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Abstract
We provide novel empirical models of the arms trade and focus on the role of energy dependence, in particular of oil, in explaining the trade of weapons between countries. Dramatic geopolitical events such as wars can cause significant disruptions in the supply of oil and increase oil prices. Oil-dependent economies have therefore incentives to provide security by selling or giving away arms to oil-rich countries and reduce the risk of instability. We find strong empirical support for this claim using data on international transfers of major weapons and information on global and local oil dependence, oil reserves and oil discoveries.

Keywords: Arms Trade, Oil, Security.

JEL classification: F10, F50, H56, Q34.

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1 Introduction

The international transfers of major conventional weapons is one of the most dynamic sector of international trade. Although the 2008 financial crisis has affected many industries worldwide and has caused a general reduction in government spending, the global volume of transfers has grown by 14% between 2004-08 and 2009-13, according to the 2014 report by the Stockholm International Peace Research Institute (Wezeman & Wezeman, 2014). Most of the countries in the world import weapons, and between 2004-2008 and 2009-13 imports increased by a staggering 53% in Africa, by 34% in Asia, by 10% in the Americas, by 3% in the Middle East, and decreased by 25% in Europe.[1]

The arms trade is a very controversial issue with many economic and strategic implications on both sides of the transaction. On the demand side, countries import weapons for reasons of national security, but a combination of prices, income and international political relations affects the optimal bundle of domestic production - sometimes in collaboration with other partners - and import of weapon systems. Using network analysis, Akerman & Seim (2014) show that in the last six decades, the global arms trade network has become more dense, clustered and decentralized over time. Particularly since the end of the Cold War, the market has become more globalized, with increasing interdependence and cooperation. Today, virtually no states are self-sufficient in arms production, including the US, and self-produced arms need to be complemented by imported weapons or components (see Brauer, 2007). As such, arms import is an essential component of the defense budget.

On the supply side, countries sell weapons for economic reasons, and defence industries are economically strategic in terms of R&D intensity, spin-offs and decreasing unit costs (Sandler & Hartley, 1999; Garcia-Alonso & Levine, 2007). Although producing weapons can be inefficient for some

[1] In the period 2009-2013, the top ten major suppliers of weapons were the US, Russia, Germany, China, France, UK, Spain, Ukraine, Italy and Israel while the top ten recipients were India, China, Pakistan, the United Arab Emirates (UAE), Saudi Arabia, US, Australia, South Korea, Singapore and Algeria.

countries, many developed economies maintain a domestic defense industrial base for economic and strategic needs, i.e., to protect and promote the so-called "national champions" and ensure a level of autonomy. At the same time, subsidies to the domestic arms manufacturers often increase their international market share. Yet, economic motivations are frequently accompanied by political interests; in fact, by exporting weapons, countries also seek to improve the military capabilities of the recipient states. As a necessary adjunct of national policy and strategic doctrine, weapons are often given only to close allies and it is not unusual to observe arms transferred free to allies, under the umbrella of military aid. By the same token, the absence of trade between pairs of country can reflect arms denial and constraints on transfers to specific recipients so as to safeguard national security.[2]

The arms trade has both a political and economic component, and the question of which factors are more likely to affect the bilateral flows of weapons is a timely and important issue. Given its size and scope, there is surprisingly little empirical research on the the arms trade, particularly on its determinants (see Smith & Tasiran, 2005, 2010; Comola, 2012; Akerman & Seim, 2014). Against this backdrop, we show that the arms trade lies at the intersection of foreign policy and economic concerns and it is an active tool of both geopolitical and economic competition; we use the most economically and politically prominent energy source, oil, and demonstrate how oil interdependence is a critical determinant of the volume of the arms trade between countries. A recent theoretical model by Garfinkel *et al.* (2015) explores the consequences of interstate disputes over contested resources, such as oil, for defence spending and trade flows. Contestation of natural resources plays a big role in many interstate disputes and shapes the security policies of the countries involved. Civil wars, violent regime changes, and regional instabilities have long been a significant cause of oil shocks, in particular when involving oil-abundant regions. Since the end-use of arms export concerns the security of the recipients, we claim

[2]Interestingly, however, arms exports may generate negative externalities when e.g., the importing nation becomes a future threat (see Garcia-Alonso & Levine, 2007).

that oil-dependent economies have strong incentives to sell or give away arms to reduce the risk of instability in oil-rich and potentially unstable regions. Specularly, oil-rich countries are more likely to receive weapons by oil-dependent economies.

We estimate the effects of oil interdependence using a gravity model of international trade and explore the extent to which the economic and political characteristics of the client and the supplier, and the connections between them, affect the bilateral arms trade. Deciphering the impact of oil dependence on the arms trade is complicated by the fact that oil and weapons could be simultaneously determined. On the one hand, establishing a relationship between the two variables leaves open the question of whether "oil causes weapons" or vice versa. We strive to include plausibly exogenous variables, such as indicators for the known amount of oil reserves and information on the discoveries of new oil fields. Moreover, we estimate leads of the dependent variable running from one to five years ahead to further circumvent the risk of causality running both ways. On the other hand, there are a number of important confounding factors, whose omission could bias the estimates. For example, countries with a developed manufacturing sector are more likely to be arms producers and at the same time to import oil. We control for multilateral resistance terms i.e., importer-time and exporter-time fixed effects (see e.g., Anderson & van Wincoop, 2003), which flexibly account for time-varying country-specific unobservables. We also include country-pair fixed effects to capture all time-invariant unobservable bilateral factors influencing arms trade flows. We implement a battery of robustness checks to support our identifying assumption.

To anticipate, our empirical analysis paints a clear picture and supports our claim that oil is a crucial factor affecting the volume of arms flows on both sides of the transaction. We proceed as follows: section 2 provides a brief overview of the latest theoretical and empirical literature on the arms trade and elaborate on our hypothesized mechanism. Section 3 presents the data and the empirical strategy. Section 4 discusses our main empirical results. Section 5 concludes.

2 Energy security and the demand and supply for weapons

The majority of scholarly research on the arms trade takes the form of theoretical models, which usually focus on the strategic interactions between exporters and importers, and the implications for arms races and arms proliferation - see, e.g., the seminal dynamic models offered by Levine & Smith (1995, 1997, 2000b), who also discuss possible common control regimes. Levine & Smith (2000a), in particular, integrate economic and strategic incentives within a unified framework, and analyze national and international regulatory regimes and market structures. They find that whereas prices have dampening effects on arms race, regulatory regimes can have either positive or negative effects on domestic production and arms imports. Garcia-Alonso & Levine (2007) build on the above models to discuss the main strategic characteristics of the arms trade and to examine the determinants of market structure in the military sector. Sandler (2000) explores collective action failures in relation to arms control and security. Kollias & Sirakoulis (2002) model the effects that arms imports have on the military balance between two antagonistic regional players. Finally, Seitz *et al.* (2015) provide a model of trade, conflict and defence spending with an arms race and determine the magnitude of welfare gains due to reductions in the likelihood of conflict and defense spending cuts.

Empirical works on the decision-making processes behind the arms trade and on the characteristics and relations between suppliers and recipients are scant at best.[3] Blanton (2000, 2005) explores the impact of human rights and democracy on the eligibility of a country to receive weapons from the USA. Smith & Tasiran (2005, 2010) examine the factors affecting the elasticity of arms imports with respect to military expenditure, per capita income and the price of arms imports, and address issues of measurement errors, non-linearity and dynamic specification. Yet, they focus solely on

[3] A number of empirical studies reverse the causal arrow and look at the effects of arms transfer on several outcomes, such as interstate conflict, ethnic uprisings and repression; Kinsella (2011) offers a comprehensive and recent review of this strand of the literature.

the characteristics of the importers. Comola (2012) explores the existence of political cycles in arms exports using data on the top 20 major exporters over the period 1975-2004; she finds that right-wing incumbents increase arms exports, whereas higher concentration of power and incumbents serving the last year of their term and potentially running for re-election have the opposite effect. Finally, Akerman & Seim (2014) find a negative relationship between differences in the polity and the likelihood of the arms trade during the Cold War.

We advance the relevance of geo-economic and geo-strategic considerations and suggest that energy interdependence is a major factor explaining the volume of arms transfers between states. In doing so, we expand the range of perspectives on the arms trade beyond questions of economic and political determinants at the national level to issues of energy dependence at the international level. The arms trade, security and energy dependence are heavily interconnected. On the demand side, recipients receive weapons mainly for reasons of national security as the acquisition of new equipments improve their defense capabilities (e.g., Levine & Smith, 2000b). Although other reasons for importing weapons exist, security is usually the main objective. On the supply side, arms are exported to support the security needs of friends and allies, and to strengthen security links. Moreover, many countries receive military aid to buy weapons and equipment from the donor country. The US is the largest supplier of military aid to over 150 foreign countries in the world, with the explicit goal of contributing to regional and global stability, strengthening military support for democratically elected governments and containing transnational threats (see US Greenbook, 2012).[4]

Therefore, the end-use of the arms trade concerns the security of the recipients. We claim that this is particularly crucial when the recipient state is a main supplier of energy and when the arms exporter is dependent on it. Conspiracy theorists have long insisted that modern wars revolve around oil, the main energy source worldwide. The post-WWII period has many

[4]USAID Economic Analysis and Data Services (2012): US Overseas Loans and Grants, Obligations and Loan Authorizations Greenbook (`http://gbk.eads.usaidallnet.gov/`)

instances of military intervention in oil-rich states, such as in Angola, Chad, Guatemala, Indonesia, Mali, Nigeria, Sudan and the Philippines. Recent examples include the military intervention in Libya in 2011 by a coalition comprising most of NATO oil-dependent economies, or the US campaign against Isis in northern Iraq. Bove *et al.* (2015) finds that the likelihood of a third-party intervention in civil war increases when the country at war has large reserves of oil and such interventions are more likely to be carried out by countries that highly depend on oil imports. Yet, military intervention is expensive and risky and can easily cause domestic backlash if the benefits are not clear-cut. To support the security needs of allies and strategic partners, countries can resort to alternative, less invasive, foreign policy tools.

We argue that the provision of security extends beyond direct military intervention and war times and that the export of arms is an effective substitute for costlier forms of assistance. The arms trade is therefore a factor to counter local threats, to inhibit or reduce the risk of political instabilities and, as a result, the chances of disruption in the oil trade. Violent events such as civil wars or terrorist incidents are often accompanied by surging oil prices, or more generally disruptions in the supply of oil; this was the case in many recent wars, such as during the Gulf War, 9/11, the Iraq War, the Lebanon Conflict and the political unrests in Venezuela in 2003. The prospects of energy supply disruptions and increases in oil prices can easily put at risk fragile economies while posing significant costs for more developed countries. Disruptions in the oil industry and higher oil prices may in fact negatively affect the real GDP growth, the real wages and increase the short-term interest rates (e.g., Kilian, 2008; Lippi & Nobili, 2012). These negative effects are more likely to materialize in oil-importing countries, which therefore have incentives to reduce the risk of instabilities in oil-rich countries.

A seminal study by SIPRI (1971), identifies, among the purposes of arms supply, a "hegemonic" aim: countries can use arms transfers to "support a particular group in power, or to prevent the emergence of an alternative group" (SIPRI 1971, p. 17). This is consistent with recent studies

which provide convincing evidence that military aid can be effective at keeping terrorist groups out of power (see Bapat, 2011). Therefore, the deliveries of major conventional weapons can be put forward as evidence of the supplier's commitment to the security and military advantage of the recipient state. In most of the wars fought in the last few decades and in most of the confrontations between states and terrorist groups, foreign arms, or restraints on arms supplies, have played a central role in determining the fortune of the combatants. Ensuring the military advantage of a country against domestic and external threats is all the more important when this country is a key supplier of oil and when the arms supplier is dependent on oil.

Note, however, that we are not suggesting the sole existence of a direct oil-for-weapons mechanism. By providing weapons, the oil-dependent country seeks to contain the risk of instabilities in a oil-rich country; yet, the latter does not necessarily need to be its *direct* oil supplier, because disruptions in the production of oil in this country are very likely to affect oil prices worldwide. In sum, we seek to test two related expectations, or hypotheses:

> **H1 (local dependence)**: The larger the amount of oil imported from a country, the higher the volume of arms exported to the same country

> **H2 (global dependence)**: The larger the level of global oil dependence, the higher the volume of arms exported to oil-rich countries

Although theoretically intertwined, the two mechanisms require two substantially different empirical models, the issue considered next.

3 Data and Empirical Strategy

To measure the volume of international transfers of arms we use the SIPRI Arms Transfers Database, which contains information on all transfers of

major conventional weapons since 1950. SIPRI has developed a unique system that uses a common unit, the trend-indicator value (TIV), to permit comparisons between deliveries of different weapons. The TIV is based on the known unit production costs of a core set of weapons and is useful to estimate the transfer of military resources rather than the financial value of the transfer. The TIV fits well with the purpose of our analysis, explaining the quantities of arms transfers rather than the contracted prices, which can be as low as zero in the case of military aid.[5]

To measure oil dependence, we assemble a very comprehensive dataset on stock variables such as oil reserves and new oil discoveries, as well as on flow variables, in particular oil imports and exports. Data on oil reserves and on new oil discoveries in thousand million barrels come from Cotet & Tsui (2013), who draw information from the Association for the Study of Peak Oil and Gas, the BP Statistical Review of World Energy, and the Oil & Gas Journal.

To test Hypothesis 1, we first construct a measure of net oil import, using disaggregated bilateral trade flows from Feenstra *et al.* (2005). This measure indicates the volume of net import of oil of the arms exporter (i.e., the oil-dependent country) from the arms importer (i.e., the oil-rich country). Note that this variable can be thought of as being made by two components. The first is whether the country-pair includes an oil-producing and an oil-dependent country, otherwise net imports would be zero; the second is whether the pair of countries actually has an established trading relationship, which is related to whether they are economic partners and/or political allies. The data are organized by 4-digit SITC Revision 2, and cover trade flows reported by 149 countries (98% of world exports) for the period from 1962 to 2000. The availability of data on oil flows limits our study to the same period.[6]

[5]More information is available on SIPRI's website (`http://www.sipri.org/databases/armstransfers`).

[6]Note that the limit of the sample is not particular to our study, and most other studies use the Feenstra et al.'s data for similar analyses. According to Baier *et al.* (2014, p.344), Feenstra et al. (2005) is "the most disaggregated publicly available data set for bilateral trade flows for a large number of years and a large number of country pairs, constructed on a consistent basis".

We then estimate the effect of net oil import on the arms trade between countries using a gravity equation model and the Poisson Pseudo Maximum Likelihood (PPML) estimator developed by Santos Silva & Tenreyro (2006). The gravity equation takes the following form:

$$Y_{ijt} = \alpha \, exp(\beta \, Net \; oil \; import_{ijt} + X_{1it} \, \delta + X_{2jt} \, \zeta + D_{ijt} \, \lambda) \, \epsilon_{ijt} \qquad (1)$$

where Y_{ijt} is the volume of major weapons transfers from country i to country j at time t, and $Net \; oil \; import_{ijt}$ is our variables of interest, the degree of oil dependence of country i from country j at time t.

X_{1it} is the vector of country i's characteristics, including the real GDP to capture the economic size of the country (larger countries should import higher volumes of weapons); the level of democracy (the Polity IV indicator) to capture the degree of institutional development; the level of military spending in % of the GDP and the number of armed forces in % of the population; and the membership in NATO or the Warsaw pact. X_{2jt} is the vector of country j's characteristics, which includes all the above variables and additional controls to account for any form of intra-state and inter-state conflict involving country j; the number of wars in its neighbourhood to pick up additional security threats; and the presence of an international arms embargo on j.

The vector D_{ijt} includes the classical impediments or facilitating factors in a list of gravity controls, in particular: the capital-to-capital distance; a measure of religious distance; a set of binary variables taking value one if i and j have a common currency, language, ethnicity or colonial history; and a dummy that equals one for regional trade agreements in force. To further investigate potential factors affecting the presence and the volume of bilateral arms trade, we also include information on military alliances and on political affinity. The latter measures the preferences of each state, or more precisely, the interest similarity among pairs of states on the basis of voting patterns at the UN General Assembly (see Voeten & Merdzanovic, 2009, for more information). Finally, ϵ_{ijt} is a multiplicative error term with $E(\epsilon_{ijt}|Net \; oil \; import_{ijt}, X_{1it}, X_{2jt}, D_{ijt},) = 1$, assumed to be statistically

independent of the regressors. Table A.1 provides information on the name, definition and source of all the above variables, and Table A.2 contains the summary statistics.

To deal with the potential co-evolution of arms transfers and net oil import over time, we include linear time trends or a set of year dummies, whose coefficients are not shown in the tables of results. We report robust standard errors clustered at the country-pair level to allow for the variance to differ across pairs; this further addresses the issue of heteroskedasticity in the error terms and controls for autocorrelation by allowing an unstructured covariance within the clusters. Finally, to address endogeneity bias that might arise from the omission of important determinants of arms export, we estimate a number of models with importer-time and exporter-time fixed effects, which account for important time-varying multilateral variables, as well as models with bilateral fixed effects, as bilateral trade flows are known to systematically depend on country-pair specific factors.[7]

Hypothesis 2 states that oil-dependent countries are more inclined to export arms to oil-rich countries, in order to safeguard its political stability and, as a consequence, prevent oil shocks and higher oil prices in international markets. To test Hypothesis 2, we augment equation (1), in the specification with multilateral resistance terms, with an interaction between a dummy indicating whether the arms exporter is an oil-dependent country in the global system and a dummy indicating whether the arms importer is an oil-rich country in the global system. This simple strategy

[7]There are several advantages of using the PPML over alternative models. First, the value of our dependent variable is most often zero, and the classical log-log gravity model is unsuitable when Y_{ijt} is zero. Dropping all the observation with no trade induces a sample selection issue, and we would lose a number of important information on cases of arms denial and constraints on the export of weapons to specific states. Using the logarithm of $Y_{ijt} + 1$ as the dependent variable generates inconsistency in the parameter of interest (Santos Silva & Tenreyro, 2006). Moreover, our dependent variable is highly heteroskedastic; we have small deviation when i and j are small countries with no political relations, whereas large values and large dispersions around the mean are observed when i and j are powerful and connected. Under heteroskedasticity, estimating log-linearized equation by OLS leads to significant biases. However, the PPML estimator is robust to different patterns of heteroskedasticity, provides a natural way to deal with zeros in trade data, and is resilient to measurement error of Y_{ijt}, which can potentially contaminate our analysis (see Santos Silva & Tenreyro, 2006, 2011).

allows us to disentangle the effect on the arms trade of a global oil dependence , when the arms exporter wants to keep global oil prices stable in international markets, from that of a local oil dependence, when the arms exporter wants to safeguard the supply of oil from a particular oil-rich country. We therefore estimate the following model:

$$Y_{ijt} = \alpha exp(\beta Netoilimport_{ijt} + \gamma Oildependent_{it} * Oilrich_{jt} + D_{ijt}\lambda + \theta_{it} + \tau_{jt})\epsilon_{ijt} \quad (2)$$

where θ_{it} and τ_{jt} serve, respectively, as exporter-time and importer-time fixed effects, accounting for the multilateral resistance terms. $Oildependent_{it}$ is a dummy that takes value one if country i is net importer of oil in the global system, i.e., when the balance of global trade in oil (the difference between global volumes of oil import and oil export) is negative. $Oil\,rich_{jt}$ is a dummy that takes value one if country j is rich in oil. As a proxy for the abundance of oil in country j, we use stock variables such as oil reserves and new oilfield discoveries at time t in lieu of flow variables like oil production which could be potentially endogenous to arms import.

On one hand, the timing and relative size of new oilfield discoveries are mostly random, at least in the short-medium run, as prospecting for oil is highly uncertain, and countries have generally little control over the timing of such discoveries (see e.g., Lei & Michaels, 2014). Moreover, oil discoveries conveys important information about the potential for oil production in the very near future. Cotet & Tsui (2013) and Lei & Michaels (2014), among others, discuss how (unexpected) oil discoveries generate exogenous variation in oil wealth and increase per capita oil production and oil exports. On the other hand, to ensure that our results are not driven by this particular operationalization, we also use alternative definitions of the *Oil rich* dummy, which takes the value one if a country's total amount of oil reserves belongs to the 75th, 90th, 95th or 99th percentile of the total (global) oil reserves at time t. This stock variable should be less vulnerable to endogeneity concerns than oil production, as reserves depend on geological features and previous exploration efforts. Our parameter of interest is now γ as it speaks to the issue of global oil interdependence (Hypothesis

2), whereas β speaks to the issue of local dependence (Hypothesis 1).

4 Empirical results

4.1 Arms transfers and net oil import

Tables 1 and 2 provide the main tests of Hypothesis 1, a direct oil-for-weapons exchange. We start from Table 1, which incorporates the baseline models. Column (1) in Table 1 provides an initial test of the impact of net oil import on the volume of the arms trade, when no other control variables are included. The estimated coefficients for net oil import is positive and significantly discernible from zero at the 1% level. In column (2) we include the set of monadic controls (i.e., country i- and country j-specific characteristics). In column (3) we add the set of dyadic controls (i.e., country-pair characteristics). In column (4) we control for year dummies, and in column (5) for a linear time trend. Our coefficient of interest, β, is remarkably stable across model specifications and remains positive statistical significant at the 1% level. The PPML specification allows for direct reading of the coefficients, and the substantive interpretation is similar to a semi-elasticity. Net oil import is measured in 10 million metric tons, this means that a one-unit increase (10 ml metric tons) in the net oil import of country i from country j will lead to an increase of between 136% and 363% in the volume of arms transfers from i to j. These findings provide a first corroboration of the thesis outlined by Hypothesis 1 and demonstrates that the higher is the net oil import of country i from country j, i.e., its local oil dependence on country j, the higher its exports of arms to j.

——————— [Table 1 in here] ———————

Although we strive to control for a host of determinants of arms trade and get as close of an estimate as possible of a pure "local oil dependence" effect, it is still possible that unobservable factors affect both the transfers of arms and the net import of oil. In such a case, the PPML estimation of equation (1) might produce biased estimates. To address these endogeneity concerns, in Table 2, column (1), we estimate equation (1) with

the inclusion of country-specific (i and j) fixed effects to account for time-invariant unobservables at the country level. Furthermore, in column (2) we estimate a specification with the inclusion of it and jt fixed effects (i.e., the multilateral resistance terms) to flexibly capture all the time-varying barriers to trade that each country faces with all its trading partners every year. This specification soaks up all the effects of country i's and country j's characteristics in the it and jt fixed effects. Finally, in column (3) we run a specification with country-pair fixed effects to absorb time-invariant characteristics at the dyadic level. Note that this model requires us to exclude all dyads where we do not observe variation in arms transfers over time, in our case almost half of the total number of observations. Results in Table 2 show that our coefficient of interest remains strongly significant when taking into account additional unobservables. Reading across the first row of results in Table 2, we find that a 10 million metric tones increase in the volume of net oil import increases the bilateral arms transfer by a minimum of 99%.

——————— [Table 2 in here] ———————

We now briefly turn to our contextual covariates on the supply and demand side of the arms trade. We find that the arms trade is a positive function of both i's and j's real GDP. It is not however associated with the level of democracy in the exporting and importing country. We include the military spending in % of the GDP to capture military capabilities on the supply side, and perception of threats on the demand side, when it is not adequately picked up by the war variables. Military spending display a positive effect, significant at conventional levels, on both sides. We also include the number of armed forces in % of the population for both i and j, a proxy of the labour intensity of a country's force structure (see, e.g., Smith & Tasiran, 2005, 2010). Whereas this is negative on the supply side, it is positive on the demand side, reflecting the modernization of labour-intensive armed forces. Note also that being a member of NATO (or the Warsaw pact) increases (decreases) the volume of arms export, but it does not significantly affect the demand for weapons. As one would expect, the

number of wars in the immediate vicinity of j (neighboring wars) increases its import of weapons while domestic war is not significantly different from zero. On the demand side, results are not surprising as the decision to import arms reflects threats, proxied here by wars or military spending, and the size of a country, proxied by the GDP (see Smith & Tasiran, 2010).

The presence of international arms embargo against the importing country reduces its level of arms import, due to possible compliance dynamics, but it fails to achieve statistical significance. Our two measures of connectedness, military alliances and political affinity, display a positive sign; this indicates that arms transfers between two states depend on the presence and strength of cordial diplomatic and military relations.[8]

4.2 Arms transfers, net oil import and global oil dependence

Table 3 offers a direct test of Hypothesis 2, on the effect of global oil dependence, while keeping local oil (i.e., net oil import) dependence constant. We also control for the full set of country-pairs's characteristics and estimate models with multilateral resistance terms. Reading across the first row of results, we find that net oil import continues to exert a positive, significant and substantive effect on the volume of arms transfers; the coefficients are virtually identical to those in Table 2, column (2), which makes use of the same conservative specification with multilateral resistance terms.

The second row presents an interaction between the *Oil dependent* dummy, on the supply side, and the *Oil rich* dummy, on the demand side. Whereas defining an oil-dependent economy is quite straightforward (i.e., whether it is a net importer of oil or not), recall that we use alternative definitions of an *Oil rich* economy. In column (1) we look at whether j has a positive discovery of oil at time t and we find that its interaction with

[8]Following the traditional literature on the determinants of bilateral trade, we also include customary control variables, such as the geographic distance, the religious distance, the presence of a common ethnicity, a common language, a common colonial history and a regional trade agreement. We omit these additional rows due to space limitations, although the full results can be produced with our replication material.

Oil dependent is associated with a 45% increase in the quantity of arms transfers. Columns (2) to (5) display the results of four alterations of the definition of *Oil rich*, according to the percentile distribution of oil reserves in country j, which provides an additional exogenous source of variation. As one moves across the columns of the table the stringency of this definition gradually builds up, and we find that only countries belonging to the 95th or 99th percentile of oil reserves at time t receive higher amount of arms, and that this effect is conditional on whether the arms exporter is oil-dependent. Interestingly, the size of the marginal effect in column (4) is very similar to that of column (1), around 0.5, although they use quite different operationalizations of *Oil rich*. The other contextual variables all continue to add significantly to the fit of the model in the same direction.

——————— [Table 3 in here] ———————

4.3 Robustness Checks

We test the robustness of our findings in several additional ways. First, we ask whether the potential failure to fully address reverse causality might introduce simultaneity bias into our estimated models. Therefore, in Table 4 we estimate a series of regressions as in equation (2) using as dependent variable future arms transfers in year $t + s$, with $s = 1, 2, 3, 4$ and 5. Our results hold up well to this series of specification checks and the size of the coefficients is virtually unaltered, which increases the confidence in our results.

——————— [Table 4 in here] ———————

Second, we ask whether our results are driven by specific outliers. Top arms exporters in the period under consideration are the two global powers, USA and Russia, while two countries, Saudi Arabia and Iran, are top oil producers and the major importers of weapons. We exclude them in Table 5, columns (1) and (2), and, by and large, the results carry over, thus suggesting that they do not rely on outliers. Third, although our hypotheses

speak to the issue of oil dependence, it could be easily extended to strategic natural resources, more generally. Gas is an obvious candidate, and we reproduce the baseline models but use gas in lieu of oil. The results are shown in columns (3)-(4) of Table 5. The coefficient on the interaction term is overall similar to the ones presented above for the case of oil, yet net gas import is not statistically significant. This last result suggests that global dependence on gas is more crucial than a direct gas-for-weapons relation.

———————— [Table 5 in here] ————————

5 Conclusions

One of the most debated issues in the study of international economics revolves around the question of whether and to what extent the economic ties between nations affect or are affected by the "flag", i.e., the nature and quality of their diplomatic relations. The arms trade is a very sensitive issue as it reveals national interests beyond simple economic considerations; as such, the volume of bilateral arms transfers can be used as a barometer of political relations between the supplier and the recipient states. The empirical literature on the arms trade is remarkably scarce and the aim of this article is to advance the relevance of energy dependence, and in particular of oil, in explaining the volume of arms transfers between countries. We claim that instances of political violence can cause disruptions in the global supply of oil and increasing oil prices. Oil-dependent economies have therefore incentives to provide security by selling or giving away arms to oil-rich countries to lower their risks of political turmoils and instabilities. This indirect military support should in turn ensure that countries maintain crude oil production within a target range. By the same token, countries with proven as well as a potential for oil production are more likely to receive weapons by oil-dependent economies. We argue for the existence of both a bilateral or local oil dependence as well as a global oil dependence. The former indicates that arms import is positively tied to the quantities of oil exported to the arms supplier. Speculatively, arms export to a specific country is affected by the degree of dependence on its supply of oil. The

latter indicates that global dependence on oil is a motivated factor for the arms trade and increases the volume of arms transfers between countries, even in absence of a direct bilateral oil-for-weapons exchange.

To test these hypotheses, we compile an extensive panel of oil wealth and oil trade data, including stock variables such as the size of reserves and recent discoveries to prove plausibly exogenous sources of variation; we also include flow variables, in particular the bilateral and global balance of trade in oil of each country, to measure the potential damage of regional instabilities to its oil supply. Our hypotheses about the impact of oil dependence on the arms trade are strongly borne out by the empirical results. Overall, the evidence seems to point consistently towards the conclusion that the arms trade can be associated to attempts to securing and maintaining access to oil and stabilizing prices. As such, oil might play an even larger role in influencing economic and political decisions than is generally acknowledged. Because of the limited number of empirical works on the arms trade and the fact that securing future energy supplies remains a major challenge, there is certainly an interesting agenda for future research in this area.

References

Akerman, Anders, & Seim, Anna Larsson. 2014. The global arms trade network 1950–2007. *Journal of Comparative Economics*, **42**(3), 535–551.

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

Baier, Scott L, Bergstrand, Jeffrey H, & Feng, Michael. 2014. Economic integration agreements and the margins of international trade. *Journal of International Economics*, **93**(2), 339–350.

Bapat, Navin A. 2011. Transnational terrorism, US military aid, and the incentive to misrepresent. *Journal of Peace Research*, **48**(3), 303–318.

Blanton, Shannon Lindsey. 2000. Promoting human rights and democracy in the developing world: US rhetoric versus US arms exports. *American Journal of Political Science*, 123–131.

Blanton, Shannon Lindsey. 2005. Foreign policy in transition? Human rights, democracy, and US arms exports. *International Studies Quarterly*, **49**(4), 647–668.

Bove, Vincenzo, Gleditsch, Kristian Skrede, & Sekeris, Petros G. 2015. "Oil Above Water": Economic Interdependence and Third Party Intervention. *Journal of Conflict Resolution*.

Brauer, Jurgen. 2007. Arms industries, arms trade, and developing countries. *Handbook of Defense Economics*, **2**, 973–1015.

Comola, Margherita. 2012. Democracies, Politics, and Arms Supply. *Review of International Economics*, **20**(1), 150–163.

Cotet, Anca M, & Tsui, Kevin K. 2013. Oil and Conflict: What Does the Cross Country Evidence Really Show? *American Economic Journal: Macroeconomics*, **5**(1), 49–80.

Feenstra, Robert C, Lipsey, Robert, Deng, Haiyan, Ma, Alyson C, & Mo, Henry. 2005. World Trade Flows: 1962-2000. *NBER Working Paper*.

Garcia-Alonso, Maria DC, & Levine, Paul. 2007. Arms trade and arms races: a strategic analysis. *Handbook of Defense Economics*, **2**, 941–971.

Garfinkel, Michelle R, Skaperdas, Stergios, & Syropoulos, Constantinos. 2015. Trade and insecure resources. *Journal of International Economics*, **95**(1), 98–114.

Kilian, Lutz. 2008. A comparison of the effects of exogenous oil supply shocks on output and inflation in the G7 countries. *Journal of the European Economic Association*, **6**(1), 78–121.

Kinsella, David. 2011. The arms trade. *The handbook on the political economy of war*, 217–242.

Kollias, Christos, & Sirakoulis, Kleanthis. 2002. Arms Racing and the Costs of Arms Imports: A Stochastic Model. *Defence and Peace Economics*, **13**(2), 137–143.

Lei, Yu-Hsiang, & Michaels, Guy. 2014. Do giant oilfield discoveries fuel internal armed conflicts? *Journal of Development Economics*, **110**, 139–157.

Levine, Paul, & Smith, Ron. 1995. The arms trade and arms control. *The Economic Journal*, 471–484.

Levine, Paul, & Smith, Ron. 1997. The arms trade. *Economic Policy*, **12**(25), 336–370.

Levine, Paul, & Smith, Ron. 2000a. Arms export controls and proliferation. *Journal of Conflict Resolution*, **44**(6), 885–895.

Levine, Paul, & Smith, Ron. 2000b. The arms trade game: from laissez-faire to a common defence policy. *Oxford Economic Papers*, **52**(2), 357–380.

Lippi, Francesco, & Nobili, Andrea. 2012. Oil and the macroeconomy: a quantitative structural analysis. *Journal of the European Economic Association*, **10**(5), 1059–1083.

Sandler, Todd. 2000. Arms trade, arms control, and security: Collective action issues. *Defence and peace economics*, **11**(3), 533–548.

Sandler, Todd, & Hartley, Keith. 1999. The political economy of NATO. *Cambridge Books*.

Santos Silva, JMC, & Tenreyro, Silvana. 2006. The log of gravity. *The Review of Economics and statistics*, **88**(4), 641–658.

Santos Silva, JMC, & Tenreyro, Silvana. 2011. Further simulation evidence on the performance of the Poisson pseudo-maximum likelihood estimator. *Economics Letters*, **112**(2), 220–222.

Seitz, Michael, Tarasov, Alexander, & Zakharenko, Roman. 2015. Trade costs, conflicts, and defense spending. *Journal of International Economics*, **95**(2), 305–318.

SIPRI. 1971. Arms Trade Registers: The Arms Trade with the Third World. *Stockholm International Peace Research Institute. Stockholm: Almqvist and Wiksell*.

Smith, Ron P, & Tasiran, Ali. 2005. The demand for arms imports. *Journal of Peace Research*, **42**(2), 167–181.

Smith, Ron P, & Tasiran, Ali. 2010. Random coefficients models of arms imports. *Economic Modelling*, **27**(6), 1522–1528.

Voeten, Erik, & Merdzanovic, Adis. 2009. United Nations General Assembly Voting Data. *Washington, DC, United States: Georgetown University. http://dvn.iq.harvard.edu/dvn/dv/Voeten/faces/study/StudyPage.xhtml*.

Wezeman, & Wezeman. 2014. *Trends in international arms transfers, 2013*.

Tables of results

Table 1: Arms transfers and net oil import, PPML estimates

	Arms transfers$_{ijt}$				
	(1)	(2)	(3)	(4)	(5)
Net oil import$_{ijt}$	3.625***	1.358**	1.731***	1.662***	1.695***
	(0.535)	(0.653)	(0.600)	(0.601)	(0.594)
Country i's characteristics					
GDP		3.461***	4.325***	5.768***	5.125***
		(0.225)	(0.303)	(0.495)	(0.373)
Democracy		0.026	0.027	0.017	0.014
		(0.022)	(0.020)	(0.017)	(0.017)
NATO		1.557***	1.554***	1.270***	1.293***
		(0.207)	(0.219)	(0.200)	(0.199)
Warsaw pact		-1.274**	-1.215**	-1.488***	-1.482***
		(0.507)	(0.488)	(0.467)	(0.469)
Military burden		0.011***	0.011***	0.009***	0.010***
		(0.001)	(0.001)	(0.001)	(0.001)
Soldiers per capita		-19.478**	-13.968*	-26.424***	-27.176***
		(7.663)	(7.463)	(9.263)	(8.294)
Country j's characteristics					
GDP		2.927***	3.446***	4.582***	4.171***
		(0.626)	(0.413)	(0.555)	(0.488)
Democracy		0.018	-0.007	-0.000	0.003
		(0.021)	(0.016)	(0.014)	(0.015)
NATO		0.414	-0.201	-0.262	-0.249
		(0.422)	(0.383)	(0.307)	(0.343)
Warsaw pact		-1.166	-1.038	-1.257	-1.110
		(0.905)	(0.834)	(0.853)	(0.846)
Military burden		0.002***	0.003***	0.002***	0.003***
		(0.001)	(0.000)	(0.001)	(0.001)
Soldiers per capita		26.928***	22.642***	18.253***	19.595***
		(9.394)	(6.576)	(5.523)	(6.086)
War		0.073	0.071	0.003	0.075
		(0.200)	(0.146)	(0.176)	(0.156)
Neighboring wars		0.164*	0.210***	0.226***	0.234***
		(0.092)	(0.068)	(0.070)	(0.069)
Arms embargo		-0.887	-0.942	-0.699	-0.830
		(0.612)	(0.614)	(0.656)	(0.655)
Country-pairs's characteristics					
Military alliance			1.140***	0.826***	0.935***
			(0.369)	(0.300)	(0.331)
Political affinity			1.268***	1.452***	1.161***
			(0.205)	(0.214)	(0.186)
Year trend					-0.047***
					(0.008)
Gravity controls	No	No	✓	✓	✓
Year fixed effects	No	No	No	✓	No
Clusters	8765	8765	8765	8765	8765
Observations	66037	64531	64531	64531	64531

Note: Robust standard errors in parentheses are clustered at country-pair level. The dependent variable, Arms transfers$_{ijt}$, measures the volume of major weapons transfers from country i to country j at time t. The main explanatory variable, Net oil import$_{ijt}$, measures the net oil import (import - export) of country i from country j at time t. Gravity controls include Distance, Common colony, Common currency, Common ethnicity, Common language, Religious distance and RTAs. *p < 0.10, **p < 0.05, ***p < 0.01.

Table 2: Arms transfers and net oil import, PPML estimates with FE

	Arms transfers$_{ijt}$		
	(1)	(2)	(3)
Net oil import$_{ijt}$	1.112***	1.615**	0.987***
	(0.325)	(0.627)	(0.378)
Country i's characteristics			
GDP	0.666		0.516
	(0.560)		(0.632)
Democracy	-0.007		-0.008
	(0.027)		(0.020)
NATO	1.608**		0.743**
	(0.625)		(0.359)
Warsaw pact	0.254		-0.989
	(0.725)		(0.747)
Military burden	-0.002		-0.002
	(0.003)		(0.003)
Soldiers per capita	7.866		15.251
	(23.245)		(20.589)
Country j's characteristics			
GDP	2.099***		2.594***
	(0.661)		(0.777)
Democracy	-0.020		-0.019
	(0.012)		(0.012)
NATO	-0.468		0.245
	(0.325)		(0.302)
Warsaw pact	0.170		0.322
	(0.751)		(0.938)
Military burden	0.002***		0.001
	(0.001)		(0.001)
Soldiers per capita	24.468***		16.122**
	(6.338)		(7.711)
War	-0.143		-0.204
	(0.236)		(0.275)
Neighboring wars	-0.033		-0.148**
	(0.058)		(0.064)
Arms embargo	0.141		-0.438
	(0.317)		(0.458)
Country-pairs's characteristics			
Military alliance	0.911***	0.812**	-0.021
	(0.298)	(0.324)	(0.320)
Political affinity	0.861***	2.245***	0.759***
	(0.192)	(0.322)	(0.275)
Year trend	0.012		
	(0.008)		
Gravity controls	✓	✓	✓
Year fixed effects	No	No	✓
(i) and (j) fixed effects	✓	No	No
(it) and (jt) fixed effects	No	✓	No
(ij) fixed effects	No	No	✓
Observations	64531	63129	32573
Clusters	8765	8919	1112

Note: Robust standard errors in parentheses are clustered at country-pair level. The dependent variable, Arms transfers$_{ijt}$, measures the volume of major weapons transfers from country i to country j at time t. The main explanatory variable, Net oil import$_{ijt}$, measures the net oil import (import - export) of country i from country j at time t. Gravity controls include Distance, Common colony, Common currency, Common ethnicity, Common language, Religious distance and RTAs. *p < 0.10, **p < 0.05, ***p < 0.01.

Table 3: Arms transfers, net oil import and global oil dependence

	Arms transfers$_{ijt}$				
	Oil rich$_{jt}$=1 if New oil discoveries$_{jt}$>0	Oil rich$_{jt}$=1 if Oil reserves$_{jt}$>=			
		$p75$	$p90$	$p95$	$p99$
	(1)	(2)	(3)	(4)	(5)
Net oil import$_{ijt}$	1.602***	1.574**	1.530**	1.458**	1.326**
	(0.614)	(0.632)	(0.622)	(0.616)	(0.600)
Oil dependent$_{it}$ * Oil rich$_{jt}$	0.454**	0.232	0.269	0.542**	0.935***
	(0.203)	(0.248)	(0.256)	(0.262)	(0.288)
Country-pairs's characteristics					
Military alliance	0.808**	0.834***	0.810**	0.794**	0.761**
	(0.323)	(0.312)	(0.317)	(0.309)	(0.305)
Political affinity	2.232***	2.240***	2.217***	2.214***	2.147***
	(0.320)	(0.319)	(0.318)	(0.314)	(0.308)
Gravity controls	✓	✓	✓	✓	✓
(it) and (jt) fixed effects	✓	✓	✓	✓	✓
Observations	63129	63129	63129	63129	63129
Clusters	8919	8919	8919	8919	8919

Note: Robust standard errors in parentheses are clustered at country-pair level. The dependent variable, Arms transfers$_{ijt}$, measures the volume of major weapons transfers from country i to country j at time t. Net oil import$_{ijt}$ measures the net oil import (import - export) of country i from country j at time t. Oil dependent$_{it}$ is a dummy variable that takes value equal to 1 if country i is globall oil importer at time t. Oil rich$_{jt}$ is a dummy variable that takes value equal to 1 if country j has a new oil discovery at time t, in column (1). In columns (2)-(5), Oil rich$_{jt}$ is redefined equal to 1 if country j belongs to the 75th, 90th, 95th and 99th percentile of oil reserves at time t, respectively. Gravity controls include Distance, Common colony, Common currency, Common ethnicity, Common language, Religious distance and RTAs. *p < 0.10, **p < 0.05, ***p < 0.01.

Table 4: Future arms transfers, net oil import and global oil dependence

	Arms transfers$_{ijt+s}$									
	s=1		*s=2*		*s=3*		*s=4*		*s=5*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Net oil import$_{ijt}$	1.570***	1.556***	1.568***	1.567***	1.521***	1.489***	1.404***	1.370***	1.068**	1.082**
	(0.559)	(0.541)	(0.522)	(0.506)	(0.536)	(0.524)	(0.530)	(0.526)	(0.528)	(0.519)
Oil dependent$_{it}$ * Oil rich$_{jt}$		0.604***		0.622***		0.692***		0.576**		0.425**
		(0.195)		(0.194)		(0.208)		(0.224)		(0.213)
Country-pairs's characteristics										
Military alliance	0.782**	0.762**	0.715**	0.691**	0.649**	0.640**	0.668**	0.664**	0.557*	0.546*
	(0.314)	(0.312)	(0.311)	(0.308)	(0.311)	(0.308)	(0.307)	(0.304)	(0.307)	(0.303)
Political affinity	2.110***	2.128***	2.118***	2.175***	2.054***	2.049***	1.937***	1.919***	1.945***	1.984***
	(0.320)	(0.321)	(0.324)	(0.328)	(0.318)	(0.314)	(0.312)	(0.306)	(0.323)	(0.323)
Gravity controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(it) and (jt) fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Clusters	8785	8785	8640	8640	8346	8346	8154	8154	7864	7864
Observations	61113	61113	58738	58738	56762	56762	56814	56814	53843	53843

Note: Robust standard errors in parentheses are clustered at country-pair level. The dependent variable, Arms transfers$_{ijt+s}$, measures the volume of major weapons transfers from country i to country$_j$ at time $t+s$, with s varying from 1 to 5. Net oil import$_{ijt}$ measures the net oil import (import - export) of country i from country j at time t. Oil dependent$_{it}$ is a dummy variable that takes value equal to 1 if country i is a global oil importer at time t. Oil rich$_{jt}$ is a dummy variable that takes value equal to 1 if country j has a new oil discovery at time t. Gravity controls include Distance, Common colony, Common currency, Common ethnicity, Common language, Religious distance and RTAs. *p $<$ 0.10, **p $<$ 0.05, ***p $<$ 0.01.

Table 5: Robustness checks

	Arms transfers$_{ijt}$			
	(1)	(2)	(3)	(4)
Net oil import$_{ijt}$	3.084*	3.002*		
	(1.823)	(1.787)		
Oil dependent$_{it}$ * Oil rich$_{jt}$		0.815***		
		(0.208)		
Net gas import$_{ijt}$			1.722	1.504
			(1.247)	(1.254)
Gas dependent$_{it}$ * Gas rich$_{jt}$				0.736***
				(0.249)
Country-pairs's characteristics				
Military alliance	0.231	0.220	0.669**	0.734**
	(0.336)	(0.327)	(0.326)	(0.328)
Political affinity	1.463***	1.381***	2.164***	2.238***
	(0.413)	(0.403)	(0.329)	(0.324)
Gravity controls	✓	✓	✓	✓
(it) and (jt) fixed effects	✓	✓	✓	✓
Countries	No USA, RUS, SAU, IRN		All	All
Observations	43879	43879	63129	63129

Note: Robust standard errors in parentheses are clustered at country-pair level. The dependent variable, Arms transfers$_{ijt}$, measures the volume of major weapons transfers from country i to country j at time t. Net oil import$_{ijt}$ measures the net oil import (import - export) of country i from country j at time t. Oil dependent$_{it}$ is a dummy variable that takes value equal to 1 if country i is a global oil importer at time t. Oil rich$_{jt}$ is a dummy variable that takes value equal to 1 if country j has a new oil discovery at time t. In column (1) and (2) we exclude the major arms' exporters (USA and Russia) and the richest oil countries (Saudi Arabia and Iran). In columns (3)-(4), we re-estimate our main specifications by using Oil in lieu of Gas. Gravity controls include Distance, Common colony, Common currency, Common ethnicity, Common language, Religious distance and RTAs. *p < 0.10, **p < 0.05, ***p < 0.01.

Appendix

Table A.1: Variable definitions and sources

Variable	Definition	Source
Arms transfers$_{ijt}$	Trend-indicator value (TIV) of major weapons transfers from country i to country j at time t in 10 million US$	Stockholm International Peace Research Institute (SIPRI) Arms Transfers Database (`http://www.sipri.org/databases/armstransfers`)
Net oil import$_{ijt}$	Volume of net oil import (import - export) of country i from country j at time t in 10 million metric tons	Feenstra *et al.* (2005)
New oil discoveries$_{jt}$	Volume of new oil discoveries in country j at time t in thousand million barrels	Cotet and Tsui (2013)
Oil reserves$_{jt}$	Volume of oil reserves in country j at time t in thousand million barrels	Cotet and Tsui (2013)
Oil dependent$_{it}$	Dummy for global oil importer countries	Authors' own
Oil rich$_{jt}$	Dummy for countries with a new oil discovery at time t	Authors' own
GDP	Real GDP in 10 million US$	Expanded Trade and GDP Data - Gleditsch (2002) (`http://privatewww.essex.ac.uk/~ksg/exptradegdp.html`)
Democracy	Regime authority spectrum on a 21-point scale ranging from -10 to +10 (Polity2 indicator)	The Polity IV Project - Marshall and Jaggers (2013) (`http://www.systemicpeace.org`)
NATO	Dummy for countries belonging to the North Atlantic Treaty Organization (NATO)	Authors' own
Warsaw Pact	Dummy for countries belonging to the Warsaw Pact	Authors' own
Military burden	Military spending as a percentage of Real GDP	The Correlates of War (COW) Project (`http://www.correlatesofwar.org/`
Soldiers per capita	Number of soldiers per capita (as a percentage of Population)	COW
War	Dummy for countries with a war	Cotet and Tsui (2013)
Neighboring wars	Number of neighboring countries with a war	Authors' own

Table A.1: Variable definitions and sources – continued

Variable	Definition	Source
Arms embargo	Dummy for countries with arms embargo from either UN or EU	SIPRI Arms Embargoes Database (`http://www.sipri.org/databases/embargoes`)
Military alliance	Dummy for pairs of countries with a formal military alliance	COW
Political affinity	Affinity of Nations score ranging from -1 (least similar interests) to +1 (most similar interests)	United Nations General Assembly Voting Data - Voeten *et al.* (2013) (`https://dataverse.harvard.edu/dataverse/harvard?q=affinity`)
Distance	Capital-to-capital distance between countries in a pair (in 10 million km)	CEPII distance database (`http://www.cepii.fr/CEPII/fr/bdd_modele/presentation.asp?id=6`)
Common colony	Dummy for pairs of countries with common colonizer	CEPII distance database
Common currency	Dummy for pairs of countries with common currency	CEPII distance database
Common ethnicity	Dummy for pairs of countries with the same language spoken by at least 9% of the population	CEPII distance database
Common language	Dummy for pairs of countries sharing a common official or primary language	CEPII distance database
Religious distance	Percentage in which both countries share religions	CEPII distance database
RTAs	Dummy for pairs of countries with regional trade agreements in force	CEPII distance database

Table A.2: Summary statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
Arms transfers$_{ijt}$	overall	8.14E-07	7.69E-06	0	0.000445	N = 66037
	between		2.96E-06	0	0.0001211	n = 8919
	within		5.29E-06	-0.0000983	0.0003806	T-bar = 7.40408
Net oil import$_{ijt}$	overall	0.0028298	0.047657	-1.975061	1.776768	N = 66037
	between		0.026982	-0.7229579	0.6972872	n = 8919
	within		0.0294296	-1.249273	1.082311	T-bar = 7.40408
New oil discovery$_{jt}$	overall	0.2607624	1.166614	0	26.06	N = 53104
	between		0.7135286	0	26.06	n = 7141
	within		1.023653	-9.389858	24.38469	T-bar = 7.43649
Oil reserves$_{jt}$	overall	14.42523	37.83175	0	269.2931	N = 53104
	between		32.12553	0	268.0759	n = 7141
	within		3.124776	-21.70162	38.02587	T-bar = 7.43649
Oil dependent$_{it}$	overall	0.6960038	0.4599845	0	1	N = 66037
	between		0.4468527	0	1	n = 8919
	within		0.2621927	-0.2706629	1.657542	T-bar = 7.40408
Oil rich$_{jt}$	overall	0.616094	0.4863391	0	1	N = 66037
	between		0.4665396	0	1	n = 8919
	within		0.2348566	-0.356879	1.516094	T-bar = 7.40408
Country i's characteristics						
GDP	overall	0.0660101	0.1399601	0.0003061	1.080727	N = 66037
	between		0.0961951	0.0003061	1.055819	n = 8919
	within		0.046305	-0.3761831	0.6000276	T-bar = 7.40408
Democracy	overall	4.145049	7.633289	-10	10	N = 65971
	between		7.563904	-10	10	n = 8894
	within		2.994871	-12.2994	19.2627	T-bar = 7.41747
NATO	overall	0.2881566	0.4529078	0	1	N = 66037
	between		0.3628751	0	1	n = 8919
	within		0.1047493	-0.6530198	1.249695	T-bar = 7.40408
Warsaw Pact	overall	0.0468677	0.211357	0	1	N = 66037
	between		0.1554131	0	1	n = 8919
	within		0.1133512	-0.8975768	0.9357566	T-bar = 7.40408
Military burden	overall	38.75193	47.23373	1.955919	439.1977	N = 65810
	between		41.61042	2.387705	439.1977	n = 8886
	within		26.69683	-164.8069	320.3836	T-bar = 7.40603
Soldiers per capita	overall	0.0101501	0.0097293	0.0007721	0.0592347	N = 65878
	between		0.0098963	0.0008129	0.0592347	n = 8913
	within		0.0029402	-0.0095188	0.0306763	T-bar = 7.39123
Country j's characteristics						
GDP	overall	0.0300009	0.0901078	0.0000366	1.080727	N = 66037
	between		0.0782683	0.0000366	0.9897429	n = 8919
	within		0.0246673	-0.4800269	0.4569758	T-bar = 7.40408
Democracy	overall	0.9815015	7.783907	-10	10	N = 65627
	between		7.166009	-10	10	n = 8893
	within		3.327537	-16.206	15.11483	T-bar = 7.37962
NATO	overall	0.1396944	0.3466723	0	1	N = 66037
	between		0.290054	0	1	n = 8919
	within		0.0592084	-0.7353056	1.048785	T-bar = 7.40408
Warsaw Pact	overall	0.0087981	0.0933853	0	1	N = 66037

Table A.2: Summary statistics – continued

Variable		Mean	Std. Dev.	Min	Max	Observations
	between		0.0757552	0	1	n = 8919
	within		0.0528084	-0.9245352	0.897687	T-bar = 7.40408
Military burden	overall	30.12046	49.15098	0	1122.41	N = 65388
	between		38.61121	0	1122.41	n = 8853
	within		35.16985	-327.9368	1054.419	T-bar = 7.38597
Soldiers per capita	overall	0.0081499	0.0084986	0	0.076889	N = 66005
	between		0.0082349	0	0.076889	n = 8913
	within		0.0029744	-0.0232502	0.0505131	T-bar = 7.40548
War	overall	0.2285879	0.4199263	0	1	N = 66014
	between		0.3630391	0	1	n = 8919
	within		0.2478524	-0.7369294	1.201561	T-bar = 7.4015
Neighboring wars	overall	0.7794115	1.034563	0	7	N = 66037
	between		0.9453883	0	7	n = 8919
	within		0.503142	-2.287255	3.946078	T-bar = 7.40408
Arms embargo	overall	0.0334358	0.179773	0	1	N = 66037
	between		0.1968729	0	1	n = 8919
	within		0.1083636	-0.8832309	1.005658	T-bar = 7.40408
Country-pair's characteristics						
Military alliance	overall	0.0893287	0.2852198	0	1	N = 66037
	between		0.2241216	0	1	n = 8919
	within		0.0750288	-0.8551157	1.050867	T-bar = 7.40408
Political affinity	overall	0.6794393	0.3708258	-1	1	N = 66037
	between		0.2877884	-0.8271789	1	n = 8919
	within		0.1995143	-0.8619195	1.970751	T-bar = 7.40408
Distance	overall	0.0007285	0.0004481	5.96E-06	0.0019951	N = 66037
	between		0.0004415	5.96E-06	0.0019951	n = 8919
	within		2.44E-19	0.0007285	0.0007285	T-bar = 7.40408
Common colony	overall	0.029862	0.1702079	0	1	N = 66037
	between		0.2274352	0	1	n = 8919
	within		0	0.029862	0.029862	T-bar = 7.40408
Common currency	overall	0.0027712	0.0525693	0	1	N = 66037
	between		0.0505179	0	1	n = 8919
	within		0.0354742	-0.7750066	0.9757441	T-bar = 7.40408
Common ethnicity	overall	0.1429199	0.3499938	0	1	N = 66037
	between		0.3405333	0	1	n = 8919
	within		0	0.1429199	0.1429199	T-bar = 7.40408
Common language	overall	0.1071066	0.3092511	0	1	N = 66037
	between		0.3149798	0	1	n = 8919
	within		0	0.1071066	0.1071066	T-bar = 7.40408
Religious distance	overall	0.1566662	0.2512904	0	0.992012	N = 66037
	between		0.253095	0	0.992012	n = 8919
	within		0	0.1566662	0.1566662	T-bar = 7.40408
RTAs	overall	0.060133	0.2377348	0	1	N = 66037
	between		0.1556189	0	1	n = 8919
	within		0.1291106	-0.8963888	1.021671	T-bar = 7.40408