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How Did Wars Dampen Trade in the MENA Region?

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Abstract

This paper investigates the effects of war on trade in the Middle East and North Africa region (MENA), an area at considerable risk for conflicts. Using an augmented gravity model, we introduce a war variable and distinguish between different types of conflicts. We run a battery of sensitivity analysis tests to control for the endogeneity problem that may arise in our estimation. The results show that, in general, wars have a significantly negative impact on trade (exports and imports); civil conflicts in particular hinder exports, imports, and overall trade significantly. The disaggregated version of the gravity model shows that non-state conflicts have a detrimental effect on bilateral trade flows in manufacturing; however, none of the conflicts modeled affect trade in services. Finally, the outcome of the gravity model for manufacturing has been used to compute ad-valorem equivalents (AVEs) of wars at the country level. We found that, on average, a conflict is equivalent to a tariff of 5 percent of the value of trade. More heterogeneity is observed at the sectoral level, where AVEs range from 4 to 65 percent.

Résumé

Ce rapport examine comment les conditions météorologiques extrêmes ont affecté la moyenne et la variance des rendements de 18 cultures vivrières au Nigeria sur une période de 42 ans (1971-2012). Du fait de l'absence de données, l'analyse au niveau des Etats s'est limitée aux cinq cultures prioritaires identifiées par l'Agenda de Transformation Agricole (ATA) et couvre une période de 22 ans (1991-2012). Le cadre de l'analyse consiste en une fonction de production stochastique proposée par Just et Pope (1978, 1979). Les résultats montrent que la productivité de plus de la moitié des cultures de base au Nigeria est menacée par l'augmentation de la pluviométrie annuelle totale et les températures extrêmes à l'échelle nationale et à travers les Etats au Nigeria. Cependant, cette augmentation se trouve avoir des effets bénéfiques sur la productivité de quelques plantes cultivées dans le nord du Nigeria. L'impact économique montre que les températures extrêmes entraîneront une perte annuelle de valeur considérable pour la plupart des cultures, sauf quelques-unes qui sont cultivées principalement dans le nord du Nigeria (Borno, Yobe, Kaduna, Kano et Sokoto) telles que le mil, le melon et la canne à sucre.

1. Introduction

War's devastating effects are not restricted to the many people killed or wounded. The consequences of war extend far beyond battlefield casualties to include forced migration, the destruction of infrastructure, and the deterioration of institutional quality and economic growth. Wars also have a detrimental effect on international trade. Economic history shows that interstate conflicts are often accompanied by the imposition of partial or total trade embargoes on the exchange of goods or services. Furthermore, all types of armed conflicts (interstate and non-state conflicts) may reduce trade flows by raising the costs of engaging in international trade.

This paper explores the effects of war on trade in the Middle East and North African (MENA) region. Whether stemming from decolonization and issues of statehood or related to the revolutionary wave of demonstrations and protests generated by the Arab Spring, interstate conflict and civil war have frequently ripped this region apart since 1945. However, and surprisingly, MENA's share of trade in gross domestic product (GDP) compares favorably to other regions. Data from the World Development Indicators (2014) show that in 2012, the share of trade (95 percent) in MENA's gross domestic product (GDP) was higher than developed regions like North America (33 percent) and developing regions like Africa south of the Sahara (66 percent). We suspect that such bright figures mask a serious heterogeneity among countries and among sectors.

The relationship between conflict and international trade has garnered much more attention from political scientists than from economists. On the one hand, empirical studies in political science have tested reverse causation, i.e. the impact of bilateral trade on the frequency of war between country pairs. Many find a negative relationship (Polachek, 1980; Mansfield, 1995; Polachek, Robst and Chang, 1999; Oneal and Russett, 1999), but others find a positive relationship (Barbieri, 1996; 2002). On the other hand, various other studies (Pollins, 1989a and 1989b; Mansfield and Bronson, 1997; and Kesht, Pollins and Reuveny, 2004) study the problem from the other direction, focusing on the effect of war on trade and showing that conflicts dampen trade. In contrast, Morrow, Siverson, and Tabares (1998; 1999) and Mansfield and Pevehouse (2000) find that the effect of militarized interstate disputes on trade is not statistically significant. Barbieri and Levy (1999) find no evidence that war involving non-major-power countries reduces bilateral trade over time, while Anderton and Carter (2001) find that wars involving major powers dampen trade both with other major powers and minor powers.

In economics, Blomberg and Hess (2006) and Glick and Taylor (2008) use a gravity equation to investigate the effect of conflicts on trade, controlling for the standard determinants of trade in the literature. Blomberg and Hess (2006) calculate that, for a given country year, the presence of terrorism and internal and external conflict is equivalent to as much as a 30 percent tariff on trade. Glick and Taylor (2008) estimate the contemporaneous and lagged effects of wars on trade, controlling for the

possible effects of reverse causality, and show that wars dampen trade. Meanwhile, Martin et al. (2008) finds that the conventional wisdom that trade promotes peace is only partially true. When war occurs because of the presence of asymmetric information, the probability of escalation is lower for countries that trade more bilaterally because of the opportunity cost associated with the loss of trade gains. However, countries more open to global trade have a higher probability of war because multilateral trade openness decreases bilateral dependence to any given country, as well as the cost of a bilateral conflict.

Despite being ripped apart by different types of interstate and intrastate conflicts since 1945, the MENA region has been widely neglected in the literature on conflicts and trade. According to Gates et al. (2010), there was a strong and fairly steady increase in the number of conflicts in the MENA region from 1945 until the early 1990s, followed by a strong decline for the next 10 years. The level of conflict was fairly moderate until the late 1970s, associated with decolonization or issues of statehood, particularly the Palestinian conflict. The increase in conflict seen during the 1970s and 1980s is probably a result of the Cold War era, during which the superpowers supported a broad range of wars and minor conflicts. During the 1980s and the 1990s, the incidence of conflict in the MENA region increased, with the Iran-Iraq war and the Algerian Civil War as the two most intense examples. While the second half of the 1990s was more peaceful than the first half, the decade as a whole again witnessed more violence. Of course, the story is not over yet, with the revolutionary wave of demonstrations, protests, and wars occurring in the Arab world since December 2010. Noting such a critical history of violence in MENA countries, one might be surprised to know that in 2012, the share of trade in MENA GDP (95 percent) was the highest among developed and developing regions. The share of service trade is not as bright as the share of goods trade, accounting for only 15 percent of MENA GDP, but it is worth noting that this percentage is higher than that in other developed regions, as well as developing regions. Although such figures may seem dazzling, heterogeneity still exists among countries and sectors; this disaggregated data reveals a dimmer picture.

This paper investigates the effects of war on the trade performance of MENA countries. We adopt the definition of different types of conflicts suggested by the Department of Peace and Conflict Research at Uppsala University: armed conflicts between two parties, of which at least one is the government of a state; non-state conflicts between two organized armed groups, neither of which is the government of a state; and one-sided violence where we distinguish between one-sided state violence, when the actor is the government of a state, and one-sided non-state violence in the opposite case. With this diversity of conflicts in the region, we must be cautious when investigating the effects on MENA trade. While interstate conflicts are often accompanied by the imposition of trade embargoes on the exchange of goods or services, and therefore affect trade between country pairs, the other types of conflicts do not

necessarily involve country pairs. Therefore, we run two sets of regressions. First, since interstate conflicts affect trade between country pairs, we run sectoral regressions in which we investigate the effect of conflicts on bilateral trade flows in 27 manufacturing sectors for the period 1980-2006. Taking into consideration that trade might have different impacts on the manufacturing and service sectors, and since bilateral trade flows in services are not available at a disaggregated level, we use the unilateral variant of the gravity model for disaggregated trade in 12 service sectors for the period 2000-2013. Second, we run macroeconomic regressions in which we investigate the impact of conflicts on countries' ability to trade (i.e., do countries trade more or less, in general), and sectoral regressions in which we take into consideration the bilateral dimension of war and assess the effects of conflicts on bilateral trade. Similar to van Lynden (2011), we propose an adaptation of the gravity model using unilateral variants of the variables that influence bilateral trade. These unilateral variants will be country-specific, instead of country-pair-specific, and will be controlled for to assess the effect of different types of conflicts on the trade volume of MENA countries for the period 1960-2013.

Our results show that, in general, wars have a significantly negative impact on exports, imports, and trade. In particular, civil conflicts (non-state conflicts) hinder exports, imports, and trade significantly. The disaggregated version of the gravity model shows that non-state conflicts, unlike other types of conflicts, have a detrimental effect on bilateral trade flows in manufacturing; however, none of the conflicts affect trade in services. Finally, the outcome of the gravity model for the manufacturing sector has been used to compute ad-valorem equivalents of wars at the country level. We found that, on average, a conflict is equivalent to a tariff of 5 percent of the value of trade. More heterogeneity is observed at the sectoral level, where AVEs range from 4 to 65 percent.

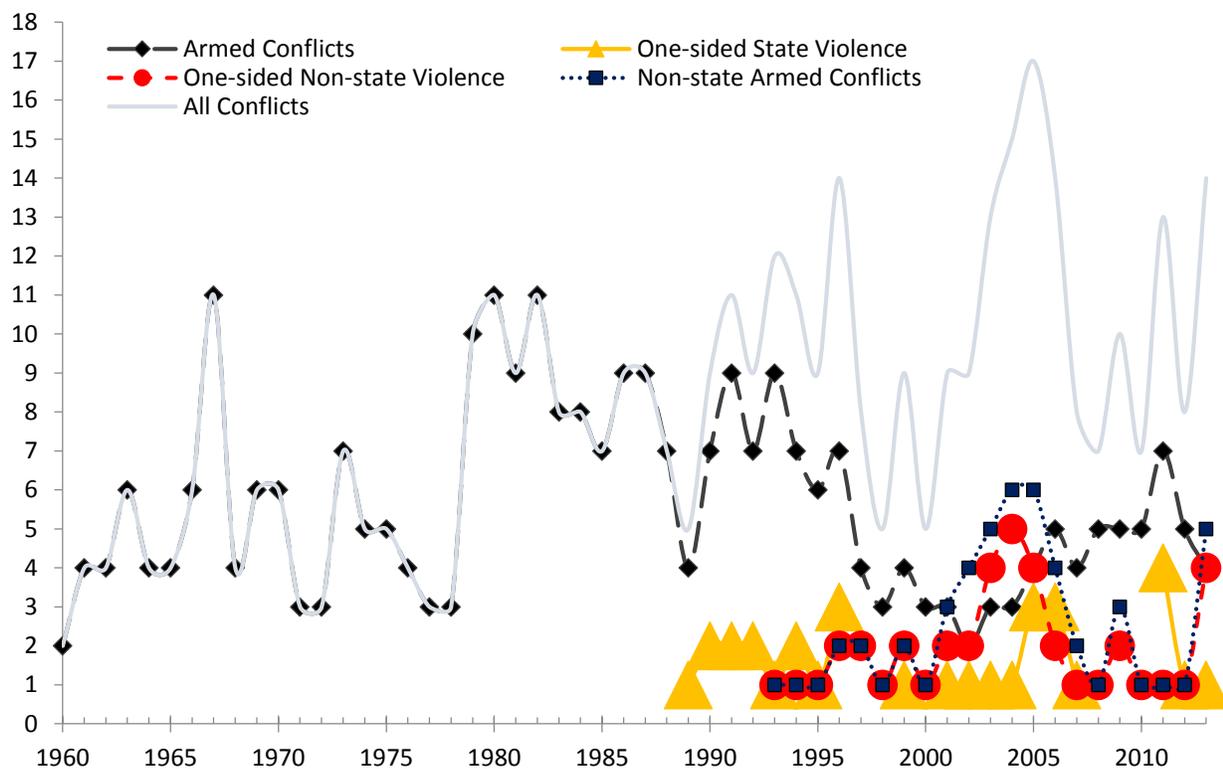
The paper is organized as follows. Section 2 describes some stylized facts regarding trade and war in the MENA region. Section 3 explains the econometric specifications and Section 4 is devoted to the discussion of the results. Section 5 presents some further results. Finally, Section 6 concludes and presents some policy implications.

2. Wars and Conflicts in the MENA Region

One of the world's most critical regions of frequent conflict is the Middle East and North Africa. Although the number of conflicts in the MENA region has fluctuated in recent decades, broadly in line with global trends (Gates et al., 2010), this number remains disproportionate to the region's population. The region accounts for only 5.5 percent of the world's population; yet it has experienced around 15 percent of the world's conflicts since 1945 and nearly one-third of all intra-state wars in the world from the late 1970s until the mid-1990s (World Bank, 2011).

Figure 1 shows the strong and reasonably steady increase in the number of conflicts in the MENA region since 1960. The level of conflict was fairly moderate until the late 1970s; in this first decade, some of the region’s conflicts were related to decolonization, while others related to issues of statehood, particularly the Palestinian conflict and the 1967 Arab-Israeli war. In addition to the persistence of the Palestinian conflict, the MENA region witnessed an increasing number of conflicts in the late 1970s and 1980s resulting from the Cold War era, during which the superpowers and their allies fought and supported a broad range of wars and minor conflicts. During the 1980s and well into the 1990s, the incidence of conflict in the MENA region increased even more with the Iran-Iraq war and the Algerian Civil War (Gates et al., 2010). While the second half of the 1990s was more peaceful than the first, that decade again witnessed more violence in the region. Finally, since December 2010, MENA countries have been experiencing the revolutionary wave of protests, uprisings, and demonstrations collectively referred to as “The Arab Spring”.

Figure 1: Conflicts in the MENA Region (1960 – 2013)

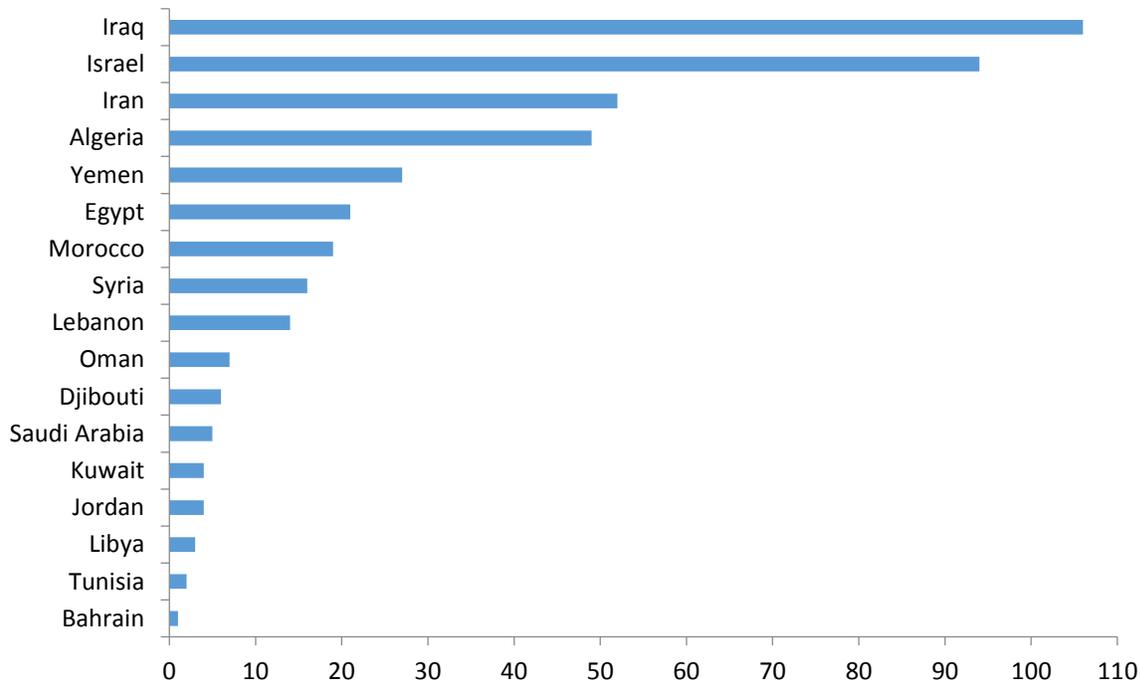


Source: Authors’ calculations from the Uppsala Conflict Data Program, Department of Peace and Conflict Research, Uppsala Universitet.

It should also be noted that the distribution of conflicts among MENA countries is highly uneven: 60 percent of conflicts since 1960 have occurred in Israel, Iran, and Iraq. Algeria, Egypt, Lebanon, Morocco, Syria, and Yemen have accounted for another 34 percent of conflicts. Most of the other

countries did not experience a single conflict since 1960 (Figure 2).

Figure 2: Total Number of Conflicts by MENA Country (1960 – 2013)



Source: Constructed by the authors using the Uppsala Conflict Data Program, Department of Peace and Conflict Research, Uppsala Universitet.

The nature of violence in the region has also changed over time. Figure 1 shows that while armed conflicts* were dominant until the late 1990s, since then, the region has seen the appearance of other types of violence, such as non-state armed conflicts, one-sided state violence, and one-sided non-state violence. Apart from the Iraqi war and the persistent Palestinian conflict, much of these latter types of violence have resulted from anti-government protests, riots, uprisings, and civil wars associated with the Arab Spring.

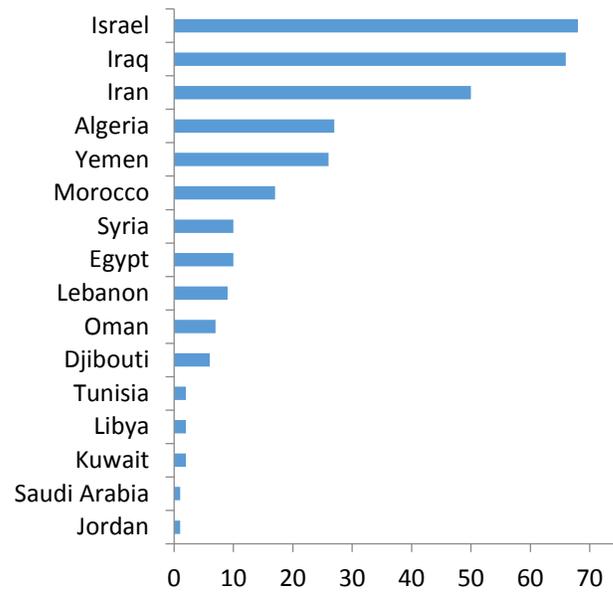
Figures 3a to 3d show that 61 percent of armed conflicts since the 1960s have occurred in Israel, Iraq, and Iran; 60 percent of one-sided state violence happened in Israel and Iraq, while 83 percent of one-sided non-state violence and 85 percent of non-state armed conflicts hit Israel, Iraq, Egypt, and Algeria.

* Types of conflicts are based on the Uppsala Conflict Data Program (UCDP)’s definitions with some alteration for the sake of clarification. Armed conflicts are defined as “a contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths”; Non-state armed conflicts is defined as “the use of armed force between two organized armed groups, neither of which is the government of a state, which results in at least 25 battle-related deaths in a year”; One-sided violence is the use of armed force by the government of a state (we call it one-sided state violence) or by a formally organized group (we call it one-sided non-state violence) against civilians which results in at least 25 deaths.

The dominance of all types of conflicts in Israel and Iraq is explained by the long-standing Palestinian conflict and the Iraqi war that began in 2003 and resulted in the end of Ba'athist Iraq and the establishment of a democratic constitution. Since then, there has followed a long phase of fighting during which an insurgency has opposed the occupying forces and the newly elected Federal government of Iraq. While the United States completed its withdrawal of military personnel in December 2011, this insurgency is ongoing and continues to cause thousands of fatalities.

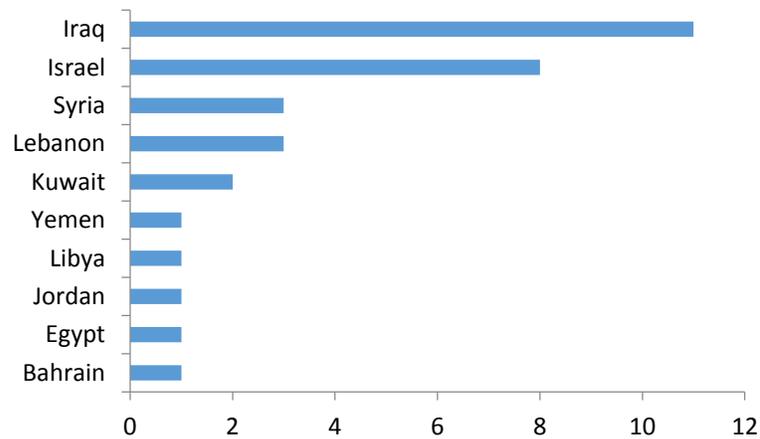
The Arab Spring, which has spurred conflict throughout the region, started in Tunisia on December 17, 2010 with the self-immolation of Tunisian Mohamed Bouazizi, who was selling fruit at a roadside stand. An hour after a municipal inspector confiscated his wares, Bouazizi doused himself with gasoline and set himself afire. His subsequent death in January 2011 brought together many unemployed people, political and human rights activists, labor unionists, students, professors, lawyers, and others, all dissatisfied with the existing system. The resulting Tunisian Revolution forced President Zine El Abidine Ben Ali to step down after 22 years in power, and a wave of unrest motivated by social discontent and government corruption then struck Algeria, Jordan, Egypt, and Yemen before spreading to even more countries. As of today, rulers have been forced from power in Tunisia, Egypt (twice), Libya, and Yemen, and civil uprisings have erupted in Bahrain and Syria. Major protests have broken out in Algeria, Iraq, Jordan, Kuwait, Morocco, and Israel, and minor protests have occurred in Oman, Saudi Arabia, and Djibouti. Many Arab Spring demonstrations have been met with violent attacks from authorities and counter-demonstrators, and these attacks have been answered, in some cases, with violence from protestors themselves.

Figure 3a: Armed Conflicts by MENA Country (1960 – 2013)



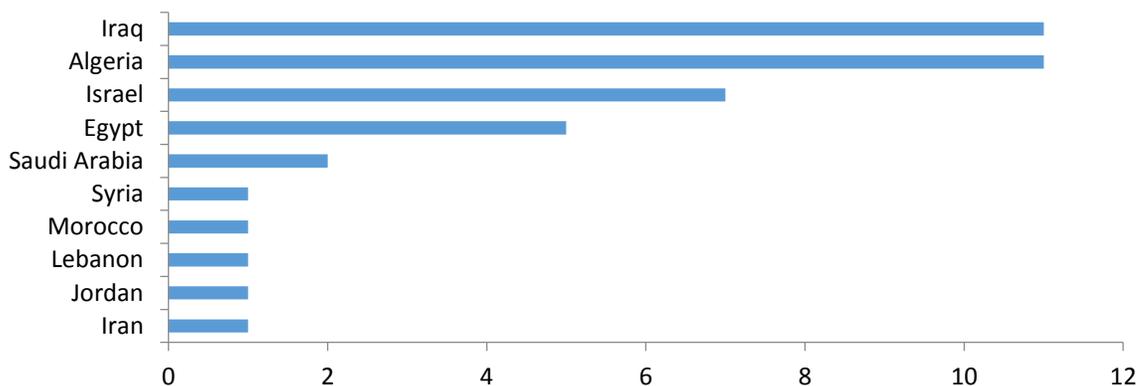
Source: Constructed by the authors using the Uppsala Conflict Data Program, Department of Peace and Conflict Research, Uppsala Universitet.

Figure 3b: One-Sided State Violence by MENA Country (1960 – 2013)



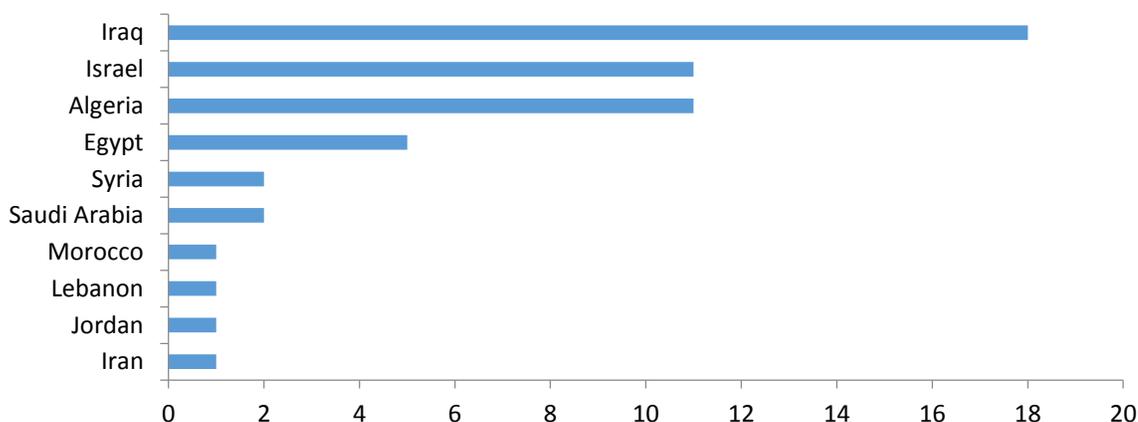
Source: Constructed by the authors using the Uppsala Conflict Data Program, Department of Peace and Conflict Research, Uppsala Universitet.

Figure 3c: One-Sided Non-State Violence by MENA Country (1960 – 2013)



Source: Constructed by the authors using the Uppsala Conflict Data Program, Department of Peace and Conflict Research, Uppsala Universitet.

Figure 3d: Non-State Armed Conflicts by MENA Country (1960 – 2013)



Source: Constructed by the authors using the Uppsala Conflict Data Program, Department of Peace and Conflict Research, Uppsala Universitet.

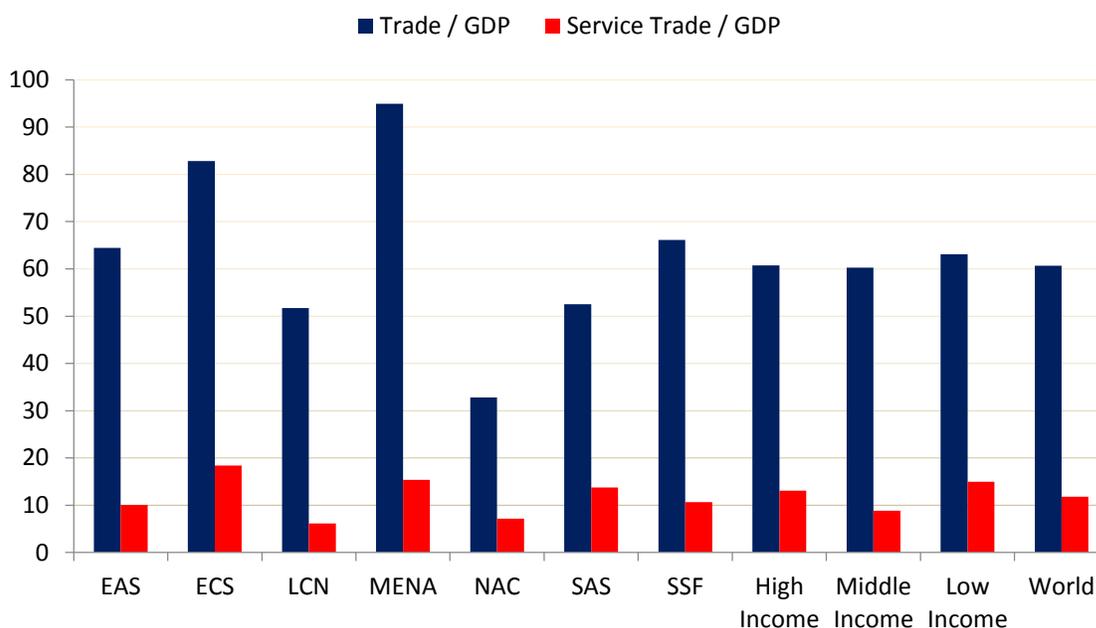
Conventional wisdom suggests that violence can significantly disrupt economic activity, particularly international trade. Economic history shows that conflicts between countries are usually accompanied by the imposition of partial or total trade embargoes on the exchange of goods or services. Moreover, violence may reduce trade flows by raising the cost of engaging in international trade. Surprisingly, however, the picture looks brighter for the MENA region.

Figure 4 shows that in 2012, the share of trade in MENA GDP was higher than in other regions, both developed ones like North America (33 percent) and developing ones like Africa south of the Sahara (66 percent). However, this is in large part due to petroleum exports. MENA trade excluding oil is at about the world average, but exports alone are below the world average. Behar and Freund (2011) show

that, depending on GDP, distance, and a number of other factors, a typical MENA country under-trades with other countries: exports to the outside world are at only one-third of their potential. However, intra-MENA trade is conditionally higher than extra-MENA trade. These results hold for aggregate exports, non-natural exports, and non-petroleum exports.

The share of service trade in MENA GDP is low at nearly 15 percent; however, this percentage is higher than other developed and developing regions (Figure 4). The share of exports in GDP is much lower, around 6 percent, although this is higher than most other regions and the world average (Figure 5). Sectors like tourism, transportation, remittance, and, to a lower extent, financial, transportation, and telecommunication services are the driving forces behind this stylized fact.

Figure 4: Trade as a Percentage of GDP, 2012



Source : World Bank, World Development Indicators database online, 2014.

Note: (i) Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product. (ii) EAS: East Asia & Pacific; ECS: Europe & Central Asia; LCN: Latin America & Caribbean; MENA: Middle East & North Africa; NAC: North America; SAS: South Asia; SSF: Sub-Saharan Africa.

Figure 5: Exports as a Percentage of GDP, 2012



Source : Authors' Calculations from World Bank, World Development Indicators database online, 2014.

Note: EAS: East Asia & Pacific; ECS: Europe & Central Asia; LCN: Latin America & Caribbean; MENA: Middle East & North Africa; NAC: North America; SAS: South Asia; SSF: Sub-Saharan Africa.

Table 1 shows that almost all Gulf Council Countries (GCC), in addition to Djibouti, Israel, Jordan, Lebanon, Libya, Malta, Morocco, and Tunisia, exceed the region's average trade share in GDP, with the highest share in 2012 for Malta (202 percent). According to authors' calculations, Malta exhibits a comparative advantage[†] mainly in fish, crustaceans, tramway locomotives, machinery, nuclear reactors, pharmaceutical products, cereal, flour, milk preparations and products, clocks and watches, and toys and games. Jordan has a revealed comparative advantage mostly in machinery, nuclear reactors, knitted or crocheted fabric, tramway locomotives, articles of apparel, paper and paperboard, beverages and vinegar, inorganic chemicals, tobacco and manufactured tobacco substitutes, salt, stone, and cement. GCC countries mainly have a revealed comparative advantage in mineral fuels and oils (Kuwait and Qatar); organic chemicals (Kuwait, Qatar and Saudi Arabia); milling products (Kuwait); dairy products, eggs, honey, and edible animal products (Qatar and Saudi Arabia); essential oils, perfumes, cosmetics, furniture, lighting, miscellaneous articles of base metal, railway, and tramway locomotives (Bahrain); stone and cement (Bahrain and United Arab Emirates); vehicles, live animals, tobacco, and manufactured tobacco substitutes (Oman); ships and boats (Oman and Saudi Arabia); musical instruments (Qatar); plastics and soaps (Qatar, Saudi Arabia); paper (Saudi Arabia); and manufactures of plaiting material, basketwork, leather, fish, crustaceans, and mollusks (Yemen). Israel's comparative

[†] The Revealed Comparative Advantage index is based on export data only. The results are available to the interested reader upon request.

advantage is in sectors like knitted or crocheted fabric, oil seeds, oleagic fruits (such as olive, sesame and nuts that produce oil), grain, electrical and electronic equipment, pearls, miscellaneous chemical products, live trees and plants, stone, cement, and pharmaceutical products. Tunisia benefits from a comparative advantage in inorganic chemicals, precious metal compound, products of animal origins, miscellaneous articles of base metal, articles of apparel, articles of leather, musical instruments, and electrical and electronic equipment.

Table 1: Trade as a Percentage of GDP for Selected MENA Countries (2002 – 2012)

		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Algeria	Total				71.20	70.63	71.57	76.74	70.88	69.13	68.26	67.61
	Services				7.10	6.32	7.14	8.55	10.70	9.66	8.19	7.38
Bahrain	Total	148.00	146.24	168.25	148.31	147.10	137.78	145.88	117.96	120.46	126.81	123.75
	Services	23.69	22.34	35.67	28.62	27.38	24.77	23.13	24.29	23.87	17.47	15.04
Djibouti	Total	82.48	90.04	87.96	91.58	95.15	101.75	104.43	79.27	78.39	85.70	83.09
	Services	43.04	45.61	43.28	46.87	44.31	39.68	40.58	35.70	38.29	37.64	35.11
Egypt	Total	40.85	47.86	67.63	72.52	71.86	75.18	74.92	52.09	49.66	45.95	44.67
	Services	18.12	21.14	28.12	28.04	25.77	26.28	26.12	18.76	17.60	14.07	14.54
Iraq	Total				100.39	84.56	69.73	77.92	76.55	71.27	70.23	74.35
	Services				12.91	8.98	6.45	6.89	9.63	8.89	7.29	7.47
Israel	Total	74.67	73.34	80.57	85.82	82.78	83.37	78.41	64.61	68.34	71.54	72.16
	Services	20.46	20.25	21.78	22.92	22.62	22.36	20.97	19.47	18.79	18.57	20.15
Jordan	Total	113.83	117.97	139.66	146.98	141.75	145.99	144.02	114.99	116.82	119.44	117.84
	Services	38.09	36.38	38.35	38.75	39.04	41.29	39.16	35.15	37.91	33.34	32.98
Kuwait	Total	81.50	86.32	89.27	91.40	90.37	92.40	93.36	92.78	92.76	95.07	93.50
	Services	19.70	20.33	19.09	16.70	18.79	20.50	18.82	23.90	20.64	17.22	16.14
Lebanon	Total	81.31	124.75	134.11	141.28	147.92	153.72	177.17	143.81	134.05	143.03	139.99
	Services	40.97	79.75	81.52	88.10	93.61	92.53	107.85	88.08	76.49	81.43	79.94
Libya	Total	96.02	92.15	86.50	97.51	95.15	93.82	94.63	103.44	107.06	99.96	114.52
	Services	9.73	8.50	7.12	6.55	5.41	3.81	4.89	8.74	8.75	12.76	8.73
Malta	Total	164.34	160.20	161.50	158.92	188.12	189.15	189.83	169.08	190.84	195.37	201.63
	Services	47.52	46.01	48.94	54.56	68.17	74.21	82.97	80.72	87.89	91.23	92.53
Morocco	Total	63.78	60.46	64.02	62.39	65.92	73.54	83.12	64.82	70.56	78.37	82.67
	Services	16.93	16.68	17.83	22.02	24.15	25.90	24.73	23.90	24.36	24.67	24.47
Oman	Total	96.45	95.38	100.57	99.68	99.65	109.34	108.87	105.31	106.55	111.19	114.09
	Services	12.43	14.68	15.55	13.22	14.15	16.18	12.68	14.72	13.93	13.17	14.76
SA	Total	66.97	73.18	79.44	85.20	89.94	95.07	96.10	84.86	82.77	85.76	83.74
	Services	13.24	12.65	12.62	13.56	16.92	19.11	16.28	19.75	16.60	13.37	11.51
Syria	Total	66.22	60.59	76.10	78.36	75.14	76.49					
	Services	15.65	14.26	19.39	18.26	16.33	17.01					
Tunisia	Total	86.82	84.72	89.85	90.66	94.40	104.57	114.87	93.90	105.25	105.10	107.09
	Services	17.96	16.85	18.11	18.53	18.95	19.22	20.25	18.88	20.13	16.97	18.29
WBG	Total	107.07	107.10	110.53	93.50	97.67	104.49	94.50	93.42	83.53	85.26	88.27
	Services	31.08	26.85	23.38	17.48	17.77	21.45	21.37	22.51	23.71	20.61	20.85
Yemen	Total	69.58	73.44	71.17	76.04	82.00	66.83	71.93	61.40	63.98	69.95	
	Services	10.01	11.01	10.21	9.63	12.60	10.11	11.69	12.11	12.48	12.06	

Source : Authors' calculations based on World Bank, World Development Indicators database online, 2014.

Note: SA: Saudi Arabia; WBG: West Bank & Gaza.

Djibouti, Jordan, Bahrain, Lebanon, and Malta exhibited higher shares for service trade in GDP than the region's average in 2012, with Malta (93 percent), Lebanon (80 percent), and Jordan (33 percent) being the highest. Authors' calculations for the Revealed Comparative Advantage index for services show that Malta exhibits high values for personal, cultural, and recreational services, financial services, and royalties and license fees. Lebanon exhibits a comparative advantage in tourism, remittances, financial and construction services, while Jordan has a comparative advantage in remittances and government services and Bahrain has an advantage in the transportation and communications services.

Table 1 also shows that, for those countries the least affected by conflict, the share of trade in GDP has been stable or has increased over the past decade. Conversely, countries like Bahrain, Egypt, Iraq, and the West Bank and Gaza witnessed a decreasing share of trade in GDP. This fact concurs with the various conflicts that struck the above-mentioned countries as a result of the Arab Spring, the aftermath of the Iraqi war, and the on-going Palestinian conflict.

3. Methodology and Data

The methodology used in this article draws on the gravity model pioneered by Tinbergen (1962) and Anderson (1979). An essential tool in the empirics of international trade to predict bilateral trade flows using multiple determinants of trade, the gravity model has undergone significant theoretical and empirical improvements over the years (Mac Callum, 1995; Feenstra et al., 2001; Feenstra, 2002; Anderson and van Wincoop, 2003; Evenett and Keller, 2002; Santos Silva and Tenreyro, 2006), enforcing its theoretical base and narrowing the gap between theoretical and empirical findings.

In order to assess the impact of war and different types of conflicts on trade in the MENA region, we adopt the definition of conflicts suggested by the Department of Peace and Conflict Research at Uppsala University: armed conflicts between two parties, of which at least one is the government of a state; non-state conflicts between two organized armed groups, neither of which is the government of a state; and one-sided violence in which we distinguish between one-sided state violence, when the actor is the government of a state, and one-sided non-state violence in the opposite case.

Although conflicts occurring in the MENA region do not necessarily involve country pairs, we cannot deny that some types of conflict have a bilateral dimension and might affect bilateral trade between the two partners involved. Furthermore, we believe that the devastating effects of conflict on trade will vary depending on countries' comparative advantages, as some sectors are more affected by war than others. Therefore, we run the regressions at a disaggregated sectoral level for both manufacturing and services. For bilateral trade in manufacturing, we use a Trade and Production dataset with 27 sectors for the period 1980–2006. To deal with the zero trade issue, while might result from the fact that war leads to discrete changes in trade and often draw the level of trade down to zero, we opt for a Poisson pseudo-maximum likelihood regression (Santos Siliva and Tenreyro, 2006). The poisson pseudo maximum likelihood (PPML) estimator is a non-linear estimator used to deal with zero trade observations and to provide unbiased and consistent estimates that are robust to the presence of heteroscedasticity. The PPML estimator offers several desirable properties for gravity models. First, it is consistent in the presence of fixed effects, which can be entered as dummy variables as in simple Ordinary Least Squares (OLS) regressions. This point is particularly important for gravity modeling because most theory-consistent models require the inclusion of fixed effects by exporter and by importer (this is why we

include them in our specification). Second, the Poisson estimator naturally includes observations for which the observed trade value is zero. Such observations are dropped from the OLS model because the logarithm of zero is undefined. Moreover, those zero observations are relatively common in disaggregated trade matrices, since not all countries trade all products with all other countries and since wars can result in the cessation of trade between partners. Third, the interpretation of the coefficients from the Poisson model is straightforward and follows exactly the same pattern as OLS. Although the dependent variable for the Poisson regression is specified as exports in levels rather than in logarithms, the coefficients of any independent variable entered in logarithms can still be interpreted as simple elasticities. The coefficients of independent variables entered in levels are interpreted as semi-elasticities, like in OLS. Our estimable equation is:

$$\begin{aligned}
X_{ijkt} = & \beta_0 + \beta_1 \ln Dist_{ij} + \beta_2 Contig_{ij} + \beta_3 Comcol_{ij} + \beta_4 Col_{ij} + \\
& \beta_5 RTA_{ij} + \beta_6 \ln(1 + tar_{ij}) + \beta_7 Lang_{ij} + \beta_8 armedconflicts_{ijt-1} + \beta_9 nonstate_{it-1} + \\
& \beta_{10} onese_{it-1} + \beta_{11} onesidens_{it-1} + \Delta i + \mu j + \alpha k + \epsilon_{it}
\end{aligned} \tag{1}$$

where X_{ijkt} is the bilateral trade flow between country i and country j in year t for sector k , $\ln Dist_{ij}$ is the bilateral distance between the two countries, $Contig_{ij}$, $Comcol_{ij}$, Col_{ij} , RTA_{ij} and $Lang_{ij}$ are dummy variables that take the value of 1 if the two countries share common borders, have colonized by the same colonizer, had previous colonial links, are members of a regional trade agreement and share common languages. αk , μj and Δi are sector, importer and exporter fixed effects, respectively.

We run regressions at the sector level to examine the different impact of conflicts on sectors.

For services, bilateral trade data is not available at a disaggregated level. Therefore, the dependent variable is total exports by country in 12 service sectors for the period 2000–2013. Disaggregated trade by service sectors come from “Trade Map,” a web-based application with statistics, trends, and indicators on global trade flows developed by the International Trade Center (ITC, Geneva). The estimable equation[‡] is as follows:

$$\begin{aligned}
\ln X_{itk} = & \beta_0 + \beta_1 GDP_{it} + \beta_2 \ln Dist_i + \beta_3 Arabic_i + \beta_4 France_i + \beta_5 UK_i + \\
& \beta_6 armedconflicts_{it-1} + \beta_7 nonstate_{it-1} + \beta_8 onese_{it-1} + \beta_9 onesidens_{it-1} + \Delta i + \\
& \alpha k + \epsilon_{it}
\end{aligned} \tag{2}$$

This equation is first run by pooling countries and sectors in the same regression; it is then run at the sectoral level (12 regressions).

[‡] We use OLS techniques (instead of PPML) and introduce exporter and sector dummies since the share of zero flows is very small.

4. Empirical Findings

Table 2 shows the impact of the different types of conflicts on bilateral trade between country pairs. In terms of our gravity variables, distance and tariffs have a significant negative impact on bilateral trade flow, while common language has a significant positive impact. More importantly, non-state war is the only type of conflict that hampers bilateral trade, reducing bilateral trade flows by 15.5 percent[§]. This finding is supported by the fact that civil wars are likely to destroy infrastructure, stop production processes and consequently affect exports (Martin et al., 2008). The effect of non-state conflicts on bilateral trade is even harsher, reducing trade by 22 percent when we combine all the conflicts simultaneously in one specification. In fact, the conflict coefficient is greater than the tariff one, showing that civil conflict hinders trade more than classical tariffs. This is true for two reasons. First, conflicts hinder both exports and imports, whereas tariffs affect only imports. Second, while tariffs can reduce trade flows for specific products and/or sectors, wars dampen trade regardless of the type of the product. On the supply side, the whole production process is affected, leading to fewer exports, while on the demand side, individuals' purchasing power is negatively impacted, leading to fewer imports.

When we run the regressions by manufacturing sectors, we find that one-sided non-state violence hampers 44 percent of manufacturing sectors (wearing apparel, industrial chemicals, other chemicals, plastic products, other non-metallic mineral products, iron and steel, fabricated metal products, machinery except electrical, and professional and scientific equipment). Sectors like tobacco and wood products are affected by non-state conflicts, furniture by non-state conflicts and one-sided state violence, and food products and beverages by armed conflicts. Trade in leather product is affected by both one-sided non-state violence and non-state conflicts. Trade in machinery electric is affected by one-sided non-state violence and by armed conflicts. The effect of conflicts seems to vary among manufacturing sectors according to the comparative advantage of the country in question. Finally, it is worth noting that we got very few counter-intuitive positive and significant coefficients of conflicts on bilateral trade of some sectors (Tables 3-5).

[§] This elasticity has been calculated as follows: $e^{\beta}-1$ where β is the “non-state” coefficient.

Table 2: The Effect of Different Types of Wars on Manufacturing (disaggregated data)

	PPML Flow	PPML Flow	PPML Flow	PPML Flow	PPML Flow
Ln(Dist.)	-1.584*** (0.133)	-1.584*** (0.133)	-1.585*** (0.133)	-1.584*** (0.133)	-1.586*** (0.133)
Ln(1+Tar)	-0.144** (0.0701)	-0.144** (0.0701)	-0.144** (0.0701)	-0.144** (0.0701)	-0.144** (0.0701)
Contig.	-0.225 (0.207)	-0.227 (0.207)	-0.226 (0.207)	-0.224 (0.207)	-0.223 (0.207)
Lang.	0.874*** (0.177)	0.873*** (0.178)	0.879*** (0.179)	0.875*** (0.178)	0.880*** (0.181)
Com. Col.	-0.257 (0.205)	-0.260 (0.205)	-0.259 (0.205)	-0.257 (0.205)	-0.263 (0.206)
Col 45	0.0812 (0.278)	0.0824 (0.277)	0.0782 (0.278)	0.0809 (0.278)	0.0756 (0.279)
RTA	0.252 (0.180)	0.252 (0.178)	0.249 (0.179)	0.251 (0.178)	0.253 (0.180)
One side NS	-0.0101 (0.0512)				-0.153 (0.172)
Non-state		-0.169*** (0.0635)			-0.248** (0.110)
One side			0.0397 (0.0849)		0.176 (0.219)
Armed				-0.0403 (0.0972)	0.00880 (0.111)
Constant	2.832** (1.207)	2.841** (1.207)	2.837** (1.207)	2.835** (1.208)	2.848** (1.206)
Exporter fixed effect	YES	YES	YES	YES	YES
Importer fixed effect	YES	YES	YES	YES	YES
Sector fixed effect	YES	YES	YES	YES	YES
Observations	222256	222256	222256	222256	222256
R-squared	0.221	0.221	0.221	0.221	0.222

Robust Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3: The Effect of Different Types of Wars on Manufacturing Exports 1 (sectoral level)

	311 Flow	313 Flow	314 Flow	321 Flow	322 Flow	323 Flow	324 Flow	331 Flow	332 Flow
Ln(Dist.)	-1.020*** (0.251)	-3.307*** (0.366)	-3.484*** (0.520)	-1.627*** (0.283)	-3.130*** (0.461)	-0.525** (0.227)	-2.640*** (0.233)	-1.960*** (0.206)	-1.455*** (0.358)
Ln(1+Tar)	-0.135** (0.0526)	-0.0319 (0.0735)	-0.293*** (0.0437)	-0.162** (0.0755)	-0.252*** (0.0603)	-0.0211 (0.166)	-0.526*** (0.109)	0.204*** (0.0709)	-0.0143 (0.207)
Contig.	0.933** (0.411)	0.0774 (0.415)	-1.953* (1.107)	0.0901 (0.359)	-1.686* (0.864)	0.537 (0.494)	-1.270** (0.533)	0.416 (0.429)	0.288 (0.455)
Lang.	1.333*** (0.225)	1.002** (0.398)	1.583*** (0.494)	1.112*** (0.271)	0.895*** (0.334)	1.260** (0.511)	1.720*** (0.346)	2.114*** (0.280)	0.644* (0.370)
Com. Col.	-0.569* (0.319)	1.749*** (0.519)	2.629*** (0.997)	0.431 (0.316)	-0.459 (0.554)	-0.526 (0.445)	-0.468 (0.485)	-1.517*** (0.365)	-1.087*** (0.371)
Col 45	-0.449 (0.671)	1.401** (0.626)	2.072** (1.005)	0.706** (0.318)	0.641* (0.378)	1.031* (0.544)	0.158 (0.538)	-0.166 (0.355)	1.007** (0.432)
RTA	0.146 (0.103)	0.0526 (0.226)	-0.532** (0.268)	0.331*** (0.117)	0.119 (0.104)	0.0935 (0.210)	0.252** (0.0985)	0.152 (0.175)	0.606** (0.269)
One side NS	-0.159 (0.120)	-0.106 (0.191)	-1.440 (0.911)	0.0896 (0.121)	-0.276*** (0.0806)	-0.706*** (0.218)	-0.156 (0.194)	-0.149 (0.267)	-0.268 (0.368)
Non-state	0.158 (0.230)	0.0423 (0.175)	-2.338*** (0.853)	-0.0882 (0.276)	0.319 (0.310)	-0.962** (0.429)	-0.502 (0.662)	-1.275*** (0.287)	-0.600* (0.315)
One side	0.0529 (0.133)	-0.0880 (0.158)	0.928 (0.970)	-0.0698 (0.128)	0.226*** (0.0812)	0.346 (0.255)	-0.102 (0.216)	-0.251 (0.280)	-0.986** (0.400)
Armed	-0.207*** (0.0781)	-0.423** (0.194)	0.688 (1.291)	-0.0269 (0.109)	-0.0257 (0.180)	-0.348 (0.295)	0.596** (0.250)	0.443 (0.460)	1.435*** (0.305)
Constant	-3.887 (2.570)	14.06*** (3.113)	17.24*** (4.392)	3.356 (2.607)	13.47*** (4.133)	-11.10*** (2.300)	9.922*** (2.402)	1.096 (2.131)	-7.660** (3.230)
Exporter fixed effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Importer fixed effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	9015	7570	4648	8876	8252	7529	7391	6899	7202
R-squared	0.600	0.828	0.906	0.736	0.886	0.489	0.938	0.875	0.444

Robust Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

311 Food products; 313 Beverages; 314 Tobacco; 321 Textiles; 322 Wearing apparel; 323 Leather products; 324 Footwear; 331 Wood products except furniture; 332 Furniture except metal.

Table 4: The Effect of Different Types of Wars on Manufacturing Exports 2 (sectoral level)

	341	342	351	352	355	356	361	362
	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow
Ln(Dist.)	-1.314*** (0.179)	-0.966*** (0.294)	-0.781*** (0.258)	-0.994*** (0.191)	-1.638*** (0.270)	-1.294*** (0.160)	-2.277*** (0.264)	-1.340*** (0.282)
Ln(1+Tar)	-0.163** (0.0747)	-0.254* (0.151)	-0.365*** (0.0833)	-0.210** (0.0856)	-0.0986 (0.123)	-0.422*** (0.0834)	-0.0980 (0.114)	-0.270*** (0.0851)
Contig.	0.583** (0.270)	-0.534 (0.454)	-0.451 (0.385)	0.671** (0.308)	0.232 (0.516)	0.133 (0.299)	0.308 (0.607)	0.172 (0.386)
Lang.	1.245*** (0.261)	1.149*** (0.309)	-0.0402 (0.197)	1.455*** (0.282)	1.482*** (0.283)	2.066*** (0.262)	0.283 (0.305)	0.709** (0.315)
Com. Col.	-0.191 (0.325)	-0.212 (0.287)	-0.275 (0.367)	-0.950*** (0.290)	-1.367** (0.541)	-1.251*** (0.273)	0.194 (0.387)	-0.0252 (0.643)
Col 45	0.136 (0.502)	1.007** (0.511)	0.505 (0.325)	0.0166 (0.541)	-1.265** (0.492)	-0.699** (0.309)	0.138 (0.358)	0.929*** (0.361)
RTA	0.713*** (0.148)	0.426** (0.193)	0.218 (0.133)	0.758*** (0.253)	0.0913 (0.155)	0.276*** (0.0726)	0.247 (0.190)	0.439* (0.260)
One side NS	-0.404 (0.307)	-0.304 (0.268)	-0.306** (0.125)	-0.812** (0.392)	0.0183 (0.198)	-1.024* (0.529)	-0.265 (0.212)	-0.205 (0.134)
Non-state	0.0907 (0.306)	-0.139 (0.173)	-0.255 (0.177)	0.693 (0.425)	0.00229 (0.286)	-0.310 (0.424)	0.385 (0.314)	-0.606 (0.449)
One sided	0.328 (0.309)	0.331 (0.355)	0.207 (0.130)	1.002* (0.550)	-0.176 (0.198)	1.130** (0.576)	0.117 (0.287)	0.0452 (0.185)
Armed	0.115 (0.332)	-0.0519 (0.159)	-0.0735 (0.193)	0.332** (0.164)	-0.156 (0.259)	0.0774 (0.248)	-0.0700 (0.177)	0.0494 (0.170)
Constant	-1.828 (1.701)	-6.251** (2.558)	-2.816 (2.365)	-2.556 (1.714)	1.827 (2.644)	-0.509 (1.415)	5.178** (2.437)	-1.308 (2.625)
Exporter fixed effect	YES	YES	YES	YES	YES	YES	YES	YES
Importer fixed effect	YES	YES	YES	YES	YES	YES	YES	YES
Observations	8133	8354	8758	8623	8138	8534	7666	7852
R-squared	0.614	0.434	0.602	0.722	0.671	0.831	0.615	0.378

Robust Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: The sectors are: 341 Paper and products; 342 Printing and publishing; 351 Industrial chemicals; 352 Other chemicals; 353 Petroleum refineries; 355 Rubber products; 356 Plastic products; 361 Pottery china earthenware; 362 Glass and products.

Table 5: The Effect of Different Types of Wars on Manufacturing Exports 3 (sectoral level)

	369	371	372	381	382	383	384	385
	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow
Ln(Dist.)	-1.595*** (0.136)	-1.607*** (0.178)	-1.998*** (0.199)	-1.408*** (0.154)	-1.344*** (0.350)	-1.416*** (0.294)	-1.739*** (0.296)	-0.681 (0.499)
Ln(1+Tar)	-0.0649 (0.0696)	-0.0155 (0.0996)	-0.256*** (0.0953)	-0.299*** (0.0679)	-0.245*** (0.0853)	-0.462*** (0.104)	-0.111 (0.132)	-0.253 (0.162)
Contig.	0.641*** (0.226)	0.733** (0.289)	-0.327 (0.371)	-0.0823 (0.301)	0.0817 (0.555)	0.0251 (0.538)	-0.334 (0.428)	0.919 (0.943)
Lang.	1.325*** (0.232)	1.909*** (0.262)	1.311*** (0.345)	1.148*** (0.222)	0.758** (0.357)	1.088*** (0.278)	0.879** (0.411)	0.576 (0.578)
Com. Col.	-0.0821 (0.241)	0.334 (0.363)	-0.354 (0.260)	-0.803*** (0.254)	-0.310 (0.281)	0.361 (0.554)	0.269 (0.405)	0.418 (0.444)
Col 45	-0.369 (0.313)	-0.367 (0.491)	0.222 (0.317)	-0.0850 (0.455)	-1.862** (0.928)	-0.0544 (0.648)	-0.971 (0.783)	-2.446** (1.111)
RTA	0.368** (0.172)	0.957*** (0.216)	0.249 (0.161)	0.335** (0.136)	0.427*** (0.133)	0.547*** (0.128)	1.110*** (0.247)	0.587*** (0.108)
One side NS	-0.701*** (0.190)	-0.419* (0.242)	0.0690 (0.141)	-0.777** (0.339)	-0.522** (0.218)	-1.263*** (0.156)	-0.462 (0.576)	-1.539** (0.623)
Non-state	-0.315 (0.308)	-0.139 (0.259)	0.122 (0.194)	-0.0349 (0.292)	-0.00188 (0.469)	2.648*** (0.789)	0.856 (0.760)	1.241 (1.204)
One side	0.382 (0.333)	0.307 (0.272)	-0.0657 (0.161)	0.762* (0.408)	0.478* (0.278)	1.262*** (0.181)	0.583 (0.670)	1.570** (0.630)
Armed	0.549*** (0.166)	0.183 (0.198)	0.00965 (0.147)	0.366* (0.203)	-0.0698 (0.122)	-0.287* (0.158)	0.654 (0.440)	0.0773 (0.274)
Constant	0.800 (1.451)	-2.213 (1.837)	4.565** (1.973)	0.829 (1.610)	1.511 (3.043)	1.990 (2.900)	4.466* (2.678)	-8.529** (4.025)
Exporter fixed effect	YES	YES	YES	YES	YES	YES	YES	YES
Importer fixed effect	YES	YES	YES	YES	YES	YES	YES	YES
Observations	7910	8036	8009	8845	9073	8988	8776	8528
R-squared	0.693	0.497	0.703	0.788	0.780	0.716	0.560	0.718

Robust Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: The sectors are: 369 Other non-metal min. prod.; 371 Iron and steel; 372 Non-ferrous metals; 381 Fabricated metal products; 382 Machinery except electrical; 383 Machinery electric; 384 Transport equipment; 385 Prof. and sci. equipment; 390 Other manufactured products.

As bilateral trade data is not available for disaggregated service sectors, we use the unilateral variant of the gravity model specified in the previous section. Table 6 shows that the gravity variables have their expected signs. However, none of the conflict variables appear to have a significant effect on service exports. Surprisingly, one-sided non-state conflicts have a significant positive effect on service exports when all conflicts variables are included in one specification.

Table 6: *The Effect of Different Types Wars on Exports of Services*

	Ln(Exports)	Ln(Exports)	Ln(Exports)	Ln(Exports)	Ln(Exports)
Ln(GDP)	1.089*** (0.203)	1.158*** (0.202)	1.075*** (0.205)	1.110*** (0.202)	1.138*** (0.205)
Ln(Dist)	-0.726* (0.421)	-0.791* (0.418)	-0.788*** (0.217)	-0.819*** (0.215)	-0.853*** (0.217)
Arabic	-1.535*** (0.206)	-1.766*** (0.243)	-1.321* (0.686)	-1.299* (0.694)	-0.00245 (0.363)
France	1.726*** (0.313)	1.970*** (0.331)	0.436 (0.287)	1.815*** (0.269)	2.033*** (0.306)
UK	1.566** (0.620)	1.703*** (0.633)	0.180 (0.650)	1.354*** (0.510)	1.568*** (0.530)
One side(-1)	-0.0530 (0.228)				-0.0873 (0.277)
One side NS(-1)		0.241 (0.162)			0.337* (0.178)
Non-state(-1)			-0.227 (0.306)		-0.272 (0.343)
Armed Conf (-1)				-0.135 (0.219)	-0.115 (0.220)
Constant	-10.30*** (2.859)	-11.69*** (2.879)	-8.464** (3.336)	-10.42*** (3.496)	-12.51*** (4.258)
Exp. Dummy	YES	YES	YES	YES	YES
Sector Dummy	YES	YES	YES	YES	YES
Observations	1631	1631	1631	1631	1631
R-squared	0.558	0.558	0.558	0.558	0.559

Robust Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

When we run the regressions by sector, we find that one-sided state violence hampers travel services and other business services and that non-state conflicts have a detrimental effect on financial services. The results also show that armed conflicts have a negative effect on communication, insurance, and construction services, as well as remittances. Counterintuitively, we find that one-sided non-state violence increases exports of travel, transportation, communication, construction, and insurance services, as well as government services.

Table 7: The Effect of Different Types of Different Types of Wars on Exports of Services

	205	236	245	249	253	260	262	266	268	287	291	REM
	Ln(Exp.)	Ln(Exp.)	Ln(Exp.)	Ln(Exp.)	Ln(Exp.)	Ln(Exp.)	Ln(Exp.)	Ln(Exp.)	Ln(Exp.)	Ln(Exp.)	Ln(Exp.)	Ln(Exp.)
Ln(GDP)	1.088*** (0.121)	0.605*** (0.224)	1.569*** (0.295)	4.527*** (1.521)	1.871*** (0.388)	2.196*** (0.583)	6.261*** (1.656)	-0.319 (1.154)	-1.464** (0.652)	3.643* (2.088)	1.115** (0.429)	0.616** (0.235)
Ln(Dist)	-0.679*** (0.246)	0.237 (0.501)	-1.108*** (0.167)	-1.796*** (0.616)	-1.497*** (0.194)	-1.406*** (0.487)	-4.202*** (1.322)	0.417 (0.819)	4.901*** (1.125)	-2.654 (1.670)	-2.337*** (0.854)	-0.0625 (0.141)
Arabic	-2.049*** (0.129)	-1.360** (0.652)	3.964*** (0.914)	0 (0.0)	0.950* (0.496)	-0.864 (0.561)	0.0908 (0.886)	-0.722 (2.093)	1.301** (0.651)	-2.041* (1.129)	-1.016** (0.471)	3.224*** (0.746)
France	1.312*** (0.175)	-0.599 (0.631)	1.766*** (0.458)	-1.422 (1.290)	1.795** (0.822)	3.574*** (0.462)	3.160*** (0.650)	-0.215 (1.651)	0.466 (0.813)	-0.425 (3.029)	1.441** (0.707)	5.392*** (1.467)
UK	0.714* (0.381)	3.283*** (1.169)	3.242*** (0.860)	-6.350** (2.744)	2.903*** (0.429)	3.094*** (0.473)	3.134*** (0.619)	2.482 (2.319)	15.78*** (2.907)	3.656*** (0.673)	-0.864 (1.271)	4.296*** (1.372)
One side(-1)	0.0157 (0.105)	-0.700* (0.393)	-0.169 (0.139)	-0.0763 (0.425)	-0.242 (0.271)	0.150 (0.490)	0.890 (1.185)	-0.407 (1.187)	-0.947*** (0.338)	1.516 (1.204)	-0.537 (0.476)	0.0782 (0.127)
One side NS(-1)	0.185** (0.0860)	0.485* (0.284)	0.263** (0.114)	1.040*** (0.245)	0.386** (0.173)	0.261 (0.337)	0.532 (0.549)	-0.123 (0.676)	0.546 (0.403)	0.225 (0.493)	0.511* (0.280)	-0.133 (0.0985)
Armed Conf (-1)	0.192 (0.191)	0.679*** (0.220)	-0.260* (0.135)	-0.733* (0.433)	-0.397** (0.195)	-0.0114 (0.0641)	-0.264 (0.267)	0.161 (0.282)	-0.399 (0.328)	-0.105 (0.186)	-0.0500 (0.0947)	-0.233* (0.138)
Non-state(-1)	0.143 (0.168)	-0.760 (0.520)	0.0404 (0.152)	-0.0449 (0.550)	0.0452 (0.218)	-0.960*** (0.342)	-0.888 (1.201)	2.069 (1.743)	0.0880 (0.342)	-2.693 (1.936)	0.426 (0.292)	0.0748 (0.319)
Constant	-9.607*** (1.680)	-3.645 (3.517)	-26.74*** (7.834)	-89.94** (34.85)	-31.74*** (8.335)	-38.13*** (12.20)	-126.2*** (34.83)	13.58 (26.15)	18.48* (9.489)	-67.34 (43.90)	-2.964 (6.110)	-7.652 (6.158)
Exp. Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	213	211	166	71	150	103	87	78	164	79	186	123
R-squared	0.955	0.894	0.909	0.660	0.810	0.736	0.811	0.725	0.770	0.736	0.781	0.960

Robust Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: The sectors are 236 Travel ; 205 Transportation ; 245 Communications services ; 249 Construction services ; 253 Insurance services ; 260 Financial services ; 262 Computer and information services ; 266 Royalties and license fees ; 268 Other business services ; 287 Personal, cultural and recreational services ; 291 Government services, n.i.e. ; REM Personal remittances.

We can summarize our main findings in three main points. First, war has a robust and significantly negative impact on exports, imports, and trade. Second, non-state conflicts are more likely to affect trade than the other specified types of war. Third, while bilateral manufacturing trade flows are affected by war in general and by non-state conflicts in particular, none of the war variables appear to affect service exports.

5. Calculating Ad-Valorem Equivalents for Conflicts

To more appropriately assess the impact of war on trade, we adopt the methodology of Kee et al. (2009) to estimate ad-valorem equivalents (AVEs) for conflicts based on the gravity model. To make conflicts comparable with AVEs, the quantity impact must be transformed into price equivalents. This yields the AVEs of a conflict $ave_j^{conflict}$ noted as $ave_j^{war} = dlog(p_j)$. Hence, the gravity equation is differentiated with respect to war_j :

$$\frac{d \ln(X)}{d(war)} = \frac{d \ln(X)}{d \ln(p)} \cdot \frac{d \ln(p)}{d(war)} = \varepsilon_j \cdot ave_j^{conflict} \quad (3)$$

where ε is the import demand elasticity in country j and p the domestic price in country j .

Hence, solving (18) for $ave_j^{conflict}$:

$$ave_j^{conflict} = \frac{1}{\varepsilon} \cdot \frac{d \ln(X)}{d(war)} \quad (4)$$

In other terms, the AVEs can be computed by taking the ratio between the coefficient of the war (obtained from the gravity model) and the elasticity of demand (coming from Kee et al, 2008) as follows:

$$ave_j^{conflict} = \frac{\beta_6^{conflict}}{\varepsilon} \quad (5)$$

This yields the ad-valorem equivalent of a conflict for the countries whose elasticity of demand is available. It is worth noting that AVEs have been computed based on the output of the bilateral gravity model, as this is the closest specification to Kee et al. (2009).

We find that a conflict is equivalent to a tariff ranging from 4 percent to 65 percent of trade flows in the manufacturing sectors. The sectors that are highly affected by different conflicts are consumption goods such as food, beverages, wearing and apparels, leather, and chemicals.

Table 8: Ad-Valorem Equivalents of Different Conflicts

	Uni-non state one side	Non-state	One sided	Armed
Algeria	0%	-4%	0%	35%
Egypt	5%	0%	0%	-7%
Israel	-31%	1190%	109%	0%
Lebanon	0%	-8%	-8%	449%
Morocco	0%	0%	0%	-23%
MENA	0%	-6%	0%	0%

Source: Constructed by the authors.

Notes: A positive sign means that the conflict boosts trade and a negative sign means that it reduces trade

Table 9: Ad-Valorem Equivalents of Different Conflicts (by sector)

		Uni-non state one side	Non- state	One sided	Armed
311	Food products	0%	0%	0%	-4%
313	Beverages	0%	0%	0%	-8%
314	Tobacco	0%	-16%	0%	0%
321	Textiles	0%	0%	0%	0%
322	Wearing apparel	-7%	0%	7%	0%
323	Leather products	-5%	-6%	0%	0%
324	Footwear	0%	0%	0%	8%
331	Wood products except furniture	0%	-13%	0%	0%
332	Furniture except metal	0%	-26%	-36%	185%
341	Paper and products	0%	0%	0%	0%
342	Printing and publishing	0%	0%	0%	0%
351	Industrial chemicals	-16%	0%	0%	0%
352	Other chemicals	-35%	0%	107%	24%
355	Rubber products	0%	0%	0%	0%
356	Plastic products	-45%	0%	146%	0%
361	Pottery china earthenware	0%	0%	0%	0%
362	Glass and products	0%	0%	0%	0%
369	Other non-metal min. prod.	-35%	0%	0%	51%
371	Iron and steel	-9%	0%	0%	0%
372	Non-ferrous metals	0%	0%	0%	0%
381	Fabricated metal products	-23%	0%	49%	19%
382	Machinery except electrical	-19%	0%	29%	0%
384	Transport equipment	0%	0%	0%	0%
385	Prof. and sci. equipment	-65%	0%	313%	0%

Source: Constructed by the authors.

Notes: A positive sign means that the conflict boosts trade and a negative sign means that it reduces trade.

6. Further Results

Since the different types of conflicts in the MENA region do not necessarily involve country pairs, we propose an adaptation of the gravity model, using unilateral variants of the variables that influence bilateral trade, such as that used by van Lynden (2011).

Our explanatory variables are the natural log of country i 's GDP and unilateral variants of the gravity-type variables: a dummy variable taking the value of 1 if 20 percent of the population speaks Arabic and zero otherwise (*Arabic*) and two dummy variables to determine whether a country has been colonized by France (*France*) or the United Kingdom (*UK*). We capture the effect of distance by taking the average distance between each country and its trade partners (*lnDist*). Finally, *war* is a dummy variable taking the value of 1 if the country has been affected by any type of conflict and 0 otherwise. We capture the lagged effect of war on trade by introducing the lagged value of the dummy variable *war* that, at the same time, allows us to control for any endogeneity problem that may arise between trade and war.

Our estimable macroeconomic equation is:

$$\ln Trade_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 \ln Dist_i + \beta_3 Arabic_i + \beta_4 France_i + \beta_5 UK_i + \beta_5 war_{it-1} + f_t + \epsilon_{it} \quad (6)$$

With being ϵ_{ijt} the discrepancy term and f_t the year fixed effects.

We then distinguish between the effects of the different types of conflicts on trade, namely armed conflicts, non-state armed conflicts, one-sided state violence, and one-sided non-state violence. We define a dummy variable for each type of conflict, taking the value 1 if the related type of conflict occurred in country in a particular year and 0 otherwise. We introduce the lagged effect of those dummy variables and our estimable macroeconomic regression becomes:

$$\ln Trade_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 \ln Dist_i + \beta_3 Arabic_i + \beta_4 France_i + \beta_5 UK_i + \beta_5 armedconflicts_{it-1} + \beta_6 nonstate_{it-1} + \beta_7 onese_{it-1} + \beta_8 onesidens_{it-1} + f_t + \epsilon_{it} \quad (7)$$

To capture the long-lasting effect of war and conflict on trade, we introduce some dynamic effects into the standard panel model by including the lagged value of trade among the regressors. Theoretically, this can be done as follows:

$$\begin{aligned} y_{it}^* &= \alpha_0 + \alpha_1 x_{it} + u_{it} \\ y_{it} - y_{it-1} &= \lambda(y_{it}^* - y_{it-1}) \end{aligned} \quad (8)$$

where y^* is the desired level of y .

By substituting the expression for y^* into the other equation, we obtain the following estimating equation:

$$y_{it} = \alpha_0 \lambda + (1 - \lambda)y_{it-1} + \lambda \alpha_1 x_{it} + \lambda u_{it} \quad (9)$$

There is a problem with the estimation of this type of model, as the lagged dependent variable will be correlated with the error term (in small samples). To overcome this, an instrumental variable technique can be used, such as Generalized Method of Moments (GMM), in which the instruments can be lagged values of the variables in the original models. There are two approaches to dynamic panel models; the most common is the Arellano-Bond dynamic panel, in which individual or fixed effects are accounted for by differencing the data.

Macroeconomic regressions are estimated for a sample of 20 countries^{**} from the MENA region for the period 1960-2013 using different econometric techniques, namely panel estimations (both fixed effects *FE* and random effects *RE*) and dynamic panel (Arellano-Bond AB)^{††}. Trade and GDP data are obtained from the World Development Indicators database at the World Bank and nominal values are deflated using the GDP deflator of 2005. Conflict data come from the Uppsala Conflict Data Program (UCDP). Language, colony, and latitude variables have been compiled from the CEPII dataset available at www.cepii.fr.

In order to assess the impact of war on trade, we run several regressions by flow (exports, imports, and total trade) and by type of war (war in general, then by differentiating by types of conflicts: non-state conflicts, armed conflicts, and one-sided state/non-state violence). We use both random and fixed effects and dynamic panel regressions.

Table 10 shows that GDP has the expected positive sign and is statistically significant. Moreover, distance has the expected negative impact on trade, exports, and imports. Finally, sharing the same Arabic language is likely to boost trade. As per our variables of interest, it is worth mentioning that the lagged dummy of *war* is negative and significant for exports, imports, and trade.

If we disentangle the effect of different conflicts on trade flows, we find that non-state conflicts have a much more detrimental effect on exports than do other types of conflict. This is in line with Martin et al. (2008), who point out that trade destruction due to civil wars (which are mainly non-state) is very large and persistent and increases with the severity of the conflict. Civil wars are likely to destroy infrastructure, stop production processes, and affect production, labor demand, and thus exports. Furthermore, we find that imports are more likely to be affected by non-state, one-sided, and one-sided non-state conflicts mainly because the purchasing power of the population is likely to decrease, leading to less demand and therefore lower imports. Consequently, total trade is chiefly affected by non-state and one-sided conflicts.

^{**}West Bank and Gaza is dropped from the sample as it doesn't show in any of the Uppsala conflict databases (conflicts affecting West Bank and Gaza are counted in Israel).

^{††} See Appendix 1 for the list of countries.

Table 10: The Effect of War on Exports, Imports and Total Trade at the macro level

	RE	FE	AB	RE	FE	AB	RE	FE	AB
	Ln(Exports)	Ln(Exports)	Ln(Exports)	Ln(Imports)	Ln(Imports)	Ln(Imports)	Ln(Trade)	Ln(Trade)	Ln(Trade)
Ln(GDP)	1.005*** (0.0155)	1.097*** (0.0691)	0.254*** (0.0523)	0.909*** (0.0130)	1.037*** (0.0624)	0.260*** (0.0521)	0.958*** (0.0116)	1.063*** (0.0545)	0.271*** (0.0448)
Ln(Dist)	-0.261*** (0.0181)		0.0278 (0.200)	-0.169*** (0.0151)		0.313 (0.207)	-0.227*** (0.0135)		0.223 (0.165)
Arabic	0.225*** (0.0413)			0.0868** (0.0345)			0.197*** (0.0307)		
France	-0.516*** (0.0428)			0.0216 (0.0357)			-0.271*** (0.0318)		
UK	-0.364*** (0.0450)			0.150*** (0.0376)			-0.137*** (0.0335)		
War(-1)	-0.227*** (0.0359)	-0.0957*** (0.0313)	-0.0580*** (0.0168)	-0.0166 (0.0300)	-0.0553* (0.0283)	-0.0170 (0.0173)	-0.0944*** (0.0266)	-0.0560** (0.0247)	-0.0363*** (0.0137)
Lag Dep. Var.			0.774*** (0.0220)			0.722*** (0.0241)			0.733*** (0.0222)
Constant	5.083*** (0.381)	1.126 (1.555)		6.816*** (0.319)	2.550* (1.406)		6.664*** (0.283)	2.649** (1.228)	
Year dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	665	665	624	665	665	624	665	665	624
Number of code	20	20	20	20	20	20	20	20	20
R-squared		0.895			0.900			0.925	

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

RE stands for random effects, FE fixed effects and AB Arelano-Bond

Table 11: The Effect of Different Types of Wars on Exports at the Macro level

	RE					FE				
	Ln(Exports)	Ln(Exports)	Ln(Exports)	Ln(Exports)	Ln(Exports)	Ln(Exports)	Ln(Exports)	Ln(Exports)	Ln(Exports)	Ln(Exports)
Ln(GDP)	1.010*** (0.0155)	0.990*** (0.0157)	0.993*** (0.0159)	0.984*** (0.0157)	1.015*** (0.0156)	1.140*** (0.0677)	1.138*** (0.0682)	1.108*** (0.0700)	1.137*** (0.0685)	1.115*** (0.0696)
Ln(Dist)	-0.290*** (0.0181)	-0.275*** (0.0186)	-0.263*** (0.0187)	-0.271*** (0.0187)	-0.290*** (0.0185)					
Arabic	0.294*** (0.0381)	0.317*** (0.0392)	0.270*** (0.0438)	0.325*** (0.0395)	0.259*** (0.0425)					
France	-0.515*** (0.0423)	-0.565*** (0.0431)	-0.547*** (0.0438)	-0.569*** (0.0434)	-0.505*** (0.0426)					
UK	-0.380*** (0.0445)	-0.389*** (0.0460)	-0.377*** (0.0464)	-0.393*** (0.0463)	-0.372*** (0.0446)					
Non-state(-1)	-0.445*** (0.0629)				-0.421*** (0.0675)	-0.173*** (0.0530)				-0.163*** (0.0547)
One side(-1)		-0.272*** (0.0934)			-0.143 (0.100)		-0.0791 (0.0691)			-0.0426 (0.0735)
Armed Conf (-1)			-0.110*** (0.0399)		-0.0811* (0.0420)			-0.0650* (0.0346)		-0.0606* (0.0353)
One side NS(-1)				0.0133 (0.0692)	0.198*** (0.0757)				-0.0121 (0.0579)	0.0427 (0.0616)
Constant	5.083*** (0.378)	5.328*** (0.389)	5.247*** (0.393)	5.442*** (0.390)	4.964*** (0.381)	0.117 (1.522)	0.162 (1.534)	0.871 (1.576)	0.192 (1.539)	0.695 (1.567)
Year dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	665	665	665	665	665	665	665	665	665	665
Number of code	20	20	20	20	20	20	20	20	20	20
R-squared						0.895	0.893	0.894	0.893	0.896

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

RE stands for random effects and FE fixed effects

Table 12: The Effect of Different Types of Wars on Imports at the Macro level

	RE					FE				
	Ln(Imports)	Ln(Imports)	Ln(Imports)	Ln(Imports)	Ln(Imports)	Ln(Imports)	Ln(Imports)	Ln(Imports)	Ln(Imports)	Ln(Imports)
Ln(GDP)	0.904*** (0.0131)	0.907*** (0.0128)	0.909*** (0.0129)	0.908*** (0.0127)	0.906*** (0.0132)	1.062*** (0.0612)	1.061*** (0.0613)	1.044*** (0.0631)	1.048*** (0.0611)	1.044*** (0.0626)
Ln(Dist)	-0.168*** (0.0153)	-0.170*** (0.0151)	-0.168*** (0.0153)	-0.169*** (0.0151)	-0.164*** (0.0156)					
Arabic	0.0975*** (0.0321)	0.0939*** (0.0320)	0.0801** (0.0356)	0.0931*** (0.0319)	0.0815** (0.0360)					
France	0.0118 (0.0356)	0.0179 (0.0351)	0.0232 (0.0356)	0.0184 (0.0351)	0.0163 (0.0361)					
UK	0.147*** (0.0375)	0.148*** (0.0375)	0.153*** (0.0377)	0.149*** (0.0375)	0.152*** (0.0378)					
Non-state(-1)	0.0505 (0.0529)				0.0712 (0.0572)	-0.104** (0.0479)				-0.0779 (0.0492)
One side(-1)		-0.00707 (0.0761)			-0.0167 (0.0850)		-0.112* (0.0621)			-0.0372 (0.0661)
Armed Conf (-1)			-0.0284 (0.0325)		-0.0330 (0.0356)			-0.0368 (0.0312)		-0.0145 (0.0317)
One side NS(-1)				-0.0307 (0.0560)	-0.0211 (0.0641)				-0.168*** (0.0517)	-0.142** (0.0554)
Constant	6.882*** (0.318)	6.839*** (0.317)	6.792*** (0.320)	6.832*** (0.316)	6.828*** (0.322)	1.965 (1.376)	1.985 (1.378)	2.394* (1.420)	2.284* (1.372)	2.368* (1.410)
Year dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	665	665	665	665	665	665	665	665	665	665
Number of code	20	20	20	20	20	20	20	20	20	20
R-squared						0.901	0.900	0.900	0.902	0.902

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

RE stands for random effects and FE fixed effects

Table 13: The Effect of Different Types of Wars on Trade at the Macro level

	RE					FE				
	Ln(Trade)	Ln(Trade)	Ln(Trade)	Ln(Trade)	Ln(Trade)	Ln(Trade)	Ln(Trade)	Ln(Trade)	Ln(Trade)	Ln(Trade)
Ln(GDP)	0.956*** (0.0117)	0.951*** (0.0115)	0.954*** (0.0116)	0.949*** (0.0114)	0.959*** (0.0118)	1.088*** (0.0535)	1.087*** (0.0536)	1.069*** (0.0551)	1.081*** (0.0537)	1.071*** (0.0550)
Ln(Dist)	-0.236*** (0.0136)	-0.233*** (0.0136)	-0.227*** (0.0137)	-0.230*** (0.0136)	-0.234*** (0.0139)					
Arabic	0.230*** (0.0287)	0.235*** (0.0286)	0.209*** (0.0319)	0.238*** (0.0287)	0.205*** (0.0321)					
France	-0.279*** (0.0318)	-0.291*** (0.0314)	-0.282*** (0.0319)	-0.293*** (0.0315)	-0.272*** (0.0322)					
UK	-0.145*** (0.0335)	-0.147*** (0.0336)	-0.140*** (0.0338)	-0.149*** (0.0337)	-0.139*** (0.0337)					
Non-state(-1)	-0.122*** (0.0473)				-0.0940* (0.0510)	-0.0960** (0.0419)				-0.0775* (0.0432)
One side(-1)		-0.124* (0.0682)			-0.0934 (0.0758)		-0.0946* (0.0543)			-0.0570 (0.0580)
Armed Conf (-1)			-0.0604** (0.0291)		-0.0550* (0.0317)			-0.0380 (0.0273)		-0.0285 (0.0279)
One side NS(-1)				-0.0117 (0.0503)	0.0697 (0.0571)				-0.0717 (0.0455)	-0.0366 (0.0486)
Constant	6.715*** (0.284)	6.762*** (0.284)	6.707*** (0.287)	6.808*** (0.283)	6.625*** (0.287)	2.060* (1.203)	2.079* (1.205)	2.499** (1.241)	2.213* (1.208)	2.428* (1.238)
Year dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	665	665	665	665	665	665	665	665	665	665
Number of code	20	20	20	20	20	20	20	20	20	20
R-squared						0.925	0.925	0.924	0.924	0.925

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

RE stands for random effects and FE fixed effects

7. Conclusion and Policy Recommendations

This paper investigates the effects of war on trade in the MENA region, which faces considerable risk of conflict. Using an augmented gravity model, we introduce a war variable and distinguish between different types of conflicts. We run a battery of sensitivity analysis tests to control for the endogeneity problem that may arise in our estimation. The results show that, in general, wars have a significantly negative impact on exports, imports, and trade. Moreover, civil conflicts (non-state conflicts) also hinder exports, imports, and trade significantly. The disaggregated version of the gravity model shows that non-state conflicts, unlike other types of conflict, have a detrimental effect on bilateral trade flows in manufacturing, but none of the conflicts affect trade in services. Finally, the outcome of the gravity model for the manufacturing sectors has been used to compute ad-valorem equivalents of wars at the sector and country levels.

We found that, on average, a conflict is equivalent to a tariff of 5 percent of the value of trade. More heterogeneity is observed at the sectoral level, where AVEs range from 4 percent to 65 percent). Since conflicts in the MENA region have a significant detrimental effect on trade, from a policy standpoint, those conflicts are likely to reduce the positive impact of trade on growth that characterized the MENA region in the last decades. Moreover, “war is development in reverse” (Collier et al., 2003) as it has an impact on life expectancy, infant mortality rates, GDP per capita, access to water, trade, and institutions.

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