTA) on agriculture. Particularly, the study focuses on trade creation and diversion in response to trade agreements (FTA). In the outset, the paper finds that PPML estimation gives a different result to OLS estimation. Notably, when the zero trade is taken into the study the finding from PPML fundamentally differ from OLS. Accordingly, the study finds that free trade agreements (FTA) such as ASEAN-China, EU-15, EU-25, and SADC increased agricultural trade among member countries. More specifically, EU-15 increases agricultural trade among members through diversion of trade while in the SADC it increases through trade creation. In fact, in the case of SADC non-member countries were also beneficial from the trade agreement. On a contrary, NAFTA created trade diversion only. For that matter, NAFTA failed to establish trade.

Similar to Sun and Reed (2010), Koo et al. (2006) take trade agreements such as the Caribbean community and common market (CARICOM), EU-15, the southern common market (MERCOSUR), and the North American free trade agreement (NAFTA), examine the effect of trade agreements on agricultural trade. However, uniquely from the previous papers, the authors study the externality of the trade agreements as well. More specifically, the study examines the diversion effect of the trade agreement to non-members as well. The diversion is studied through employing dummy variables. Accordingly, the finding shows that on one hand NAFTA failed to have a significant effect in increasing agricultural trade flow between members. On other hands, the agricultural trade diversion from non-member countries into member countries is insignificant. The possible explanation, for the insignificance of the NAFTA, is that the countries have already an established trade flow because of the proximity. The non-existence of diversion effect shows that non-members countries may not be affected by trade agreements.

Lambert and McKoy (2009), admitting non-existence of the effect of sectoral analysis on agriculture, examine the effect of PTA on agriculture and food products. To achieve the objective, the paper employs gravity model and both inter-bloc and extra-bloc agricultural trade. Accordingly, the study shows that intra-bloc agricultural trade increasing due to a preferential trade agreement (PTA). This finding confirms that PTA results in a creation of trade among signatory countries. However, the result also confirms that it results in trade diversion from extra-bloc to intra-bloc countries. The diversion is particularly prevalent in developing countries.

In another seminal paper (Anderson and Valenzuela, 2007) estimates the effect of trade distortions on value-added agricultural output in different countries. The study reveals that moving towards free trade farm income in developing countries increases. The move towards free trade results in alleviating poverty in developing countries. Further, the study found net food importers are

also benefiting despite the term of trade distortions. However, the finding does not show each and every developing country farmers income improves from the globalisation. Last but not least, own countries trade distortion policies tend to harm the agriculture sector more than the non-agriculture sector. In a nutshell, the research concludes that multilateral trade among countries is beneficial in improving farmer's net income.

Medvedev (2006) in his article studies the effect of preferential trade agreements (PTA) on the trade flow of member countries. To achieve the objective, the author employs world trade matrix and detailed enforced preferential trade agreements (PTA). In compiling the essential database, the author considers trade pattern between PTA countries is a weak measure of preferential trade. In fact, using gravity model and total trade to estimate the effect of PTA on Trade flow between signatory countries will result in a biased PTA coefficient. More specifically, the coefficient would be downward biased. Therefore, the author aspires to solve the problem through using world trade matrix and detailed enforced preferential trade agreements (PTA). Accordingly, the author finds the aggregate trade agreements have a significant effect on trade flow. However, the marginal impact of trade agreements differs. For instance, the impact of south-south preferential trade agreements is more than north-south preferential trade agreements. Further, the finding shows that the north-north agreement to have affecting significantly.

Another important article by Miljkovic and Shaik, (2010) estimate the impact of trade openness on technical efficiency of agriculture sector in the US. The study is conducted using stochastic frontier analysis (SFA). The finding shows that trade openness fails to influence the technical efficiency of the agriculture sector in the US significantly. Further, there is no difference even after dividing the trade openness into the share of export and import. The finding means that importing agricultural commodities after removing some tariff barriers fails to boost the agriculture productivity in the US. Similarly, an export increase due to fewer restrictions in trading countries fails to improve the technical efficient of agriculture in the US. Therefore, the trade openness does not have a positive effect on the technical efficiency of the agriculture sector.

In more particular and relevant article, Aghrout (2007) examines the impact of a bilateral trade agreement. More specifically, the author examines Algerian trade association agreement with European Union (EU). The finding shows that the new partnership agreement results in eliminating the preferential status of Algeria with European countries (EU). However, Algeria remains to benefit from the trade agreement for the export items. Last but not least, the author also examines the potential effect of the trade agreement on foreign directed investment (FDI) flow into Algeria. Accordingly, the result shows that the effect is minimal. The potential effect is that the agreement affects the FDI slightly, and this is also in line with the general FDI flow into the region.

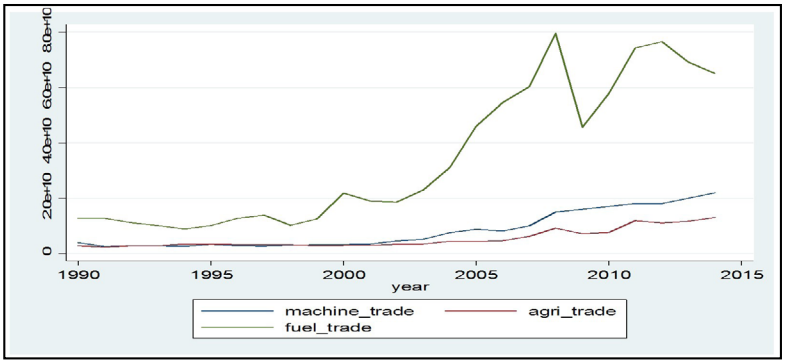
Trade structure of selected countries

As we can observe in the figure below the main export and import commodities of Algeria includes machinery, agriculture, and petroleum. Particularly, from 2000 onwards the trade flow increases. For instance in 2014, Algeria trade balance was $3.62B with $63.7B export and $60B import. The top export items include petroleum ($60.7B), coal ($1B), Ammonia ($603M) and others. On other hand, the top import includes cars and trucks ($4.18B), wheat ($2.3B), petroleum ($2.06B), medicaments ($1.91B) (Figure 1).

Similarly, agriculture trade consists the majority of the traded commodes from 1990 to 2000. However, after 2000 petroleum trade over takes the agriculture trade. While it over takes machinery trade. For instance, in 2014, Egypt trade balance was negative $49.2B with $33.2B export and $82.4B import. The top export commodities include petroleum ($8.14B), wire ($996M), video displays ($757M), and gold ($667M). While the top imports constitute refined petroleum ($10.26B), wheat ($5.36B), iron ($2.9B) and cars ($2.27B). AS can be seen from the figure Algeria and Egypt import a significant amount of wheat from abroad (Figure 2).

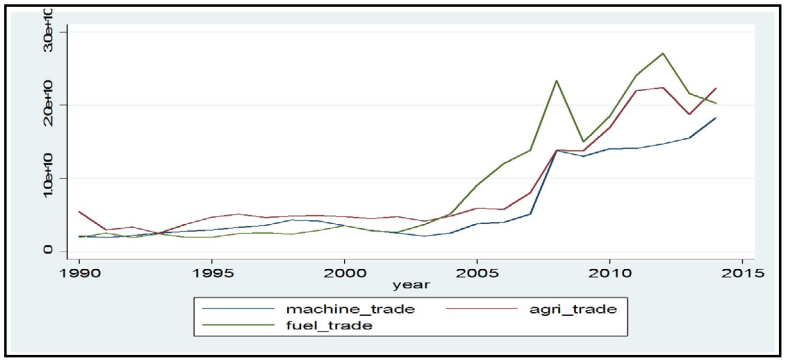
From 1990 to 2000 agriculture takes the lion's share of trade in case of morocco and followed by machinery and petroleum trade. However, after 2000 the share of agricultural trade decreased proportionally as compared to machinery and petroleum trade. For instance in 2014, Morocco trade balance was negative $17.1B with $27.8B export and $44.9N import. The exports includes wire ($3.02B), minerals and chemicals ($5.62B), and suits ($1.35B). on the other hand, petroleum consists ($8.77B), cars ($1.64B), and wheat ($1.42B) (Figure 3).

Similarly, to the previous North African countries,



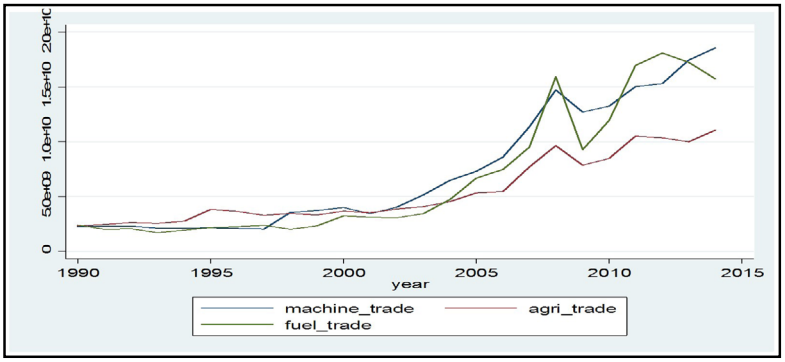
Source: Authors own stata plot

Figure 1: Algeria trade flow.



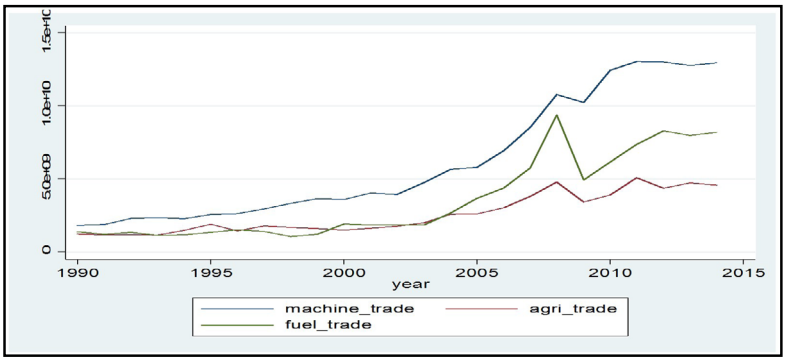
Source: Authors own stata plot

Figure 2: Egypttrade flow.



Source: Authors own stata plot

Figure 3: Morocco trade flow.



Source: Authors own stata plot

Figure 4: Tunisia trade flow.

Tunisia's trade structure shows that agriculture plays an import role following machinery and petroleum trade flow. If we examine the trade flow it shows a significant increase from 1990 to 2015. If we observe the dynamics, for instance in 2014, Tunisia imported $22.7B and exported $16.1B remaining with $6.54B negative trade balance. The export constitutes, wire ($1.78B), suits ($1.76B), petroleum($1.33B), and others. While the top imports constitute petroleum ($4.02B), cars ($603M), wheat ($464M) and others agriculture and non-agriculture commodities (Figure 4).

Materials and methods

Methods

According to the gravity model, the pattern of trade among nations is determined primarily by distance and economic size of trading countries. The model stipulates that countries with large economy are likely to produce, consume and export more. These countries will be able to generate more revenue and spending it by importing other commodities. Further, the model assumes geographical location between countries have an impact on both cost of export and import. The basic gravity model assumes only economy size and distance between countries determine trade.

After some refinements and extensions, the gravity model is heavily used in studying the effect of trade agreements. Further, empirically it is proven to be useful in identifying the effect of trade agreements on agricultural trade, economic growth, foreign directed investment, human development, price stability, employment, women's decision making power and so on. Therefore, following works of Anderson (1979), Deardorff (1998), Baier and Bergstrand (2001), Eaton and Kortum (2002), Anderson and van Wincoop (2003) and Baier and Bergstrand (2007) we will estimate the causality between free trade agreement (FTA) and Agricultural trade flow.

According to this model, the impact of trade agreement can be estimated using the gravity model as follows:

$$lnAGR_{ij} = \gamma_0 + \gamma_1 lnGDP_i + \gamma_2 lnGDP_j + \gamma_3 lnPOP_i + \gamma_4 lnPOP_j + \gamma_5 DIST_{ij} + \gamma_6 LANG_{ij} + \gamma_7 COLONY_{ij} + \gamma_8 FTA_{ij} + \varepsilon_{ij} \quad (1)$$

Where: AGR_{ij} is the value of agricultural trade flow from country i to country j. GDP_i and GDP_j represent nominal domestic product in both country i and j respectively. The variables $nPOP_i$ and $lnPOP_j$ show the growth in the population in both reporting and partner countries respectively. While $DIST_{ij}$ measures the geographical distance between country i and j from their economic centre (capital city in most cases). Since similarity of language plays an important role in trading a binary variable $LANG_{ij}$ which have a value of one if the language is the same and zero if they have different language is incorporated. Last but not least, membership in to free trade agreement (FTA) is taken in to account that is FTA_{ij}. According to Anderson (1979), Deardorff (1998), Baier and Bergstrand (2001), Eaton and Kortum (2002), Anderson and van Wincoop (2003) and Baier and Bergstrand (2007), this estimation help find unbiased estimate of γ_0, γ_1, γ_2, γ_3, γ_4, γ_5, γ_6, γ_7 and γ_8. Therefore, in this research the gravity model will be estimated.

Independent variable	Description	Expected sign
GDP_i	Gross Domestic Product for reporting country i	+
GDP_j	Gross Domestic product for partner country j	+
POP_i	Population of reporting country i	+
$POPj$	Population of partner country j	-
$DIST_{ij}$	Distance between reporting and partner countries i and j	-
$LANG_{ij}$	Dummy = 1, if country i and j have common language	+
$COLONY_{ij}$	Dummy = 1, if country i and j have colony connection	+

Source: own processing

Table 1: Explanatory variable and expected sign.

Data

The sample used in this study includes selected North African countries and their trade partners. More specifically, Algeria, Egypt, Morocco, and Tunisia are used as reporters and all countries as partner countries. Further, the study employs a sample from 1991 to 2013 and estimate using STATA software. The agriculture data used in the study includes live animals, meat and edible meat offal, dairy, eggs, honey, and ed. Products, edible vegetables, cereals, and sugars and sugar confectionery. For detail component of the agriculture data, one can refer the appendix part. The trade value of the stated agricultural products comes from the United Nations Commodity Trade Statistics Database (COMTRADE). The AGR trade flow variable is generated

by summing the stated agricultural products trade flow.

The study uses the size of an economy and population in the gravity model. To capture the effect of the size of the economy and population for both reporter and partner countries data from World Bank Development Indicators database is employed. Further, taking into account historical factors and geography could play a role in the international trade, variables such as distance, common language, and colonial ties are considered. The geographic and historical data comes from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII).

Last but not least, the study uses free trade agreement (FTA) with EU and AGADIR. The trade agreement with European Union countries is included in the variable eu_fta and trade agreement among Algeria, Egypt, Morocco, Tunisia, and Jordan is included in the agadir_fta. The trade agreement data comes from The WTO Regional Trade Agreements database. For estimation convenience, I have created the dummy variable FTA and include both trade agreements with reporting and partner countries.

For analytical reason, we have presented some basic statistical summaries we have used in our study. In the table below, we have included the mean value, standard deviation, minimum and maximum value of the variables. Last but not least, we incorporated the number of observations we include in the study (Table 2).

Results and discussion

In this section, we will present the set of estimations we made to examine the impact of free trade agreement on agricultural trade flow. The estimation is made for both aggregate and disaggregated agricultural trade flow and trade agreements. First, we will examine the implication aggregate free trade agreement trade agreement (FTA) on Agriculture in general and particularly on dairy, vegetable, live animal, meat, and sugar.

As can be observed from the regression results, we can see several interesting and valuable result in Table 3. Taking the gross domestic product (GDP) terms first, we see both reporter and partner country GDP are positively affecting the agricultural trade flow between North African countries and the rest of the world. More specifically, everything remaining the same as reporter state GDP increases by 1 percent, the agricultural trade flow increases by approximately 0.965 percent. Similarly, as the partner country GDP increases by 1 percent the agricultural trade flow between reporter and partner country increases by about 0.532 percent. The difference in the magnitude is expected, taking into account the level of protection the North African countries (reporting countries) have to non-members. On the other hand, the partner countries have both lesser protection and trade agreements with several countries. Last but not least, the GDP coefficients for both cases are statistically significant. In fact, the P-values are below 0.001 and it is indicated by three stars.

The second import result is the impact of distance in influencing the agricultural trade between reporting and partner countries. In line with our expectation, everything remaining constant as the distance between reporting and partner countries increase the agricultural trade between the countries is negatively affected. However, the magnitude is weaker. For instance, everything remains the same as the distance between reporting and partner countries increases by 1000 kilometer

Variable	Obs	Mean	Std. Dev.	Min	Max
ln_gdp_rep	9863	24.91476	.5091146	23.58149	25.60625
ln_gdp_par	9863	25.36595	2.102228	18.79031	30.32542
ln_pop_rep	9863	17.34273	.7329548	15.93396	18.31064
ln_pop_par	9859	16.6305	1.579587	11.15138	21.03389
ln_agricul~e	9863	13.3239	3.238161	1.098612	21.72579
ln_dairy	4581	12.69944	3.070172	0	19.86685
ln_vegtable	5957	12.04713	3.050945	0	19.93752
ln_animal	1984	10.97154	3.278014	2.564949	18.74443
ln_meat	1907	11.74744	3.139194	2.197225	20.45946
ln_sugar	5432	11.62056	3.012901	0	20.63956

Source: Authors own estimation

Table 2: Description of data used in the study.

	(1)	(2)	(3)	(4)	(5)	(6)
	ln_agricul~e	ln_dairy	ln_vegtable	ln_animal	ln_meat	ln_sugar
ln_gdp_rep	0.965***	1.226***	0.170	1.131***	0.455	0.908***
	(8.84)	(7.29)	(1.31)	(3.99)	(1.77)	(6.41)
ln_pop_rep	0.175*	-0.494***	1.163***	-1.062***	-0.0724	0.0219
	(2.27)	(-4.19)	(12.81)	(-5.39)	(-0.42)	(0.22)
ln_gdp_par	0.532***	0.452***	0.669***	0.562***	0.292***	-0.00853
	(26.04)	(14.98)	(26.47)	(10.46)	(5.44)	(-0.32)
ln_pop_par	0.0164	-0.404***	-0.0872**	-0.399***	-0.143*	0.494***
	(0.62)	(-10.40)	(-2.82)	(-5.41)	(-2.29)	(13.53)
contig	0.0232	0.0353	0.00101	0.185	-1.108*	0.810***
	(0.13)	(0.14)	(0.01)	(0.57)	(-2.56)	(4.11)
comlang_off	0.270***	0.529***	0.842***	0.648***	-0.416*	0.0641
	(3.50)	(4.84)	(9.38)	(3.38)	(-2.11)	(0.64)
colony	2.134***	0.205	1.677***	1.093***	0.921**	1.784***
	(11.80)	(0.93)	(9.78)	(3.99)	(3.19)	(9.34)
dist	-0.0000567***	0.0000876***	-0.000103***	-0.000126***	0.000135***	-0.000102***
	(-6.03)	(6.79)	(-9.51)	(-4.21)	(7.76)	(-7.52)
fta	0.391***	0.122	0.599***	-0.713***	-0.335	-0.0346
	(4.32)	(0.97)	(6.03)	(-3.73)	(-1.63)	(-0.31)
_cons	-27.46***	-14.75***	-28.30***	-6.435	-4.192	-19.21***
	(-15.23)	(-5.28)	(-12.87)	(-1.43)	(-0.95)	(-8.36)
N	9859	4580	5954	1983	1906	5430

Note: t statistics in parentheses, * p<0.05, ** p<0.01, *** p<0.001.
Source: author's own estimation using stata

Table 3. Aggregate trade agreement effect on agriculture and selected variables.

agricultural trade decreases by only 0.0567 percent. Despite the magnitude being weak, the result is both statistically significant and coherent with the trade theories. Although, it requires further research one can give credit to globalization and technology in reducing transportation costs and reducing the importance of distance in agriculture trade.

The other historical and social variable influencing trade pattern is having common colonial tie and language. In line with previous research results both have a positive effect on agricultural trade flow between reporting and partner countries. For instance, citrus Paribas having similar colonial tie increases the trade flow by approximately 2.134 percent as compared to partner country without a colonial tie. Further, having the same language increases the trade flow by around 0.27 percent. Both results are statistically significant, and the P-value is below 0.001.

The last but, valuable result is the effect of the trade agreement on the aggregate agriculture and disaggregated agricultural trade flow. The result for aggregate agriculture shows that everything remaining constant free trade agreement between reporter and partner countries increases the trade flow by approximately 39.1 percent. The result is both coherent with our expectation and statistically significant. In fact, similar to our previous coefficients it has a p-value of less than 0.001.

To capture the specific effect of FTA on agriculture, we have estimated the impact of FTA on dairy, vegetable, live animals, meat, and sugar. Accordingly, the result shows that trade agreement have a positive effect on dairy and vegetable products while it has an adverse effect on live-animal, meat, and sugar. However, from these results only coefficient for vegetable and live animal are statistically significant. More specifically, everything remaining constant trade agreement increases vegetable trade flow between partner countries by approximately 60 percent. In contrast, trade agreement decreases live animal trade by around 71 percent. The result for the later indicates that other factors are determining live-animal trade between reporter and partner countries. In fact, it is valuable to see if the result differs among different trade agreements and North African countries.

Therefore, to make sure different trade agreements have a similar impact on agricultural trade flow we estimated aggregated and disaggregated agriculture trade flow on EU and AGADIR trade agreements. Accordingly, the result for aggregate agriculture

shows that both EU and AGADIR trade agreement have a positive effect on agriculture trade flow. However, the magnitude of the effect shows us there is exists a difference. For instance, free trade agreement with EU countries increases agricultural trade flow by approximately 35 percent. The result is coherent with empirical literature results, and it is statistically significant with p-value of 0.001. Similarly, the trade agreement among Algeria, Egypt, Tunisia, Morocco and Jordan (AGADIR) positively influence the agricultural trade flow between signatory countries. In fact, the trade agreement affects the trade flow by more than 70 percent everything remaining constant. Further, the result is found to be statistically significant with a p-value of below 0.05.

In Table 4 below we further examined the effect of EU and AGADIR trade agreements on dairy, vegetable, live animal, meat and sugar trade flows. Accordingly, EU trade agreement affects vegetable and live animal trade significantly. While AGADIR trade agreement influencing dairy and live animal trade flow.

More specifically, dairy trade is influenced positively by AGADIR trade agreement. In fact, as a result of AGADIR trade agreement the milk trade flow between signatory countries increases by more than 100 percent. The result is in line with our expectation, and it is statistically significant with a p-value of below 0.001. However, we have to be vigilant in interpreting this result because the change may not necessarily reflect the volume of agricultural trade.

The other significant causality we can observe is between EU and AGADIR trade agreement and vegetable trade flow between reporting and partner countries. The estimation shows that both EU and AGADIR trade agreement positively influence vegetable trade flow. More specifically, EU trade agreement causes vegetable trade to increase by 48 percent while AGADIR trade agreement increases the trade flow by around 155 percent. Both coefficients are statistically significant with a p-value of 0.001.

Contrary, to the previous results trade agreement, negatively affect live animal trade. More specifically, in response to a trade agreement with EU countries agricultural trade decreased

	(1)	(2)	(3)	(4)	(5)	(6)
	ln_agricul~e	ln_dairy	ln_vegtable	ln_animal	ln_meat	ln_sugar
ln_gdp_rep	0.967***	1.241***	0.182	1.137***	0.455	0.910***
	(8.86)	(7.38)	(1.39)	(4.01)	(1.77)	(6.42)
ln_pop_rep	0.171*	-0.517***	1.146***	-1.069***	-0.0728	0.0191
	(2.22)	(-4.38)	(12.61)	(-5.41)	(-0.42)	(0.19)
ln_gdp_par	0.535***	0.466***	0.683***	0.566***	0.292***	-0.00661
	(25.99)	(15.30)	(26.69)	(10.43)	(5.33)	(-0.24)
ln_pop_par	0.0115	-0.426***	-0.106***	-0.405***	-0.144*	0.491***
	(0.43)	(-10.82)	(-3.37)	(-5.42)	(-2.25)	(13.25)
contig	0.0385	0.0887	0.0514	0.198	-1.107*	0.818***
	(0.22)	(0.36)	(0.27)	(0.61)	(-2.55)	(4.13)
comlang_off	0.245**	0.424***	0.758***	0.624**	-0.418*	0.0509
	(3.07)	(3.73)	(8.14)	(3.17)	(-2.03)	(0.49)
colony	2.148***	0.273	1.721***	1.112***	0.923**	1.791***
	(11.85)	(1.24)	(10.02)	(4.02)	(3.16)	(9.35)
dist	-0.0000576***	0.0000834***	-0.000106***	-0.000127***	0.000135***	-0.000102***
	(-6.11)	(6.44)	(-9.77)	(-4.23)	(7.69)	(-7.53)
eu_fta	0.355***	-0.0362	0.487***	-0.741***	-0.338	-0.0541
	(3.73)	(-0.27)	(4.65)	(-3.73)	(-1.52)	(-0.45)
agadir_na	0.708*	1.095***	1.554***	-0.408	-0.318	0.0835
	(2.57)	(3.34)	(5.15)	(-0.65)	(-0.60)	(0.29)
_cons	-27.43***	-14.68***	-28.28***	-6.481	-4.195	-19.19***
	(-15.21)	(-5.26)	(-12.88)	(-1.44)	(-0.95)	(-8.35)
N	9859	4580	5954	1983	1906	5430

Note: t statistics in parentheses, * p<0.05, ** p<0.01, *** p<0.001.
Source: author's own estimation using stata

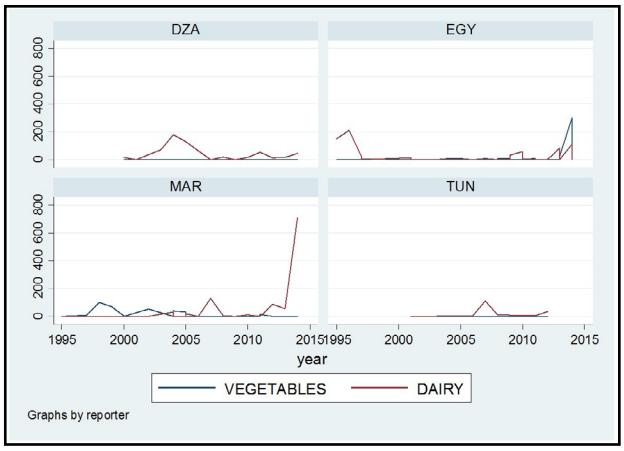
Table 4:. EU and AGADIR trade agreement effect on Agriculture and selected variables.

by more than 74 percent. However, the AGADIR trade agreement fails to impact the live animal trade.

Last but not least, an interesting finding from examining the trade flow is the potential of trade creation. This trade creation is particularly true between North African countries and former soviet countries (Latvia and Lithuania). More specifically, the trade flow of Algeria, and Tunisia with Lithuania sharply increased in both dairy and vegetable products in response to EU trade agreement. This trade creation could be seen in the second and third quadrant of figure 5. Similarly, in figure 6 it observable the trade creation particularly with Algeria (DZA), Egypt (EGY), and Tunisia (TUN).

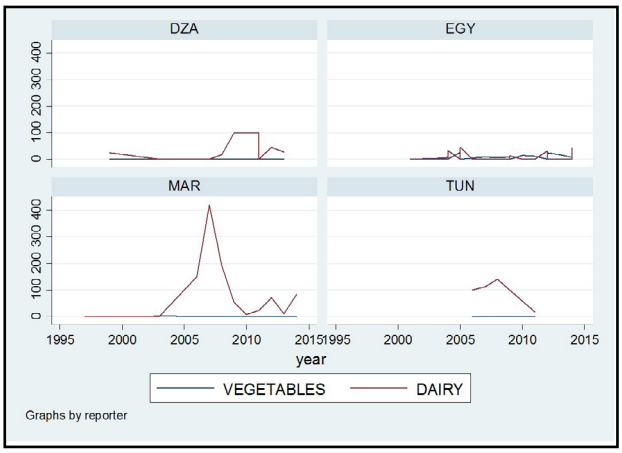
In summary, the empirical result shows that trade agreement boosts trade flow between partner countries. This result is in line with the summary of our data. For instance, if we see the trade before and after the trade agreement on average we observe trade flow increasing. This result is presented in the following table 4. However, we have to be careful not to overstate the implication of the summary result. Because, the increase in trade flow could also be due to other factors such as economic growth, foreign aid, and other factors which could affect agricultural trade flow.

If we observe the mean value for all countries,



Note: the y-axis (trade flow) is in 10,000 dollars
Source: Authors own stata plot

Figure 5: Lithuania Trade Creation with selected North African countries.



Note: the y-axis (trade flow) is in 10,000 dollars
Source: Authors own stata plot

Figure 6: Latvia Trade Creation with selected North African countries.

Algeria					
Agriculture	Obs	Mean	Std. Dev.	Min	Max
Before TA	908	2.99e+07	8.60e+07	3	6.78e+08
After TA	941	5.47e+07	2.06e+08	38	2.73e+09
Egypt					
Agriculture	Obs	Mean	Std. Dev.	Min	Max
Before TA	1764	1.58e+07	8.17e+07	57	1.44e+09
After TA	1918	3.67e+07	1.56e+08	10	2.18e+09
Morocco					
Agriculture	Obs	Mean	Std. Dev.	Min	Max
Before TA	1406	1.03e+07	3.28e+07	62	3.18e+08
After TA	1394	2.21e+07	8.55e+07	13	9.86e+08
Tunisia					
Agriculture	Obs	Mean	Std. Dev.	Min	Max
Before TA	1107	5888018	1.61e+07	4	1.30e+08
After TA	915	1.14e+07	3.29e+07	4	2.90e+08

Source: Authors own summary

Table 5: Average Trade flow before and after trade agreement.

the agricultural trade flows after trade agreement show a significant increase. For instance, the agricultural trade flow of Algeria increased from 29.9 million USD to 54.7 million USD.

Conclusion

In our study similar to Grant and Lamber (2008) we found trade agreement have a significant impact on agricultural trade flow although the full impact could lag for some time. Further, the study finds the impact could differ based on the commodities considered. Therefore, the finding in our current article coincides with Grant and Lamber (2008). In a similar vein, our finding regarding trade creation is coherent with what Sun and Reed (2010) found in their study. In their study, Sun and Reed (2010) find trade agreement could potentially create trade between partner countries. However, the finding shows that the trade creation could depend on the type of trade agreement and the partner countries.

The objective of this paper is to examine the effect of different trade agreements on trade flows of both aggregate and disaggregate agriculture. To achieve the objective, the article uses selected North African countries (Algeria, Egypt, Morocco, and Tunisia) as reporting countries and the rest of the world as partner countries. Further, the study uses annual nominal agriculture trade flow data from 1991 to 2013 for the selected countries. To correctly identify the causal effect, the article uses gravity model as a workhorse. Accordingly, the study finds that everything remaining constant enforcement of free trade agreement positively influences trade flow of agricultural. This result applies to all trade agreements considered in this study. The disaggregated trade flow data shows that the trade agreement mainly impacts commodities such as vegetable and live animals. However, products such as meat and sugar are failed to be influenced by the trade agreement. This lack of free trade impact on meat and sugar could be because those products are either exported or imported to or from non-member countries. Another possible explanation is the trade for commodities such as dairy, meat and sugar are influenced by other exogenous factors. Therefore, the paper advice for further research regarding factors influencing dairy, meat and sugar trades. However, fortunately, our model could explain the causality of trade flow in aggregate agriculture and vegetable and live animal trade.

Last but not least, one important finding is the potential of trade creation. As could be seen in the appendix figure 3 and 4, the trade agreement with EU created a market for former soviet countries. Particularly, Latvia and Lithuania were able to export dairy and vegetable products to the North African countries. However, in this study we cannot conclude if there exists trade diversion at the cost of the new trade creation.

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