ERF 2020

26TH Annual Conference

The Determinants of Tunisia's Trade Deficit in Recent Years: A Gravity Model Approach

Makrem Ben Doudou and Christophe Rault

ECONOMIC RESEARCH FORUM
منتدى البحوث الاقتصادية

The Determinants of Tunisia's Trade Deficit in Recent Years: A Gravity Model Approach

Makrem Ben Doudou[a], and Christophe Rault[b,]

[a] *Department of Economics - Faculty of Economics and Management of Mahdia, University of Monastir, Tunisia.*

[b] *LEO, University of Orléans (France), CESifo, and IZA (Germany)*[$.]

Abstract. – A plethora of empirical research studies have unveiled the determinants of bilateral flows, mainly free trade agreements and institutions. However, little is known about their net effect on trade balance. In this paper we aim at identifying the factors at the origin of the widening of Tunisia's trade deficit in recent years, using a sample of 164 Tunisia trading partners for the 1995 to 2016 period. More specifically, we analyze the trade balance effects of the quality of institutions and the various free trade agreements (FTA) concluded by Tunisia with its partners. Using an extended gravitational equation along with the Poisson Pseudo Maximum Likelihood technique, we find that Tunisia's trade flows increase with the rise in income of Tunisia and its trading partners. In addition, only the AGADIR agreement and the FTA concluded with the European Union have had a beneficial effect on trade balance. The free trade agreement signed with Turkey has significantly contributed to an excess of Tunisia's trade deficit, while the Pan-Arab FTA has a very limited effect on both exports and imports. Additionally, we find that the increase in corruption and political instability in Tunisia following the Arab Spring in 2011 associated with insufficient measures of control of corruption have had negative impacts on exports and trade balance.

Keywords: Arab Spring, Corruption, Gravity model, Tunisia's trade deficit, Free trade agreements, institutions, Poisson Pseudo Maximum Likelihood.
JEL Classifications: F14, F15, C23

[$] University of Orléans (CNRS, LEO FRE 2014), rue de Blois-BP 26739, 45067 Orléans, France
Email: chrault@hotmail.com. Web-site: http://chrault3.free.fr. (**corresponding author**).

1. Introduction

Trade openness has been acknowledged as an engine for economic development (Edwards, 1993; Sachs and Warner, 1997). This is because trade liberalization not only increases Gross Domestic Product (GDP), but also helps developing economies to build up foreign exchange reserves (Atif *et al.*, 2017). The export-led growth hypothesis postulates that an expansion of exports in developing countries would usually lead to an improvement in economic growth (Barro, 1991). Being aware of the importance of exports, the Tunisian government has implemented several measures of trade's reforms over the last decades, which have generated a significant improvement in Tunisia's trade flows. International statistics reveal in fact that Tunisia's total trade volume has increased from nearly 6.085 billion USD in 1986 to around 45.588 billion USD during the 2010-2016 period; about 7.5 times the value of 1986. During the same period, its share to GDP also rose from 67.485% to 99.678%. Tunisia's exports were boosted substantially from about 2.722 billion USD in 1986 to nearly 6.561 billion USD during the 1987-2000 period, and 20.771 billion USD over the 2010-2016 period.

However, despite this expansion of trade flows, Tunisia experienced an alarming widening of its trade deficit. Tunisia's trade deficit has increased beyond 2005 (see appendix 3). Its proportions have been worrying since 2014, when it exceeded 10% of GDP. By the end of 2017, it was estimated at about 12% of GDP, about 4.9 billion USD in absolute value (author's calculations from the World Bank database). The analysis of the structure of the trade balance shows that the main cause of this worrying level of trade deficit is the growing deficit in the merchandise trade balance during the 2005-2017 period. This deficit raised by $3.7 billion over the 2005 – 2017 period (author's calculations based on the WITS database).

Many scholars have highlighted the negative impacts of the widening of trade deficit on real economy. Baharumshah *et al.*, (2003) argue that a persistent current account deficit may lead to serious economic problems such as economic crises or persistent budget deficit in other countries. According to literature, widening current deficit is one of the important factors that had caused economic crises in Argentina (mid 1990s,) Turkey (in 2001), and Chile and Mexico (early 1980s), etc. Therefore, it is of crucial importance for Tunisia to determine the causes of poor trade performance observed in recent years and to identify measures or actions that should be taken to reduce Tunisia's trade balance deficit.

Investigating the literature, we can observe that several studies have been conducted to analyze Tunisia's external trade in a gravity framework. This empirical research can be

subdivided into three classes. The first group of studies evaluated the determinants of trade merchandises at the Tunisian country level. Another stand of research has undertaken a multi-country analysis, including Tunisia to study bilateral trade flows. A third group of empirical research used gravity model to evaluate the possibilities of trade expansion for Tunisia or MENA countries.

Although existing studies on Tunisia's trade provide tremendously important results which help to understand the dynamics of Tunisia's trade flows (exports and imports) since the 80s, little research has been conducted on the determinants of Tunisia's trade deficit, particularly in recent years, where the deficit reached a high record. To our knowledge, none of the applied studies has attempted to investigate the net effect of the gravity explanatory variables (such as GDP level, free trade agreement and institutions) on Tunisia's trade balance, specifically during the recent years. Therefore, little is known about how theses variables could affect trade balance in MENA countries, and particularly, how they have contributed to the improvement or worsening of Tunisia's trade balance. Furthermore, the only empirical research that has studied the determinants of Tunisia's trade balance focused mainly on the effect of exchange rate and budget deficit, employing cointegration, causality and other recent techniques applied to times series data (see *e.g.*, Ajili, 2007, Neaime *et al*., 2017, Bahamani-Oskooee *et al,* 2019a, Bahamani-Oskooee *et al.* 2019b, among others). Therefore, there is no existing comprehensive empirical literature to explain the widening of Tunisia's trade deficit in recent years, with a focus on free trade agreement and institutional factors.

Moreover, some previous studies have examined the effect of free trade agreement in a sample of countries including Tunisia, assuming that the effect is homogenous (*e.g.* Abdmoulah, 2011; Cestepe, Yıldırım and Bahtiyar, 2015). However, according to Ostry and Rose (1992), the nature of the relationship between trade liberalization and trade balance is unclear. The authors argue that many factors may influence the impact of trade liberalization on trade balance, including the reaction of exchange rate and real wages, the agents' perceptions regarding the shocks, the value of elasticities, etc. Besides, Santos-Paulino and Thirlwall (2004) indicate that the nexus between trade liberalization and trade balance depends among others on the price of traded goods. Thus, assuming that the effect of free trade agreements is homogenous among countries is doubtful. Hence, there is no guarantee that the results found by previous study using a sample of MENA countries, for example, is valuable for each country included in the sample, since there are many factors that may intervene in the relationship between the two series. Given that these conditions are not the

same in all countries, it is hard to believe that the effect of free trade on bilateral trade flows may not change from one country to another. For this reason, we reexamine in this paper the relationship between FTA and both exports and imports in Tunisia using more recent data.

Regarding trade and institutions, previous studies only used panel data and not specific time series for Tunisia. The problem with applying panel data is that they assume that the effect of institutions is homogenous across the considered countries. However, in literature nothing proves that this hypothesis is true. Anderson and Marcouiller (2002) show through a theoretical import model and empirical investigation that higher corruption impairs international trade by rising risk and uncertainty associated with international exchange. Besides, some theoretical research including Leff (1964), Huntington (1968) and Bhagwati (1982) suggest that corruption facilitates transactions in countries with defective institutions (high protectionism, slow bureaucracy, etc), and favors the development of bilateral trade. These findings suggest that the effect of institutions on trade is not homogenous and may vary across countries depending on the reaction of the public. La Porta *et al.* (1997) explain that trust in government mechanisms, public cultural beliefs or its religious affect the reaction of people and determine the performance of institutions. Therefore, it seems appropriate to analyze the relationship between institutions and trade in each country separately.

In this regard, this paper aims at examining the determinants of Tunisia's trade balance using an augmented gravity model. It focuses mainly on the role of free trade agreement and institutions. For this purpose, we consider an econometric gravity equation inspired from the theoretical model developed by Anderson and Van Wincoop (2003). Then, this equation is estimated using the Poisson Pseudo Maximum Likelihood (hereafter PPML) technique proposed by Santos-Silva and Tenreyro, (2006). As pointed out by Irshad *et al*., (2018), the PPML method allows to handle zero trade flows and leads to more efficient estimators than the other linear estimation methods. Besides, this approach is suitable in case of heteroscedasticity of error term and can deal with the bias caused by autocorrelated errors and multi-collinearity (Álvarez *et al.*, 2018). The econometric analysis uses a sample covering merchandise exports and imports of Tunisia with 164 countries, for which trade and macroeconomic data is available over the 1995- 2016 period. Specifically, following the theoretical developments of the gravity literature and the approach of Caporale *et al.* (2012), we estimate two Tunisian trade equations using the PPML technique, one for exports and one for imports, and we compare the elasticities of each of the explanatory variables in order to derive their net effect on the trade balance. Our econometric specifications include, in conjunction with the standard explanatory variables, GDP and distance, dummy variables

capturing cultural, historical and geographical factors, variables capturing EU-Tunisia, Turkey-Tunisia, AGADIR and PAFTA agreements, as well as variables measuring corruption and political stability.

We contribute to the existing literature in several ways. First, in contrast to the existing literature on the gravity model, our paper examines the dynamic of Tunisia's trade balance in recent years and attempts to explain the widening of Tunisia's current account deficit. Secondly, contrary to previous studies which used time series data, we take into account the effect of institutions and trade liberalization on trade balance and provide a more comprehensive investigation on the determinants of Tunisia's trade balance. Third, we reexamine the nexus between FTA and both exports and imports in Tunisia employing a different estimation method (the Poisson Pseudo Maximum Likelihood) from previous studies. Fourth, we evaluate the effectiveness of the new measure undertaken by the Tunisian government in recent years to eradicate corruption. Specifically, we test whether there is a relationship between insufficient control of corruption and the decline in trade balance. Our results provide evidence on the role of institutions in general, and particularly the role of the deficiency of control of corruption in the widening of trade deficit, which has been neglected in the trade literature on trade balance. Besides, we highlight the role of Tunisian GDP and specifically the bad economic evolution since the Arab spring in explaining Tunisia's trade deficit.

In the remainder of the manuscript, we proceed as follows. In section 2, we provide a literature review. In section 3, we present the econometric specifications, the data sets, as well as the econometric methodology. In section 4, we discuss our research findings. Finally, in section 5, we offer some concluding remarks, as well as some policy implications.

2. Literature review

The literature on Tunisia's external trade is organized around three lines of research. The first evaluates the determinants of trade merchandises at the Tunisian country level. Zidi and Dhifallah (2013) focused on the effect of free trade agreement between EU and Tunisia on bilateral imports over the 1995-2004 period. Angulo *et al.* (2011) attempted to investigate the factors explaining olive oil exports of Tunisia during the 2001-2009 period. Kacem (2015) unveiled the relationship between institutional similarity and international trade considering Tunisia exports with 21 European countries over the 1996–2009 period. Ghali *et al.* (2013) conducted a specific country analysis for Tunisia and Egypt to investigate the correlation between Non-Tariffs Measures (NTM) and imports over the 1989-2009 period. Ghali *et al.* pointed out that the NTM effect is more pronounced in Egypt than in Tunisia. They also found that the impact is more effective on the intensive margin than on the extensive margin.

The second line of research has undertaken a multi-country analysis, including Tunisia to study bilateral trade flows. Abdmoulah (2011) attempted to unearth how bilateral trade reacts following trade liberalization for a group of 20 Arab countries during the 1997-2008 period, taking four free trade agreements into account: AGADIR, Gulf Cooperation Council (GCC), Arab Maghreb Union (AMU) and Greater Arab Free Trade Area (GAFTA). Estimating the gravity model with zero inflated negative binominal approach, they conclude that GAFTA agreement is fruitful in some extent while, the other agreements - AGADIR, AMU and GCC are fruitless.

Cieślik and Hagemejer (2009) looked into the effect of the Euro-Mediterranean Free Trade Area on the improvement of both imports and exports for 7 selected MENA countries from 1980 to 2004, controlling for other bilateral associations implemented in the late 1990s and leading to the AGADIR agreement. Several binary variables were used to investigate the impact of the EU-MENA agreement and other trade agreements. Employing both fixed effects and two fixed effects estimation methods within a panel framework, Cieślik and Hagemejer conclude that while MENA-EU association agreements is beneficial to EU exports toward their MENA partners, it doesn't stimulate MENA exports toward the EU.

Parra-Robles *et al.* (2012) undertook both multi-country and specific country analysis of both export and imports for10 MENA countries, considering the effect of a wide range of South-South and North-South trade agreements. The analysis is done at both aggregate and disaggregate level. Using several estimations techniques, they found results in line with those

of Cieślik and Hagemejer (2009). They also noted that the EU-Turkey custom union is beneficial for both bilateral imports and exports.

Kahouli and Maktouf (2014) analyzed export data for 27 Euro-Mediterranean countries to identify the effect of four regional trade agreements – eurozone, Arab Maghreb Union and EU-15, and the AGADIR free trade agreement. Using panel and cross-sectional data for the 1980–2011 period, they found a strong evidence of a positive relationship between exports and the trade agreements considered in the study.

Cestepe, Yıldırım and Bahtiyar (2015) study the features of bilateral trade between 13 MENA countries and 30 OECD trading partners, considering the implications of trade liberalization policy for MENA exports between 2000 and 2009. Cestepe, Yıldırım and Bahtiyar used different method of estimation - population averaged LS, fixed effects LS, GMM, and fixed effects Poisson Maximum Likelihood. They found that bilateral free trade agreements enhance exports of MENA countries. However, the effect of World Trade Organization membership is negative.

Ben Ali and Mdhillat (2015) addressed the trade effect of corruption using two panels of 15 MENA countries and 22 European Union countries over the 2002-2012 period. Estimating the trade model with both random effect and fixed effect, Ben Ali and Mdhillat demonstrated that an increase in perception of corruption is associated with a fall in the volume of bilateral trade. Further, control of corruption enhances substantially bilateral trade.

Ramzy and Zaki (2018) looked into the relationship between environment regulations and agricultural exports. Employing the zero-inflated Poisson (ZIP) model, Ramzy and Zaki pointed out that environment regulations seem to increase agricultural trade between MENA and EU countries.

Karam and Zaki (2018) investigated the nexus between institutions and bilateral exports, considering aggregated as well as disaggregated data by industrial sectors for a panel of 21 MENA countries during the 1995-2014 period. They found, using three different estimation techniques, an insignificant correlation between trade and the level of institutions, but significant association between institutional gap and bilateral trade.

Martınez-Zarzoso and Marquez-Ramos (2019) re-visit the relationship between institutions and exports from 19 Mena countries toward 189 countries between 1996 and 2013, constructing two approximations of the variable of interest- the bilateral level of institution and the institution similarity. They found a positive association between bilateral trade and the level of institution in importing and exporting countries. The authors also found

a positive correlation between trade and the similarity of institutions when considering the rule of law and regulatory quality.

The third line of research used a gravity model to evaluate the possibilities of trade expansion for Tunisia or MENA countries. For instance, Sarr *et al.* (2004) analyze Tunisia export potential using the random effect and the Tobit technique. The dataset covers 90 countries. Their results suggest that Tunisia has a great potential to expand its trade with the rest of the world. Söderling (2005) estimates trade potential in the MENA area using three different estimators, *e.g.*, Tobit technique, two steps procedure estimation and random effect. He noted the existence of significant untapped export markets for Mediterranean countries, both within and outside the EU. Tamini *et al.* (2016) calculate intra-North African trade potential at aggregate and sectoral levels using a stochastic frontier analysis.

3. Empirical model, variables used, data and econometric methodology

3.1 Econometric specification

In this study, we estimate a gravity model with a structure that incorporates several characteristics of the theoretical model elaborated by Anderson and Van Wincoop (2003). The authors elaborated a structural gravity equation in the following form:

$$T_{ij} = \frac{Y_i Y_j}{Y_m}\left(\frac{\tau_{ij}}{P_i P_j}\right)^{1-\sigma} \quad (1)$$

, where T_{ij} denotes nominal exports from i;$Y_i$and $Y_j$are levels of nominal income; Y_m is world income; P_i and P_j represent level of multilateral resistance, and allows to take the barriers to trade with all other partners into account; τ_{ij} is level of bilateral trade costs. Finally, $\sigma > 1$ is the elasticity of substitution between goods produced in the source country and those produced in the destination country.

Log-linearizing the structural gravity equation (1) and adding a stochastic error term, ε_{ijt} yields the following equation:

$$Ln(T_{ij}) = Ln(Y_i) + Ln(Y_j) - (Y_m) + (1-\sigma)(\tau_{ij}) - (1-\sigma)(P_i) - (1-\sigma)(P_j) + \varepsilon_{ijt} \quad (2)$$

Following previous research using gravity model, we model the trade cost function, τ_{ij}, as a linear function of a number of trade barriers, namely the geographical distance, the

quality of institutions and a series of dummy variables capturing historical, geographic and trade policy factors.

$$\tau_{ij} = DIST_{ij}^{\delta_1} INST_i^{\delta_2} e^{\delta_3 LANG_{ij} + \delta_4 COL_{ij} + \delta_5 BORD_{ij} + \delta_6 AS_j + \delta_7 FTA_{ij}} \quad (3)$$

, with $DIST_{\text{ij}}$, the geographical distance between the two partners; $INST_i$, the quality of institutions in country i; $LANG_{\text{ij}}$, COL_{ij}, $Bord_{\text{ij}}$ are dummy variables that take one if the two countries share the same language, the same colonizer and the same border respectively; AS_j is a dummy variable taking the value one if the partner j has a maritime border; and FTA_{ij} a vector of regional trade agreement dummies.

Substituting equation (3) into (4) yields the following specification:

$$\begin{aligned} Ln(T_{ij}) = {} & Ln(Y_i) + \text{Ln}(Y_j) + Ln(Y_m) \\ & + \delta_1 ln(DIST_{ij}) + \delta_2 Ln(INST_{it}) + \delta_3 LANG_{ij} + \delta_4 COL_{ij} + \delta_5 BORD_{ij} + \delta_6 AS_j + \delta_8 FTA_{ij} \\ & -(1-\sigma) Ln(P_i) - (1-\sigma) Ln(P_j) + \varepsilon_{ijt} \end{aligned} \quad (4)$$

Equation (4) represents the augmented empirical gravity equation inspired from the theoretical developments in gravity literature. The first line alludes to the traditional "mass" gravity variables, the second line refers to barriers of trade between two partners, and the last line includes multilateral trade costs.

Our study aims at unfolding the factors that are responsible for the widening of Tunisia's trade balance deficit, and at evaluating the trade influence of regional trade agreements and institutional factors. Therefore, we extend equation (4) with additional variables to assess the influence of the different trade agreements concluded by Tunisian government on trade balance. We consider four measures of regional trade agreements: FTA_TURQ, FTA_UE, FTA_AGA and FTA_PAFTA. The variables FTA_TURQ and FTA_UE are included to control for the trade effect of the Turkey-Tunisia and the EU-Tunisia agreements, respectively, while FTA_AGA and FTA_PAFTA allow to evaluate the impact of Tunisia membership in AGADIR and PAFTA agreements, respectively. Appendix 2 gives an overview of the four FTAs considered in this analysis.

In addition, we introduce alternatively two institutional variables, namely: corruption and political stability, in order to explore the reaction of trade balance to bad institutions in

Tunisia: we choose the governance indicator, political stability and the absence of violence (PS) from the worldwide governance indicator database, which reflects the probability of destabilization of a government by unconstitutional and / or violent means. Following Ben Ali and Mdhillat (2015) and others, we consider two approximations of corruption. The former is the control of corruption index (COC) which reflects the quality of governance, and the latter indicator is the corruption perception index (CPI) which indicates the level of corruption. It should be mentioned that these indicators tend to be related to one another (resulting in multicolinearity) and therefore they were introduced one by one in the model.

Finally, to deal with multilateral resistance, we follow Lavallée (2006), Avom and Fankem, (2014) and introduced bilateral and time fixed effects. According to these authors, this solution is the most appropriate in a panel data model.

The econometric specifications of the gravity equations that we employ to study Tunisia's trade are therefore as follows:

$$\text{Ln}\left(Exports_{ijt}\right) = (\alpha_0) + \alpha_1 \text{Ln}\,(Y_{it}) + \alpha_2\,\text{Ln}\left(Y_{jt}\right) + \alpha_3 ln\left(Dist_{ijt}\right) + \alpha_4\,\text{Ln}(INST_{it}) + \\ + \alpha_5 LANG_{ij} + \alpha_6 COL_{ij} + \alpha_7 BORD_{ij} + \alpha_8 AS_j + \alpha_9 FTA\_UE_{ijt} + + \alpha_{10} FTA\_TURQ_{ijt} \\ + \alpha_{11} FTA\_AGA_{ijt} + \alpha_{12} FTA\_PAFTA_{ijt} + \lambda_{ij} + \lambda_t + \varepsilon_{ijt} \qquad (5)$$

$$\text{Ln}\left(Imports_{ijt}\right) = (\beta_0) + \beta_1 \text{Ln}\,(Y_{it}) + \beta_2\,\text{Ln}\left(Y_{jt}\right) + \beta_3 ln\left(Dist_{ij}\right) + \beta_4\,\text{Ln}(INST_{it}) + \\ + \beta_5 LANG_{ij} + \beta_6 COL_{ij} + \beta_7 BORD_{ij} + \beta_8 AS_j + \beta_9 FTA\_UE_{ij} + + \beta_{10} FTA\_TURQ_{ij} + \\ \beta_{11} FTA\_AGA_{ij} + \beta_{12} FTA\_PAFTA_{ij} + + \lambda_{ij} + \lambda_t + \varepsilon_{ijt} \qquad (6)$$

, where t denotes time; $Export_{ijt}$ is the volumes of Tunisia aggregate exports toward country j at time t; $Import_{ijt}$ is the volume of Tunisia imports from country j at time t; the world GDP (Y_m) is absorbed in the intercept; Y_{it} is Tunisia's GDP in year t; Y_{jt} is GDP of the partner country in year t; $Dist_{ij}$, $LANG_{ij}$, COL_{ij}, $BORD_{ij}$, AS_j are defined earlier ; FTA_UE_{ijt} is a dummy variable equal to 1 if the trading partner and Tunisia are involved in the EU regional trade agreement at time t; FTA_TURQ_{ijt} is a dummy variable equal to 1 if Tunisia and Turkey are engaged in a trade agreement at time t ; FTA_AGA_{ijt} is a dummy variable taking 1 if the two partners are members of the AGADIR regional trade agreement at time t; FTA_PAFTA_{ijt} is a dummy variable taking 1 if the two partners are members of the PAFTA regional trade

agreement at time t; $INST_{it}$ is an indicator of Institutions; λ_{ij} and λ_t capture multilateral resistance and denote binary and time fixed effects respectively ; and ε_{ijt} is an error term. It is assumed to be uncorrelated with explanatory variables and follows a normal distribution of zero mean and constant variance.

Three institutional variables are introduced alternatively in the model:

- IPC_{it} : index of perception of corruption. The Indicator is ranked from 0 to 10, with 10 denoting a low level of corruption

- COC_{it} : control of corruption. It measures the effectiveness and strength of government actions in preventing and fighting corruption. The index is ranked from -2.5 (weak) to 2.5 (strong).

-PS_{it}: political stability. It is ranked from -2.5 to 2.5, with 2.5 indicating a high level of stability.

3.2 Expected signs of the explanatory variables

Gross domestic product (Y)*:* It is used as an approximation to the size of the economy. A high level of exporting country' GDP is associated with higher level of production and wider variety of products to be exported. Therefore, we expect a positive sign for the α_1 and β_2 coefficients. A high level of importing country' GDP is associated with higher capacity to import goods. Therefore, the coefficients α_2 and β_1 should also have a positive sign.

Distance (DIST): Distance is frequently employed in gravity equations as a proxy of transport costs. It may also capture the research costs of information about other economies or trading partners. Hence, a large distance between two countries generates high costs in doing business; which reduces firm trade gains and reduces trade itself. Therefore, the coefficient associated with the variable $ln(Dist_{ijt})$ should be negative.

Common language (LANG): Sharing an official language can significantly reduce barriers to trade. This ease of communication must therefore, be reflected positively on the flow of trade. Hence, the coefficient associated with the variable $LANG_{ij}$ should be positive.

Post-colonial ties (COL): Theoretically, the existence of post-colonial links between the two partner countries should increase the volume of their bilateral trade. Thus, the coefficients of the variables related to post-colonial ties, COL_{ij}, should be positive.

Free Trade Agreements (FTA): Theoretically, free trade agreement is expected to stimulate trade flows between partners through the abolition of bilateral tariff and non-tariff barriers. Thus, the coefficients of the variables related to free trade agreements $FTA_{tuni_{jt}}$should be positive.

Access to the sea (AS): This variable allows to take into account the effect of having a maritime border on the volume of trade. International transport statistics show that 80% of international trade flows in volume are shipped by sea and handled in ports (UNCTAD, 2015). Therefore, the AS_j variable should be positively associated with the volume of trade.

Corruption: The theoretical and empirical literature suggests that corruption negatively affects trade flows by increasing risks and the uncertainty inherent in international transactions. It is well known also that the improvement in the control of corruption will enhance exports and imports as better control of corruption tends to reduce the costs associated with trade. Therefore, we hypothesize that the signs of the variables IPC_i and COC_i would be positive.

Political stability: According to the literature, political stability has a positive impact on trade. Fosu (2003) stipulates that political instability adversely influences export performance by reducing production efficiency and competitiveness. Álvarez *et al.*, (2018) argue that increasing politic instability and greater violence are expected to be detrimental to trade. Therefore, the variable PS_i is anticipated to be positively associated with trade.

3.3 Data

The gravity equations have been estimated for annual bilateral merchandise flows (exports and imports) of Tunisia with its 164 trading partners spanning the 1995- 2016 period. The source of the trade data is the IMF's Direction of Trade Statistics (DOTS) database. Gross domestic product is extracted from World Development Indicators (2017) of the World Bank. Statistics on geographic factors, linguistic and historical ties are provided by the CEPII. We collected the data on regional trade agreements from the World Trade Organization database. We extracted the control of corruption index and the political stability index from World Governance Indicators of the World Bank. The source of the corruption perception index is the Transparency International publications[1].

[1] The data of this study is available from the corresponding author. See appendix 1 for further details.

In table 1, we report the mean and the standard deviation along with the maximum and the minimum values of the variables in the export and the import models. The mean of Tunisian bilateral exports over the 1995-2016 period is 0.063 Billion USD. The upper value of bilateral exports is realized with France in 2011. The mean of Tunisia bilateral imports during the same period is 0.090 billion USD. The highest value of bilateral imports is realized with France in 2008. The mean of Tunisian GDP over the 1995-2016 period is 33.4 billion USD whereas the mean of country partner GDP is 315 billion USD. The country with the lowest GDP is São Tomé-et-Príncipe, whereas the country with the highest GDP is the United States. The variable DIST has an average of 5525.765. The most distant partner from Tunisia is New Zealand, while the nearest partner is Malta. The mean of the index of perception of corruption of Tunisia is 4.577. The maximum value of the index of corruption is observed in 2001 indicating that the lowest level of corruption in Tunisia is reached in 2001, whereas the minimum value of the variable IPC_i is recorded in 2011 and 2015, suggesting that the upper level of corruption is reached in 2011 and 2015. Control of corruption has a mean equal to -0.134, which implies that, over the period of study, the Tunisian government has made little effort to improve control of corruption. It is worth noting that after a net improvement until 2002, control of corruption has weakened dramatically to reach its lowest level in 2008. Although some improvement since 2010, the score of control of corruption still has negative values, which indicates greater efforts are needed to improve the performance of government actions. The average score of political stability in Tunisia is -0.095. In more detail, the highest level of stability is reached in 2000, whereas the lowest level is reached in 2016.

The average value of binary variables indicates the share in Tunisia's trade. For instance, 13.4% of Tunisian bilateral flows is realized with countries having the same colonizer; 26.8% with countries sharing the same language; 1.2% with countries sharing the same border; and 80.4% with countries having access to sea.

The average value of FTA binary variables indicates how Tunisia's trade is distributed with its partners. We can observe that 12.1 percent of Tunisian bilateral flows is realized with countries from the EU; 3% of Tunisian bilateral trade is done with Turkey. FTA_PAFTA_{ij} and FTA_AGA_{ij} have a mean of 0.068 and 0.008, respectively, suggesting that 6.8% of bilateral trade is realized with other members of the PAFTA agreement and 8% is happening with other members of the AGADIR agreement.

Table 1. Descriptive statistics[2]

Variable	Obs	Mean	Std, Dev,	Min	Max
Exports	3608	0.063	0.361	0	5.466
Imports	3608	0.090	0.378	0	4.533
Y_{it}	3608	33.4	10.6	18.030	47.587
Y_{jt}	3559	315	1260.00	0.072	18624.00
$Dist_{ijt}$	3608	5525.765	3610.202	400.532	18491.6
COL_{ij}	3608	0.134	0.34	0	1
$LANG_{ij}$	3608	0.268	0.443	0	1
$BORD_{ij}$	3608	0.012	0.109	0	1
AS_j	3608	0.804	0.396	0	1
FTA_UE_{ij}	3608	0.121	0.326	0	1
FTA_TURQ_{ij}	3608	0.003	0.057	0	1
FTA_PAFTA_{ij}	3608	0.068	0.252	0	1
FTA_AGA_{ij}	3608	0.008	0.09	0	1
IPC_i	3608	4.577	0.470	3.8	5.3
COC_i	3444	-0.134	0.194	-0.533	0.369
PS_i	3444	-0.095	0.467	-0.988	0.324

3.4 Estimation method

The estimation of the gravity model is fraught with several econometric problems such as heteroscedasticity, autocorrelation and heterogeneity (Santos-Silva and Tenreyro, 2006). Besides, there is a lengthy tradition of log-linearizing and estimating the gravity equation by Ordinary Least Squares (OLS). However, this practice is incompatible in the presence of two major econometric problems. The former problem is related to heteroscedasticity. Santos-Silva and Tenreyro (2006) show that estimates tend to be biased when estimating a log-linearized gravity equation with heteroscedastic errors by OLS. Indeed, if the error terms are heteroscedastic, the transformed residuals (by the log-linearization) will generally be correlated with the explanatory variables. The latter problem is related to presence of zero trade values in the sample considered. In fact, log-linearization is operationally inadequate, especially when using a database containing zero trade values: by taking the log, the zero-

[2] The Exports, Imports, Y_{it} and Y_{jt} variables are measured in billion US dollars. The $Dist_{ijt}$ variable is measured in Km. COL_{ij} , $LANG_{ij}$, $BORD_{ij}$, AS_j, FTA_UE_{ij} , FTA_TURQ_{ij}, FTA_PAFTA_{ij} , FTA_AGA_{ij} are binary variables taking one or zero. IPC_i, COC_i, PS_i are indexes.

trade disappears from the sample[3]. The PPML technique proposed by Santos-Silva and Tenreyro (2006) treat properly the two problems mentioned above, that is heteroscedasticity and the presence of zero observations. In addition, this approach makes it possible to obtain more efficient estimators than the other linear estimation methods; always produces convergent estimates in the presence of heteroscedasticity, and can resolve the bias caused by autocorrelation of errors and multi-collinearity (Álvarez et *al.*, 2018), as well as non-normal residuals (Agostino and Trivieri, 2014). In this regard, instead of the log of the dependent variable, we regress the level value of Tunisian exports (or imports) using the PPML method.

4. Econometric results

Tables 2 below reports estimations of the export and import equation using the PPML approach as well as some diagnostic tests. The Regression Specification Error Test (RESET) confirms that all estimated models are well specified since the p-value is higher than 1%. The Wald test statistic has a p-value equal to 0.000, which is below the significance level of 1 percent, thereby confirming the overall significance of the explanatory variables[4].

The obtained estimated coefficients by PPML reveal that the standard gravity variables (GDP and distance) have an impact in line with theoretical expectations (see the discussion in section III.2). According to the results in column (1) to (6), higher level of Tunisian gdp raises significantly both goods' exports and imports. Results for exports (column (1) to (3)) imply that export is elastic with national GDP and a 1% increase in national GDP stimulates exports within a range of 0.860% to 1.043 %, which are similar to those obtained by (Olper and Raimondi, 2008; Caporale *et al.*, 2012; Atif *et al*., 2017). Similarly, imports finding (column (4) to (6)) suggests that GDP is positively and significantly associated with Tunisia's imports and a 1% increase in gross domestic increases imports within a range of 0.411% to 0.480%. However, the effect of national GDP is more pronounced on exports.

Likewise, the gross domestic product of the partner country affects positively and significantly exports (column (1) to (3)) and imports (column (4) to (6)) at the 1% level. Specifically, the magnitude of 0.519 indicates that a 1% increase in partner country GDP boosts exports of Tunisia by roughly 0.52% (column (2)). In the same way, a 1% increase in

[3] By taking the log of equation (1), zero values will be eliminated automatically by econometric software as it is impossible to calculate the log of zero. The PPML method estimates the gravity model in its multiplicative form, making possible to keep the zero observations in the sample.

[4] These two tests have been often used in the case of PPML estimations. Additional tests (not reported here, but available upon request) confirm that all usual assumptions on the residuals are also verified.

gross domestic product of the partner country increases imports of Tunisia by around 1.06% (column (4)). By referring to previous results, we observe that the positive effect of income appears stronger in the import equation than in the export one. This result reflects not only the fact that Tunisian products are less competitive in both local and foreign markets, but also, the fact that Tunisian consumers have a greater preference for foreign products.

The sign and significance of the coefficient associated to geographic distance (column (1) to (6)) is in line with theoretical developments and previous empirical research, suggesting that an increase in transport and transaction costs, captured by an increase of the variable LDIST, discourage bilateral trade flows. Interestingly, the estimates indicate that, in line with the finding of Ranilovic (2017), the effect of distance is more pronounced in exports than in imports.

Colonial links affect negatively Tunisia's exports (column (1) to (3)). However, it has a positive and significant impact on Tunisia's imports (column (4) to (6)). This is reflecting the fact that, so far, sharing a common colonizer has helped to boost Tunisia's imports.

The coefficient of common border dummy is significant with a positive impact for Tunisia's exports (column (1) to (3)) but it is negatively associated with imports (column (4) to (6)). Conversely, the maritime borders dummy is insignificant with a positive coefficient on Tunisia's exports (column (1) to (3)). Nevertheless, its coefficient is positive and significant in case of imports (column (3) to (6)).

A common language is significant with a positive coefficient in both cases for exports (column (1) to (3)) and imports (column (4) to (6)). This means that a common language has succeeded in supporting transactions.

Regarding the effects of free trade agreement, the estimated parameter of the FTA_EU variable is positive and significantly different from zero for exports (column (1) to (3)), but exhibits a positive and insignificant results in import regressions (column (4) to (6)). At this juncture, it is worth noting that in a paper by Studnicka *et al.* (2019) European regional trade agreements appear to have no impact on total European Union exports. Studnicka *et al.* (2019) further note that this finding breaks down, however, if one distinguishes between individual European countries. This implies that the presence of heterogeneous effects across EU member states may explain the insignificant effect of the FTA concluded with the EU on Tunisia imports.

The same results are obtained for the AGADIR variable. While the variable FTA_AGADIR enters the export regression with positive and significant sign (column (1) to (3)), it is statistically insignificant for imports (column (4) to (6)).

By contrast, the coefficient associated with Turkey agreement variable is positive and significantly different from zero in the import model (column (4) to (6)), however it is negative and insignificant in the export model (column (1) to (3)). This insignificant effect reflects not only the fact that the Turkish government still imposes trade barriers on Tunisian exports, such as exports of agricultural products, in which Tunisia has a comparative advantage, albeit remaining very restricted, but also the lack of competitiveness of the Tunisia manufactured products on the Turkish market.

Finally, the coefficient of FTA_PAFTA dummy is insignificant in both cases of exports and imports (column (1) to (6)) and reveals the failure of efforts deployed by Arab countries to foster intra-regional trade. This finding is plausible, given the lack of complementarities between Tunisia and the Gulf countries (Péridy, 2005).

Concerning the three institutional variables, they all have a significant impact on exports (column (1) to (3)). By contrast, no significant relationship is found for the role of institutions on Tunisia's imports (column (4) to (6)). The perception of corruption variable enters the export regression with a positive and significant sign (column (1)), suggesting that an increase in corruption impedes exports. The coefficient of control of corruption shows a negative effect on exports (column (2)), indicating that a higher control of corruption is associated with lower exports. While control of corruption is generally expected to have a positive impact on exports, a negative coefficient is plausible as a recent study by Yerkes and Muasher (2017) pointed out that Tunisian government mechanisms to address corruption are failing. They further suggest improving anti-corruption laws. This result is interesting in term pf political economy as it suggests that the different measures applied in Tunisia to control corruption are insufficient to eradicate corruption. Regarding the positive result in the political stability variable for exports (column (3), there is a clear implication that the increase in political instability in Tunisia following the Arab spring 2011 has had negative effects on Tunisia exports.

Table 2. PPML results for the augmented gravity equations

	Exports			Imports		
	(1)	(2)	(3)	(4)	(5)	(6)
Ln (Y_{it})	0.844***	1.043***	0.860***	0.531**	0.480***	0.411***
	(4.554)	(4.573)	(4.437)	(2.512)	(2.929)	(3.468)
Ln (Y_{jt})	0.510***	0.519***	0.519***	1.059***	1.054***	1.054***
	(6.021)	(5.859)	(5.859)	(21.27)	(20.62)	(20.62)
$ln(Dist_{ijt})$	-2.228***	-1.655***	-1.655***	-1.991***	-1.986***	-1.986***
	(-13.73)	(-9.404)	(-9.404)	(-10.56)	(-10.38)	(-10.38)
COL_{ij}	-0.866*	*-0.772**	*-0.772**	0.600**	*0.707***	*0.707***
	(-1.959)	*(-1.812)*	*(-1.812)*	(2.197)	(2.552)	(2.552)
$LANG_{ij}$	1.753***	2.990***	2.990***	0.748*	0.869**	0.869**
	(5.528)	(8.971)	(8.971)	(1.810)	(2.114)	(2.114)
$BORD_{ij}$	2.025***	0.431	0.431	-1.902***	-2.085***	-2.085***
	(3.313)	(1.024)	(1.024)	(-3.209)	(-3.971)	(-3.971)
AS_j	-1.384***	0.432	0.432	2.599***	2.677***	2.677***
	(-2.785)	(0.857)	(0.857)	(4.266)	(4.458)	(4.458)
FTA_UE_{ij}	0.300***	0.354***	0.354***	0.0261	0.0750	0.0750
	(2.965)	(2.987)	(2.987)	(0.390)	(1.104)	(1.104)
FTA_TURQ_{ij}	-0.00259	-0.0276	-0.0276	0.112*	0.133**	0.133**
	(-0.0258)	(-0.280)	(-0.280)	(1.745)	(2.050)	(2.050)
FTA_PAFTA_{ij}	0.133	0.137	0.137	0.00815	0.0969	0.0969
	(0.875)	(0.814)	(0.814)	(0.0634)	(0.771)	(0.771)
FTA_AGA_{ij}	0.278***	0.266***	0.266***	-0.0864	-0.0680	-0.0680
	(3.560)	(3.391)	(3.391)	(-0.942)	(-0.743)	(-0.743)
IPC_i	0.300***			0.214		
	(3.381)			(1.071)		
COC_i		-0.808***			-0.309	
		(-3.492)			(-1.079)	
PS_i			0.215***			0.0821
			(3.492)			(1.079)
Constant	-2.410	-11.63**	-6.931*	-10.15*	-8.078*	-6.284*
	(-0.597)	(-2.403)	(-1.696)	(-1.664)	(-1.870)	(-1.932)
Observations	3,559	3,398	3,398	3,559	3,398	3,398
R-squared	0.988	0.988	0.988	0.984	0.984	0.984
Wald test p-value[5]	0.000	0.000	0.000	0.000	0.000	0.000
Reset test p-value[6]	0.0914	0.0552	0.0552	0.1319	0.0278	0.0278

z-statistics are reported in parentheses

*** p-value<0.01, ** p-value<0.05, * p-value<0.1

[5] The null hypothesis for the Wald test is that all coefficients of the explanatory variables are equal to zero.

[6] The Regression Specification Error Test is used to test for the null that there is no errors specification in the empirical model.

5. Conclusion

In this paper, we aim at investigating the determining factors of Tunisia's exports and imports using a sample of 164 countries over the 2015-2016 period. We contribute to the existing literature by uncovering factors determining Tunisia's trade deficit over the recent period using an econometric specification inspired by the theoretical gravity equation established by Anderson and Van Wincoop (2003). We take into account the effect of various free trade agreements concluded by Tunisia and the role of insufficient control of corruption in the rise of trade balance deficit. Finally, we use the Poisson Pseudo Maximum Likelihood approach which deal with the econometric problems arising from heteroskedasticity in the error term, which allows to handle zero trade flows and can resolve the bias caused by the autocorrelation of errors, multi-collinearity as well as non-normal residuals.

Our econometric specification includes, along with the standard gravity variables, GDP and distance, binary variables accounting for common language, common colonizer, common border and access to sea, variables for the AGADIR and the PAFTA agreements, and the free trade agreement with the EU and Turkey, as well as variables measuring corruption and political stability.

One of the main findings is that national GDP is positively and significantly associated with Tunisian trade. More interestingly, the effect of national GDP is more pronounced in the export model, suggesting that any fall in Tunisian GDP translates into lower exports than imports. This result might explain in part the increase of the current account deficit from 2011. Recent statistics show that GDP growth rate has declined from 3% in 2014 to 1.2% in 2015 and 1.1% in 2016. During the same period, goods exports to GDP have declined continuously from 35.35% in 2014 to 32,64% in 2016 (WDI database, 2017).

The GDP of an importing country is also a relevant determinant of Tunisia's trade flow and appears with a positive coefficient in both models of exports and imports, however the effect is more pronounced for imports, suggesting that the trade balance of Tunisia deteriorates in the long-run when the GDP of a partner country increases. Moreover, the positive effect of a partner's GDP on exports suggests that the fall in demand for Tunisian goods in European union countries, Tunisia's main trading partners, during the 2008-2009 global financial crises, and the period that follows, has impacted negatively Tunisia's exports.

The free trade agreement with EU as well the AGADIR agreement have had a boosting effect on exports and insignificant impact on imports, suggesting a positive and significant correlation with Tunisia's trade balance. On the other hand, the regional trade agreement concluded with Turkey exhibits an insignificant interaction with exports and a positive and

significant correlation with imports, suggesting that it has had a detrimental effect on Tunisia's trade balance. In addition, regarding the insignificant coefficient of the PAFTA agreement in the export and import models there is a clear implication that such arrangement cannot significantly affect Tunisia's trade balance.

With regard to the quality of institutions, the estimated results show that the increase in corruption and political instability in Tunisia following the Arab Spring in 2011 associated with insufficient measures of control of corruption has had a significant negative effect on Tunisia's exports resulting in a trade deficit.

Our findings suggest the following recommendations to policy makers. Our econometric results indicate that the influence of Tunisian GDP on exports is stronger than on imports, which implies that an increase in national GDP would translate into higher exports than imports, leading thereby to an improvement in trade balance. Therefore, there is a very urgent need to boost production for adjusting the balance of trade. The free trade agreement with EU and the AGADIR agreement have resulted in an improvement in trade balance for Tunisia. Thereby, the Tunisian government should take care of these two factors to adjust Tunisia's trade balance. Furthermore, there seems to be some inequality in the benefits from Tunisia-Turkey trade agreements. Thus, Tunisia should continue to press for more favorable terms in future agreements. In addition, there is a clear suggestion that the PAFTA agreement cannot significantly affect Tunisia's trade balance. Therefore, it seems necessary for the Tunisian government to review carefully the exiting free trade agreements in order to benefit from the advantages of international integration. Moreover, as the UE is prone to economic weakness, it is necessary for Tunisia to diversify its exporting markets and boost its exports to emerging market such as sub-Saharan African countries, which represent for Tunisia, as pointed out by African Development Bank (2014) a source of potential and significant growth that is little exploited. African Development Bank (2014) examined the index of trade complementarities between Tunisia exports and imports of its main partners and concluded that there is a relatively high degree of complementarities between Tunisia and some countries in sub-Saharan Africa which has been so far little exploited.

Regarding the effect of institutional factors, it is crucial to ensure and maintain political stability, improve the existing legal text and put in place more effective measures to eradicate corruption. In addition to their direct effect on trade balance, maintaining political stability and combating corruption should create the appropriate conditions to encourage investment and production in Tunisia, with positive effects on trade balance.

Further research could be done to extend our analysis. First, it would be useful to explore the relationship between free trade agreements and Tunisia's trade flows at a sectoral level. Second, looking at data that distinguish between individual European countries could also lead to a more detailed assessment of the impact of free trade agreements.

Acknowledgement

Makrem Ben Doudou is grateful for financial support offered by the Ministry of Higher Education and Scientific Research of Tunisia under the Young Teachers-Researchers Program 2017.

Appendix

Appendix 1. Source of variables

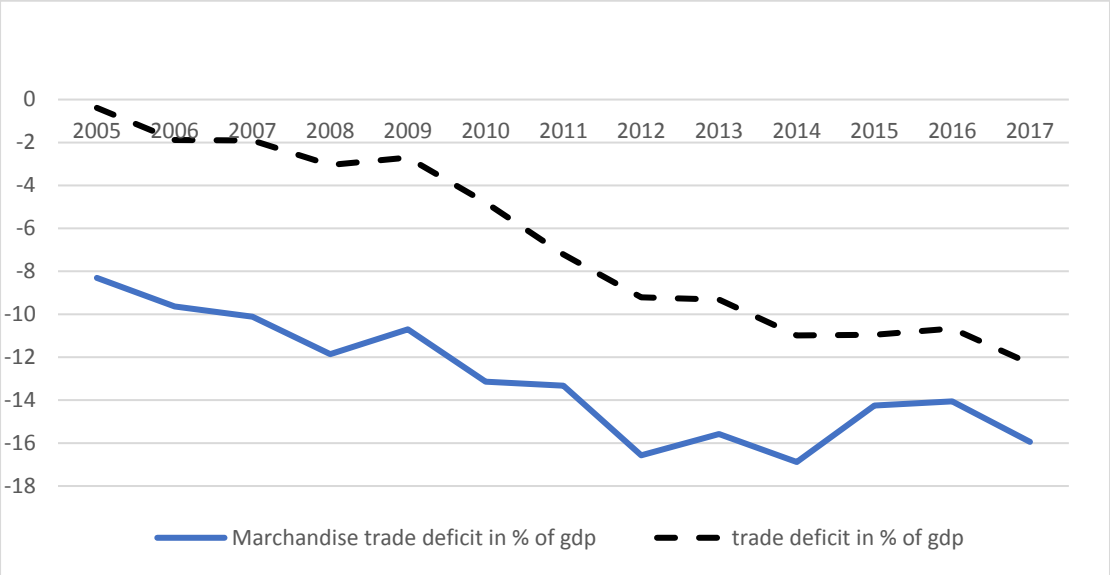
Variables (definition and unity)	Sources
$Export_{ijt}$ is the volumes of aggregate exports from Tunisia to country j at time t (measured in current US dollars).	DOTS database
$Import_{ijt}$ is the volume of imports from country j to Tunisia at time t (measured in current US dollars).	DOTS database
Y_{it}: Tunisia's GDP in year t (measured in current US dollars).	WDI database
Y_{jt}: GDP of country j in year t (measured in current US dollars).	WDI database
$Dist_{ij}$: geographical distance between Tunisia and country j (measured in km).	CEPII database
$LANG_{ij}$: dummy variable equal to one if the two partners share common language, zero otherwise.	CEPII database
COL_{ij} : it takes one if the two trading partners have the same colonizer; zero otherwise.	CEPII database
$BORD_{ij}$: it takes one if both partners share the same border; zero otherwise.	CEPII database
AS_j : dummy variable accounting for access to sea. It takes one if the partner country has maritime borders; zero otherwise.	CEPII database
FTA_UE_{ijt}: dummy for EU – Tunisia's trade agreement. It takes one if the trading partner and Tunisia are involved in the EU regional trade agreement at time t; zero otherwise.	World Trade Organization database
FTA_TURQ_{ijt} : agreement dummy taking one if Tunisia and Turkey are members of a bilateral free trade agreement at time t; zero otherwise.	World Trade Organization database
FTA_AGA_{ijt}: dummy for membership in AGADIR agreement. It takes one 1 if Tunisia and the partner country are engaged in the AGADIR regional trade agreement at time t; zero otherwise.	World Trade Organization database
FTA_PAFTA_{ijt}: dummy for membership in PAFTA agreement. It takes 1 it Tunisia and the	World Trade Organization database

partner country are member at time t; zero otherwise.	
IPC_{it} : index of perception of corruption. It is ranked from 0 to 10, with 10 denoting a low level of corruption.	Transparency International publications
COC_{it} : control of corruption. It is ranked from -2.5 (weak) to 2.5 (strong).	World Governance Indicators database
PS_{it}: political stability. It is ranked from -2.5 to 2.5, with 2.5 indicating a high level of stability.	World Governance Indicators database

Appendix 2. List of free trade agreements concluded by Tunisia

Agreement	**Year of entry into force**	**partners**
EU - Tunisia	1998	Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, United Kingdom
Pan-Arab Free Trade Area (PAFTA)	1998	Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syria, United Arab Emirates, Yemen
Turkey - Tunisia	2005	Turkey
Agadir Agreement	2007	Egypt, Jordan, Morocco

Appendix 3: Structure of Tunisia's trade deficit



Source: Authors' calculations, based on WDI database

References

Abdmoulah, Walid (2011), Arab Trade Integration: Evidence from Zero-Inflated Negative Binomial Model, *Journal of Economic Cooperation and Development*, 32, 2, 39-66

African Development Bank (2014), Tunisia: Interim Country Strategy Paper 2014-2015, *African Development Bank*, Abidjan.

Agostino, Mariarosaria, and Trivieri Francesco (2014), World Bank trade loans and export performance of recipient countries, *Journal of Economic Policy Reform*, 17:2, 99-128, DOI: 10.1080/17487870.2014.894912.

Álvarez, Inmaculada C., Barbero Javier, Rodríguez-Pose Andrés, and Zofío José L. (2018), Does Institutional Quality Matter for Trade? Institutional Conditions in a Sectoral Trade Framework, *World Development*, 103, 72 – 87.

Anderson, James. E, and Marcouiller Douglas (2002), Insecurity and the Pattern of Trade: An Empirical Investigation, *The Review of Economics and Statistics*, 84(2), 342–352.

Anderson, James. E., and Van Wincoop Eric (2003), Gravity with Gravitas: A Solution to the Border Puzzle, *The American Economic Review*, 93(1):170–192.

Atif, Rao Muhammad, and Haiyunand Liu, and Mahmood Haider (2017), Pakistan's agricultural exports, determinants and its potential: an application of stochastic frontier gravity model, *The Journal of International Trade & Economic Development*, VOL. 26 (3), 257-276.

Avom, Désiré, and Fankem Gislain S. G. (2014), Qualité du cadre juridique, corruption et commerce international : le cas de la CEMAC, *Revue d'économie politique* 124 : 101-128.

Bahamani-Oskooee, Mohsen, Hadj-Amor Thouraya, Harvey Hanafiah , and Karamelikli Huseyin (2019a), Is there a j-curve effect in Tunisia's bilateral trade with her partners? New evidence from asymmetry analysis, Econ *Change Restruct*, *52(1)*: 1 - 18. https://doi.org/10.1007/s10644-017-9216-3.

Bahamani-Oskooee, Mohsen, Hadj-Amor Thouraya, Nayer Majid M., and Niroomand Farhang (2019b) On the link between real effective value of Tunisia's Dinar and its sectoral trade with the rest of the world: New evidence from asymmetry analysis, *The Quarterly Review of Economics and Finance,* https://doi.org/10.1016/j. qref.2018.05.006

Baharumshah Ahmad Z., Lau Evan, and Fountas Stilianos (2003), On the Sustainability of Current Acount Deficits: Evidence from Four ASEAN Countries. *J. Asian Econ.*, 14(3): 465-487

Barro, Robert J. *(*1991), Economic Growth in a Cross Section of Countries, *The Quarterly Journal of Economic*s 106 (2): 407-443.

Ben Ali, Mohamed, and Mdhillat Mosbah (2015), Does Corruption Impede International Trade? New Evidence from the EU and the MENA Countries, *Journal of Economic Cooperation and Developmen*t 36 (4): 107-119.

Bhagwati, Jagdish N. (1982), Directly unproductive, profit-seeking activities, *Journal of Political Economy* 90 (5), 988-1002.

Caporale, Guglielmo M., Rault Christophe, Sova Robert, and Sova Anamaria (2012), European free trade agreements and trade balance: Evidence from four new European Union members, *The Journal of International Trade & Economic Development*, 21:6, 839-863, DOI: 10.1080/09638199.2011.555562.

Cestepe, Hamza, Yıldırım Ertugrul, and Bahtiyar Bersu (2015), The Impact of Trade Liberalization on the Export of MENA Countries to OECD Trade Partners, Procedia Economics and Finance 23, 1440 – 1445.

Cieslik, Andrzej, and Hagemejer Jan (2009), Assessing the Impact of the EU-sponsored Trade Liberalization in the MENA Countries, Journal of Economic Integration, DOI: 10.11130/jei.2009.24.2.343

Edwards, Sebastian (1993), Openness, Trade Liberalization, and Growth in Developing Countries, *Journal of Economic Literature* 31 (3) : 1358-1393.

Fosu, Augstin K. (2003), Political Instability and Export Performance in Sub Saharan Africa, *The Journal of Development Studies*, 39:4, 68-83, DOI: 10.1080/713869426.

Ghali, Sofiane, Zitouna Habib, Karray Zouhour, and Driss Slim (2013), Effects Of Ntms On The Extensive And Intensive Margins To Trade: The Case Of Tunisia And Egypt, *The Economic Research Forum*, working paper N° 820.

Huntington, Samuel (1968), *Political Order in Changing Societies*, New Haven: *Yale University Press.*

Irshad, M. Saqib, Xin Qi and Arshad Hamza (2018), Competitiveness of Pakistani rice in international market and export potential with global world: A panel gravity approach, *Cogent Economics & Finance*, https://doi.org/10.1080/23322039.2018.1486690

Kacem, Anis (2015), Free Trade Agreement Between Tunisia And The European Union, Do Institutions Matter? An Empirical Validation By A Gravity Model, *Journal of Asian Business trategy*, Volume 5(2), 19-36

Kahouli, Bassem and Maktouf Samir (2015), Trade creation and diversion effects in the Mediterranean area: Econometric analysis by gravity model, *The Journal of International Trade & Economic Development*: *An International and Comparative Review*, 24:1, 76-104, DOI: 10.1080/09638199.2013.873479

Karam, Fida, and Zaki Chahir (2018), Why Don't MENA Countries Trade More? The Curse of Deficient Institutions, *The Quarterly Review of Economics and Finance,* https://doi.org/10.1016/j.qref.2018.04.017.

La Porta, Rafael, Lopez-De-Salines Florencio, Shleifer Andrei, Vishny Robert W. (1997), Trust in large organizations. *Am Econ Rev Pap Proc* CXXXVII(2):333–338.

Lavallée, E., (2006), Similarité institutionnelle, qualité des institutions et commerce international, *Économie internationale,* 108, 27-58.

Leff, Nathaniel H. (1964), Economic development though bureaucratic corruption, *The American Behavioural Scientist* 8 (2), 8-14.

Martınez-Zarzoso, Inmaculada and Marquez-Ramos Laura (2019), Exports and governance: Is the Middle East and North Africa region different? *The World Economy*, 42, 143–174, DOI: 10.1111/twec.12633.

Neaime, Simon, Lagoarde-Segot Thomas, and Gaysset Isabelle (2017), Twin Deficits and the Sustainability of Macroeconomic Policies in Selected European and Mediterranean Partner Countries: Post Financial and Debt Crises, *FEMISE research paper* N° FEM42-06.

Olper, Alessandro, and Raimondi Valentina (2008) "Explaining National Border Effects in the QUAD Food Trade, Journal *of Agricultural Eco*nomics 59 (3): 436–462.

Ostry, D. Jonathan, and Rose Andrew K., (1992), An empirical evaluation of the Macroeconomic effects of tariffs, *Journal of International Money and Finance* 11, 3–79.

Parra-Robles, Maria. D., Martínez-Zarzoso Inmaculada., and Suárez-Burguet Celestino (2012), The impact of FTAs on MENA trade, I*bero America Institute for Econ. Research* Discussion Papers N°217.

Péridy, N. (2005), Toward a Pan-Arab Free Trade Area: Assessing Trade Potential effects of the Agadir Agreement, *Developing Economies* 43: 329–345.

Ramzy, Myriam and Zaki Chahir (2018): Do environment regulations matter for EU-MENA trade? *Applied Economics*, DOI: 10.1080/00036846.2018.1441519

Ranilovic´, Nina (2017), The Effects of Economic Integration on Croatian Merchandise Trade: A Gravity Model Study, *Comparative Economic Studi*es, doi:10.1057/s41294-017-0032-6.

Sachs, Jeffrey, and Warner Andrew (1997), Sources of Slow Growth in African Economies, *Journal of African Economies* 6 (3): 335-376.

Santos-Paulino, Amelia, and Thirlwall A. P. (2004), The impact of trade liberalization on exports, imports and the balance of payments of developing countries. *The economic Journal, 114*, 50–72.

Santos-Silva, Joao, and Tenreyro Silvana (2006), The Log of Gravity, *The Review of Economics and Statistics* 88 (4): 641–658. doi : 10.1162/rest.88.4.641.

Sarr, Abdourahmane, Söderling Ludvig, Fanizza Domenico, and Koranchelian Taline (2004), Tunisia: Selected Issues, IMF Country Report No. 04/360, *International Monetary Fund*, Washington, D.C.

Söderling, Ludvig (2005), Is the Middle East and North Africa Region Achieving Its Trade Potential? IMF Working Paper No. 05/90, *International Monetary Fund*, Washington, D.C.

Studnicka, Zuzanna, Thierie Wouter, and Hove Jan Van (2019), The impact of regional trade agreements on European exports, *International Economics and Economic Policy.*

Tamini, Lota D., Chebbi Houssem E., and Abbassi Abdessalem (2016), Trade performance and potential of North African countries: An application of a stochastic frontier gravity model, Working Paper 2016-4, *Centre de Recherche en Economie de l'Environnement, de l'Agroalimentaire, des Transports et de l'Énergie*.

UNCTAD (United Nations Conference on Trade and Development) (2015), Review of Maritime Transport 2015, *United Nations Conference on Trade and Development*, Geneva,

Yerkes, Sarah and Muasher Marwan (2017), Tunisia's Corruption Contagion: a transition at risk, *Carnegie Endowment for International Peace*, Washington.

Zidi, Ahmed, and Dhifallah Saïd M. (2013), Trade Creation and Trade Diversion between Tunisia and EU: Analysis by Gravity Model, *International Journal of Economics and Finance*; Vol. 5, No. 5, http://dx.doi.org/10.5539/ijef.v5n5p131