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# Non-trade in the MENA revisited: systematic review and gravity analysis

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## Abstract

This working paper deals with the comparatively low levels of trade in the MENA region with a focus on the impact of the Palestinian Israeli conflict. The methodological focus is on the application of the gravity model for international trade.

We provide an innovative systematic review that does not only use the standard approach (search engine search) but also identifies primary studies by means of expert interviews. We identify 118 studies of potential relevance.

We identify best practices and review estimates on trade potential. In terms of citations reported in Google Scholar a study by Arnon, Spivak and Weinblatt (published in World Economy 1996) is the most influential paper on this topic. The last year for which a trade potential estimate according to our systematic review is available is 1999. This paper fills this gap by providing estimates for the year 2019.

We first replicate, extend, and update the study Arnon, Spivak and Weinblatt taking best practices as identified by the systematic review into account. Based on the best practice identified in the systematic review we estimate a panel PPML gravity model for 76 countries and the years 1991-2019 inclusive. Next, we use two alternative approaches to estimate the intra MENA trade potential that could be reaped as a consequence of a geopolitically more stable and open Middle East. In the year 2019 this 'pot of gold' in percent of intra MENA trade amounts to 10% to 54% (import based) and 21% to 48% (export based), respectively. These estimates are lower than those reported in the earlier literature. The conclusion is that an economically significant trade potential still exists.

## Keywords

Trade, systematic review, gravity, PPML, MENA.

**JEL:** F5, F14, N74, O19

## Econometric software

Stata version 17.0

## Acknowledgements

An early version of this paper was presented at the European Trade Study Group (Groningen, 2022). Comments by participants are gratefully acknowledged. This paper is part of a larger ongoing PhD project on the economic prospects of the Middle East Peace Process, that analyses the Oslo negotiations that led to the Paris Agreement that provides a settlement including economic arrangement for the relations between Palestine and Israel.

# Non-trade in the MENA revisited[1]
## systematic review and gravity analysis

## 1 Introduction

Already at the start of the long history of applied trade modelling, Linnemann (1966: 215) pointed out the low levels of bilateral trade between Israel and Arab states as an issue worth investigating by means of his gravity model. He explicitly suggested the possibility of estimating 'the "normal" level of trade flows which were (and presently are) at an "abnormal" level'.[2] Gravity has lived up to Linnemann's expectations in many ways. Noteworthy is the ability of gravity models to analyse (and, to a large extent, predict) trade potential in the context of politically disturbed trade flows. Indeed, gravity models have in the past met the test of predicting trade potential in situations characterized by the kind of political conflicts and physical border protection measures that are characteristic of the current trade environment of Israel and Palestine. In particular, the gravity model has worked quite well in foreseeing double digit growth rates of East West trade as a consequence of the end of the Cold War (van Bergeijk and Brakman 2010, van Bergeijk 2015). Gravity has also been used to analyse (non) trade in the Middle East as we review in Section 2, but here the model has unfortunately not yet been put to a similar real world before-after test as the Arab-Israeli conflict has dragged on to the present day. It is true that trade with Egypt and Jordan increased 2 to 3-fold, but it is still at rather low levels, because 'the level of hostility due to the continuing conflict is still high and creates a significant barrier to trade' (Bader et al. 2012: 61). Still, we would agree with Linnemann that gravity also provides a useful tool for the assessment of trade potential in this context.

Assessments of trade relations and trade potential for the Middle East have often been inspired by political events: the 1979 peace agreement between Egypt and Israel, the 1991 regional Madrid Peace Process, the 1993 Oslo Accord between Palestine and Israel and the 1994 peace agreement signed between Jordan and Israel. Each diplomatic step held further promise and eventually led to more openness in the Middle East region. More recently, for example, the 2020 Abraham Accords, signed on November 2020 between Bahrain, the United Arab Emirates, and Israel, changed the political and economic arena of the Middle East and North Africa (MENA) whilst opening the door to new economic initiatives and cooperation between the Arab World and Israel.[3] In all these economic assessments the gravity method played an important role as a

[1] An early version of this paper was presented at the European Trade Study Group (Groningen, 2022). Comments by participants are gratefully acknowledged.

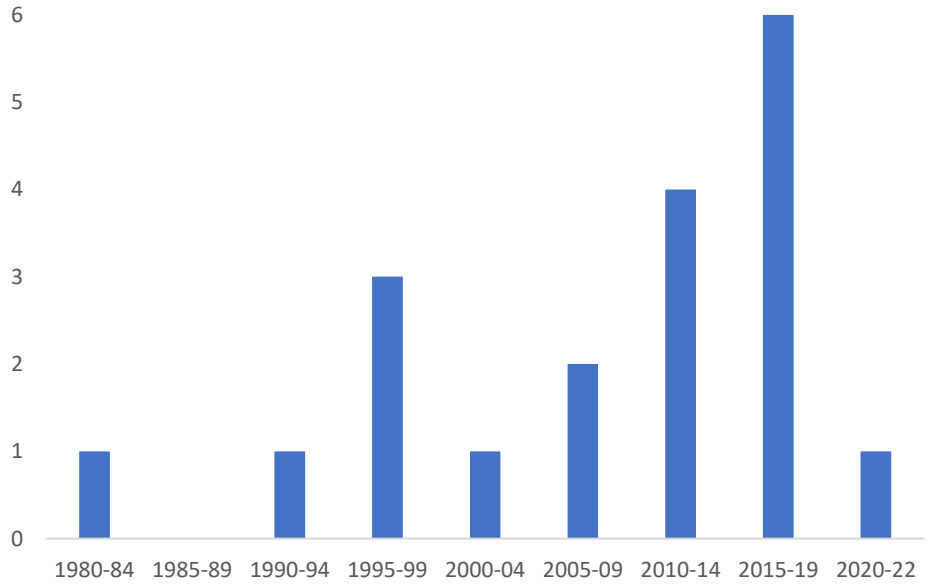
[2] Linnemann (1966) is a PhD thesis at Erasmus University Rotterdam (the promotor is Jan Tinbergen) that provides the underpinnings for the Appendix to Tinbergen (1962) that contains the first published gravity model.

[3] A recent example is the July 15, 2022 statement of Saudi Arabia on opening its airspace "for all air carriers", meaning lifting the ban on Israeli flights.

way to quantify the potential benefits of peace, forecasting new trade with MENA trading partners enabled by regional peace agreements.

This paper takes stock of the empirical literature that assesses the economic impact of the Arab-Israeli conflict with a focus on the Palestinian/Israeli relation. We first provide a systematic review of the economic literature of the past 40 years that for the purpose of this paper has been focused on the use of the gravity model, that has been the intellectual workhorse of 19 identified studies and on their research strategies and findings (Figure 1).

**Figure 1**
**Identified gravity model studies 1983-2022**




The overview of the primary studies enables us to derive best practices for the second contribution of this paper, that is a replication and extension of one of the seminal papers in this literature "The potential for trade between Israel, the Palestinians and Jordan" co-authored by Arnon, Spivak and Weinblatt and published in *World Economy* in 1996. Arnon et al. (1996) provide one of the major analyses of that time. The article gives the econometric underpinnings of their 1997 book project, *The Palestinian economy: Between imposed integration and voluntary separation*.[4] Given its influence both in academia and policy circles the investment in a replication adds value. In the econometric part of this paper (section 4), we first replicate their gravity model successfully, then increase both the country sample and the time dimension (their study was a cross section) and finally apply a different econometric technique, PPML. Although we observe differences in size and significance, the basic findings of their gravity model survive this

[4] The book also led to offspring in the *Economic Journal* (Arnon and Weinblatt 2001) and *Weltwirtschaftliches Archiv* (1996), that are not trade related.

endurance so that the policy implications of that study by and large remain the same: there is significant trade potential that could be reaped if a peace settlement could be achieved. Our third contribution to the literature is the use of state-of-the-art gravity estimates as a basis to assess the 'pot of gold' of a comprehensive peace settlement for MENA. The gravity estimates provide the basis for two straight forward approaches to assess the trade potential that MENA countries miss due to the political conflict: (i) a comparison of observed trade flows and predicted trade flows, and (ii) a counterfactual based on model outcomes that focusses on MENA. These assessments are of course not to be treated as exact predictions but rather as the order of magnitude of the increase of trade that would be enabled by a peace settlement and a normalization of political and economic relationships in the MENA region.

The structure of this paper is as follows. Section 2 offers an overview of the literature based on the systematic review with a focus on method. Section 3 discusses data sources and research strategy. Section 4 provides the replication and builds the state-of-the-art gravity model, and reports on simulations of the 'pot-of-gold' enabling us to arrive at a rough ballpark number. Section 5 draws conclusions.

## 2 Systematic review

This research is part of a larger project covering the role the bilateral economic relations, specifically the trade between Palestine and Israel, in the grand search for peace settlement, with the 1994 Paris Protocol, part of the 1993 Oslo-I Accord and its metamorphosis being the focal point for these relations. We apply three methods to collect primary studies. The first method is the collection of secondary literature based on private knowledge and unofficial conversations (with friends and former colleagues). This helped us to collect all so-called Aix reports (10 in total - published and unpublished) and the Paltrade and The Peres Center for Peace (2006) report *The Untapped Potential: Palestinian-Israeli Economic Relations: Policy Options and Recommendations*. Added to this, was a search of complementary reports dealing with the region and economic trade relations of World Bank (19 papers), UNCTAD (14 papers), reports to the Ad Hoc Liaison Committee (AHLC a.k.a. donor countries) (12 papers), and other international and local research bodies including Bank of Israel, Tony Blair Institute for Global Change, and Palestine Economic Policy Research Institute (MAS). These papers were obtained via websites or online library system. Some of these reports were specifically tracked following local news publications and/or other unofficial meetings with people from the region working in the field. The secondary resources collection of the studies was complemented by a Google Scholar search using terms including 'Economic relations' 'Israel', 'Palestine' 'Occupied Territories' 'the economic agreement Palestine-Israel' and 'Oslo Accords'. The collection of all secondary data started early 2015 and continued until October 2022.[5]

The second method to identify potential studies are interviews conducted with experts and participants to informal and formal negotiations. This option to use experts and witnesses to identify papers has as far as we know not been used in a systematic review before. Not every topic will lend itself for this kind of involvement and of course it is costly and time consuming. In our case the option occurred thanks to the fact that the project already was designed to have interviews and a review of empirical studies. In a case, such as the one we are studying, where negotiations are ongoing and/or political sensitivities may prohibit publication, the inclusion of nonpublished work is highly relevant. The second method helped us to identify missing studies by both directly referring to specific studies or people that have been conducting recent relevant studies, as well as sometimes providing us with personal copies of 'non-papers' (typically unofficial papers that are written for informal discussion). The interviews were conducted between January 2017 and August 2021, with 26 interviews in total.[6] Some of these papers and reports are only available in Arabic or Hebrew, thus were by default excluded from the systematic review. The other English papers

[5] Project papers were also presented at The European Neighbourhood Policy Summer School (June 2016), the 17th Development Dialogue (online conference, July 2021) and the European Trade Study Group's 23rd annual conference, Groningen September 2022, also with the aim of getting suggestions of studies that we had missed.

[6] These interviews were performed with 8 Palestinians, 16 Israeli and 2 Internationals.

and studies provided through the interviews were analysed while sometimes leading to other references they address. Also, prominent published literature written by the interviewees themselves was reviewed to complement the relevant data mapping. This occasionally led to approaching the interviewees again with queries about other non-papers mentioned in the literature and for their assistance in tracking these non-papers. The interviews helped to collect 20 non-papers and reports, 5 studies out of these are only available in Arabic/Hebrew. The other 15 are comprised of 4 unpublished white papers; and an unpublished study funded by the EU from 1999 on the economic relations in the region, including 9 articles and 2 appendixed studies.

In 2021 we decided to complement the collection of both primary and secondary studies that have been collected up to this point in time with an extensive systematic search for empirical studies. This is the third (partially overlapping) method to identify primary studies of potential relevance. We performed a search based on Google Scholar as this source also covers books, reports, and the 'grey' literature (working and conference papers, pre-pubs etc.). The search included English Language publications only and included combinations of key words that provided geographical scope ('Israel'; Palestine', 'West Bank', 'Gaza', 'Occupied Territories'), topical scope ('trade', 'export', 'import', 'trade potential') and methodological scope ('empirical', 'model', 'estimat*' 'gravity'). Based on title and abstract (and when unclear followed by reading the introduction and the conclusion) we excluded non-economic papers. We also followed up on the reference sections of identified papers (backward check) and checked in Google Scholar for papers quoting the identified primary studies (forward check) and then repeated this process for the thus identified papers. After two iterations this process was exhausted, that is: no new papers could be identified.

The total number of studies thus identified for potential inclusion is 118. We read these studies in detail, and based on this reading, we excluded 99 studies (84%). Appendix 2 provides an overview of the excluded studies and the reasons for exclusion, and Figure 2 provides an overview of the included and excluded studies by type of publication.

All in all, we identified 19 papers that used the gravity model, reported the empirical estimates, and aimed at analysing the causes of low levels of bilateral trade for (selections of) MENA countries.[7] Excel files were designed and used for double coded manual data extraction.

[7] Initially we identified 29 primary studies of which after careful consideration 3 were duplicates (pre-publications, conference papers, working papers, dated drafts, etc.) where the gravity results were identical. As a rule, we have included only the last version, typically published in a journal; 6 were grounded in gravity but did not apply a trade matrix, only estimations of import and export demand for one selected country based on its trade flows with many countries; and 1 was a duplication of one of these 6.

**Figure 2**
**Identified studies by quality of publication**


## 2.1 Some bibliometric details

The earliest identified primary paper is a book chapter in Arad, Hirsch and Tovias (1983: 87-116); the most recent paper is a 2022 peer reviewed journal article (Sekkat 2022). The median study was published in 2009; Figure 1 illustrates an increasing trend in the frequency of included primary studies by year of publication. Peer reviewed studies appeared in 6 articles with journals listed by Web of Science; 2 book chapters appear with MacMillan and 1 with Routledge. Non-peer reviewed publications consisted of reports by World Bank and Aix Group and 6 working papers. The 19 studies generated 758 citations based on Google Scholar, with Arnon et al. (1996, 1997) receiving a total of 30%, followed by Wolde and Bhattacharya (2010) with 20% of the citations; the rest of the studies received (far) less than 100 citations each.[8] In order to provide systematic elaborations of the identified studies, in section 2.2 we first provide a discussion of methodological developments in the estimation of the gravity models. Section 2.3 discusses stylized facts and provides an overview of strategies to infer the causes of low levels of bilateral intra-MENA trade and ways to assess trade potential. Section 2.4 gives an overview of the excluded empirical studies.

[8] The number of Google Scholar citations was determined November 8, 2022.

**Table 1**
**Identified gravity model-based studies (characteristics and key findings)**

| Study | | N | Period | Estimation technique | Dependent variable | Key findings (reported values are converted to US$ at 2020 prices with GDP deflator) |
|---|---|---|---|---|---|---|
| 1 | Arad et al. 1983 | ~250 (99 product categories (24 OECD countries) | NR | NR | BI | Trade potential for bilateral trade for Israel US$ 19 million and Egypt US$ 11 million, that is: roughly a doubling of trade |
| 2 | World Bank 1993 | 95 countries | 1989 | ML | BE, BI | Israel-Palestina trade above normal level. Predicted changes in import shares of Arab Countries from 2.6 to 9.7% Palestinia 30.9 to 68.9%) |
| 3 | Arnon et al. 1996 | 250 (16 countries) | 1991 | OLS | BE, BI | Trade potential Palestina US$0.9 bn, Jordan US$ 0.4 bn and Israel US$ 0.5 bn. West Bank exports much more to Israel than predicted |
| 4 | Ekholm et al. 1996 | 24 (13 OECD and 11 outward oriented developing countries) | 1989, 1990, 1992 | OLS | BE, BI | Simulations for 12 MENA countries based on gravity estimates for the 'normal' volume of trade in the absence of political conflict and trade barriers 3 to 5 fold increase in Israelian exports (integration scenario ads some 10%) |
| 5 | Arnon et al. 1997 | 35 countries | NR | NR | BE, BI | Also calculates trade potential for 1986 (in addition to Arnon et a; 1996). In 1986 Israel's trade was above potential; 1992 trade potential of US$ 0.3bln |
| 6 | Miniesy et al. 2003 | 27291 (186 countries) | 1970-1992 | NR | BT | Intra-MENA trade reaches only 45% of its potential |
| 7 | Tovias et al. 2007 | NR | 1995-2001 | NR | BE, BI | Total inter-regional trade potential: exports US$7.5-9.8 billion (observed $3.5-5.4 billion). 3- fold increase of Israeli exports |
| 8 | Scorbureanu 2007 | 117 (10 trade couples) | 1995-2005 | Unbalanced panel, GLS, RE | BE, BI | focusses on impact of lacking cross border infrastructure (export elasticity concerning infrastructure +5; import elasticity -2). |
| 9 | Nugent et al. 2010 | 10 countries | 1970-2000 (5 years interval) | OLS | BE | For Jordan 75% increase in exports ("positive for 'most' MENA countries") |
| 10 | Wolde and Bhattachary a 2010 | 7,832 (93 countries) | 2005-2007 (period average) | PanelTobit | BE, BI | Estimated MENA dummy coefficient for exports -2.0 to -2.6 and for imports -0.1 to -0.2) but not significant if surveys on border procedures are used as additional explanatory variable. |
| 11 | Bader et al. 2012 | 234,597 (173 countries) | 1948-1999 | Panel FE | BT | Geographical factors are more critical for intra-MENA trade. |
| 12 | World Bank 2014 | 8,583 (182 countries) | 2009-2011 (average) | OLS, FE | BS | Especially Egypt and Turkey are under-trading intra-MENA; Israeli trade with Jordan, Egypt and Lebanon below potential. |

| Study | | N | Period | Estimation technique | Dependent variable | Key findings (reported values are converted to US$ at 2020 prices with GDP deflator) |
|---|---|---|---|---|---|---|
| 13 | Karam and Zaki 2016 | 222,256 (27 sectors) | 1980-2006 | PPML | Manuf. BE | Focuses on trade impact of state and non-state conflict. At the macro level a conflict is equivalent to a tariff of 5% at the sectoral level tariff equivalents range from 4% to 65%) |
| | | (20 countries) | 1960-2013 | PPML FE, panel | BE, BI | |
| 14 | Didier 2017 | 129,3064 (approximately 200 countries) | 1948-2012 | Panel FE, PPML, lags | BE, BI | Focus on trade impact of shocks during the Arab-Israeli conflict. The nature of Arab-Israeli peace agreements strongly and heterogeneously influences Israeli trade with trading partners. |
| 15 | Roesmara-Donna et al. 2018 | 8,960 (16 MENA countries) | 1988-2015 | Panel FE, RE, IV, PPML | BE | Democracy has a positive effect on trade in MENA Region, with dominant effect on partner country than home country. Democracy positively affects (3-4%) of trade in MENA region, especially democracy in partner countries. |
| 16 | Karam and Zaki 2019 | 21 MENA countries (99 sectors) | 1995-2014 | Panel PPML | BT | Institutions in MENA countries are not well developed and provide a significant barrier to intra-MENA trade. |
| | | 21 | 1995-2014 | Panel PPML | BS | Exporters institutional gap significantly reduces exports also after controlling for endogeneity. |
| 17 | Gupta et al. 2019 | 43,013 (164 countries) | 1985-2013 | Panel, FE, RE, HT, PPML | BT | Focusses on impact of the Geo-Political Risk indexes an elasticity of trade to the GPR of − 0.12 and − 0.18. |
| 18 | Martínez-Zarzoso and Márquez-Ramos 2019 | 19 MENA (with 189 trading partner countries, and the full sample) | 1996-2013 | PPML Panel FE | BE | Income elasticities of MENA exporters are considerably lower than the elasticity of the average exporter and common border is not statistically significant. Common language effect is considerably higher. Voice and accountability, and rule of law show a consistent negative (positive) and statistically significant effect on exports (importers) |
| 19 | Sekkat 2022 | 18 MENA (with 110 non-Mena trading partners) | 1970-2015 | OLS, Tobit, PPML | BI | For the MENA countries import restriction is the only commercial sanction that is effective in reducing trade; The low bilateral trade in the MENA region is affected by the low rate of democracy in the region. |

Notes: BE Bilateral Exports, BI Bilateral Imports, BT Bilateral Trade, FE Fixed Effects, HT Hausman–Taylor, IV Instrument variables, ML Maximum likelihood, NR Nor reported, OLS Ordinary Least Squares, PPML Poisson Pseudo-Maximum Likelihood, RE Random Effects.

## 2.2 Observations on methods

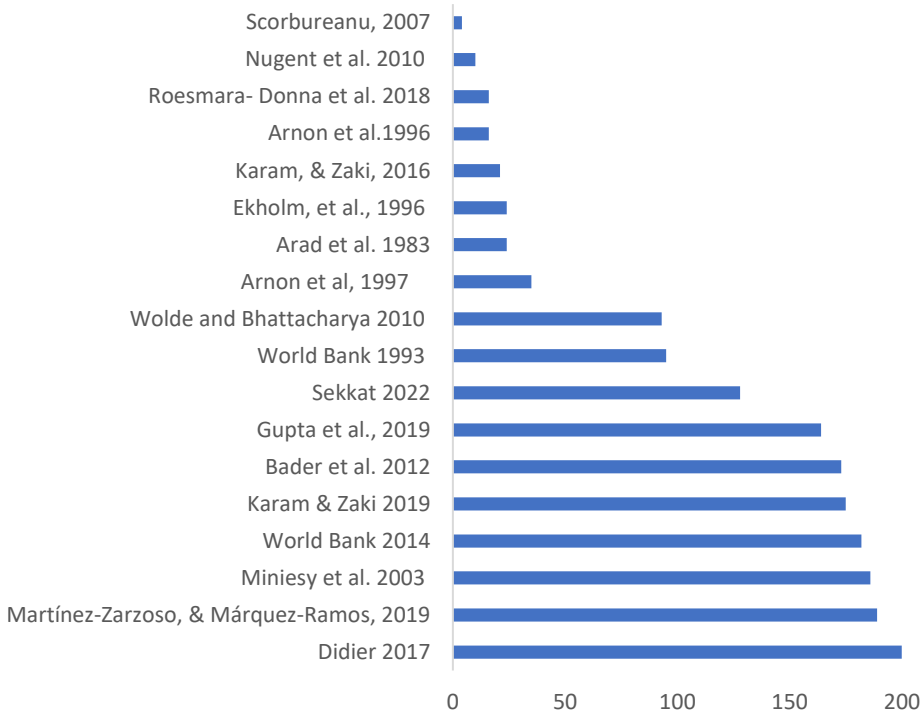
As could be expected from the fact that we cover 39 years of research we encounter a lot of heterogeneity with respect to reporting standards, methodology, and data. Reporting standards over time increased significantly and have become more accessible. We note, for example, that about a quarter of the studies do not specifically report the estimation method (although it could be deduced from the year of publication, the cross-section nature of the study and the common standards of gravity analysis at the time of publication that three of these studies probably used OLS). One sobering but important conclusion is therefore that it would not be possible to do a meta-analysis since elementary statistics are not always reported. One (peer-reviewed) study, for example, did not even report an indication of the sample size.

One of the problems with gravity models for long has been the treatment of non-trade (zero flows) due to the multiplicative formulation of the gravity model that was therefore estimated in logarithmic format. The log of zero does not exist and zero trade flows were often completely dropped meaning that the estimated model could not consider the information contained in the zero trade flows. Since the topic of this paper is directly related to non-trade this is not a feasible solution. As an alternative to omitting zero flows, the trade literature often applied a strategy replacing zero flows with small arbitrary values. Also, alternative estimators such as Tobit were introduced to fix the zero problem (in our sample Wolde and Bhattacharya 2010). The first study in our sample to use state-of-the art gravity modelling with Poisson Pseudo Maximum Likelihood (PPML)[9] is Karam and Zaki (2016).

A second main problem – originally mainly related to data collection and (access to) computing power – was that studies by and large worked with cross-section estimation. If longer periods were analysed, typically this was done comparing parameters estimated with cross-sections at different moments in time. The first balanced panel in our sample is Miniesy et al. (2003). The availability of dedicated data sets such as CEPII (Head and Mayer 2014; available at cepii.fr) and data set sharing by (in our sample) Feenstra et al. (1997), Glick and Rose (2016), Head et al. (2010), and Rose (2004), facilitated large sample time series analysis. Indeed, the combination of readily available data and technological progress (including the Internet) nowadays enable researchers to do more at home than was possible with the mainframes of the 1980s. Figure 3 below provides an overview of the number of exporting countries per study.

[9] See Santos Silva and Tenreyro (2006) who also emphasize the need to estimate the gravity equation in multiplicative form rather than using logarithmic transformation even in the absence of the zero trade flow problem. See Karam and Zaki (2019: 66-67) for a discussion in the context of MENA trade flows.

**Figure 3**
**Number of countries included in the identified gravity model studies 1983-2022**




The inclusion of directional time-varying fixed-effects in state-of-the-art applications control for observable and unobservable time-varying covariates. In addition to controlling for any other potential observable and unobservable factors that vary over time and may influence trade flow, according to Anderson and van Wincoop (2003), controlling for exporter-time and importer-time fixed-effects for each exporter and importer, enables researchers to consider (changes in) multilateral resistance.

Our goals with this paper are modest. We want to replicate the seminal research by Arnon, Spivak and Weinblatt (1996, 1997) using state-of-the-art estimation techniques, extend their sample and update their findings for recent years so as to provide an empirical economic perspective of the potential trade gains that could be associated with an end to the conflict.

## 2.3 Stylized facts and trade potential

The studies published over half a century since Linnemann's (1966) observation that trade in the region is at an abnormal low level empirically substantiate that trade in the Middle East remains below potential. As illustrated in Table 1, estimates of the trade gap indicate that a 2-to-5-fold trade increase could be expected both for individual countries and for MENA. A constant issue in the studies is their concern about the large share of zero trade flows. Several reasons

are suggested, prime of which are the political difficulties (Ekholm et al. 1996, Karam and Zaki 2016, Didier 2017), of course, but also the lack of cross border trade infrastructures (Scorbureanu 2007), the specific location of Israel and Palestine between potential MENA trade partners, political systems (Roesmara-Donna et al. 2018) and lacking or substandard institutions including democratic standards are indicated (Martínez-Zarzoso and Márquez-Ramos 2019, Karam and Zaki, 2019, Sekkat 2022) as potential causes for low levels of trade. True as this may be the studies also show that the traditional gravity variables exert a strong influence on trade in the region. Indeed, Bader et al. (2012) argue that geographical factors are more critical for MENA countries with stronger (more negative) distance effects and lower trade stimulation of common borders.

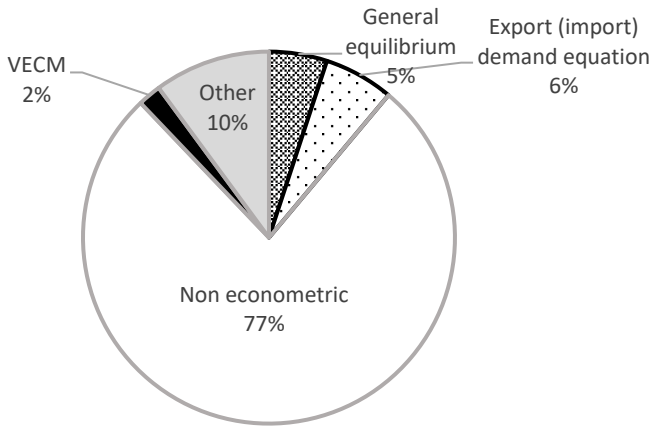
A great many methods have been used to arrive at estimates of the trade potential. Quite some papers compare predictions and observations of the gravity model. A logical problem is that the assumption that too low trade could adjust upward is that in a gravity setting this requires that other trade that is too high will have to be adjusted downward. Sometimes the estimated parameters of a gravity model for a specific sample are used in combination with observations for Palestine and Israel explanatory variables in order to predict what their trade flows could be under normal conditions. This would seem to suffer from the fallacy of hasty generalization: it is an out of sample prediction that assumes that coefficients estimated for a fundamentally different group of countries could be applicable. Finally, gravity models are also used to directly estimate specific parameter values, for example for the creation of a Free Trade Area (FTA) or dummy variables that measure the extent to which trade is below the normal level (that is: after controlling for other gravity variables, such as GDP, population, language, and geographical variables, including distance, common borders, being landlocked or an island, etc.). All in all, it is important to realize that trade potential estimates are at best snapshots, as trade potential is influenced by economic development of the trade partners and estimates based on more recent data can thus be expected to yield higher estimates as a result of increasing GDPs. Moreover, another point hardly ever noted in this literature is that developments outside and exogenous to MENA can have an impact on intra-MENA trade when multilateral trade resistance outside MENA changes. The upshot is not that gravity analysis is futile, but that interpretation needs to be cautious. From this perspective it is important to adopt a good practice that is suggested by the many studies that provide ranges of estimates based on different approaches.

## 2.4 A selection of findings from excluded studies

The 99 excluded studies have been cited 726 times (average 8 citations per study; median 2) as compared to 758 citations for the 19 included studies (average 42; median 29). As illustrated in Figure 2, the vast majority of the excluded studies consists of reports (69%), only a handful of articles registered in the Web of Science, and 20 articles and book chapters that are not covered by Web of Science. Figure 4 characterizes the excluded studies by method. The majority of these studies do not report original econometric findings (although the empirical

literature is often discussed); in the remainder of this section, we focus on the primary studies that report econometric findings.

**Figure 4**
**Excluded studies by method (N=99)**




Note: 'Other' includes macro-econometric, input-output, and partial equilibrium models, cost benefit analysis, growth equations, SURE, GMM and household studies.

The excluded econometric studies are characterized by substantial methodological heterogeneity. Typically, the excluded studies analyse the problem through the lens of an individual country, for example using an input-output analysis (Niksic et al. 2014), a macroeconmetric model (Makhhol et al. 2004) or a general equilibrium model (Astrup and Dessus 2005, Botta 2010, Missaglia and Valensisi 2010, 2014). The same lens of an individual country is deployed in 6 excluded studies that, although grounded in gravity theory and therefore labelled as a gravity model by the authors of the primary studies, provided estimates of import and export demand for one country only based on its trade flows with many countries (1 x N), such as Hashai (2004), Bank of Israel (2014), Al-Majali and Adayleh (2018), El-Jafari (1997), Temurov and Kilicaslan (2016) and Saqfalhait et al. (2011).[10]

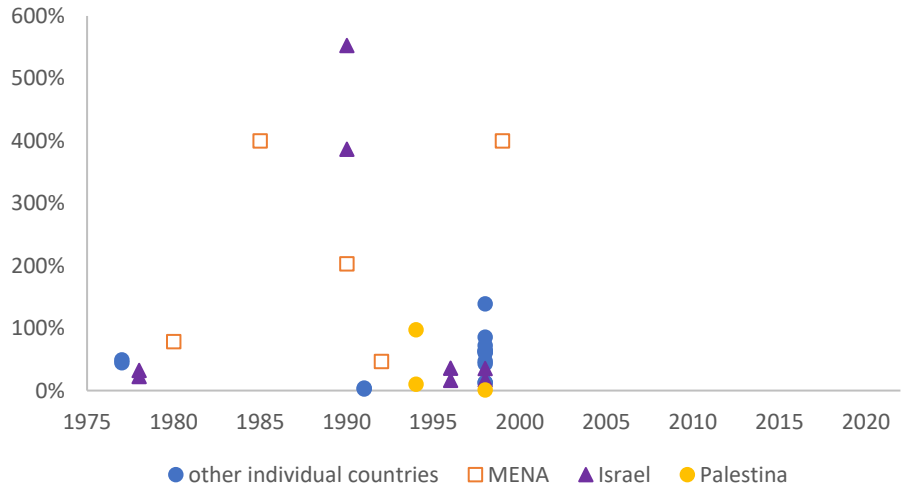
Despite the methodological heterogeneity the econometric studies support the stylized fact that bilateral trade is below potential. This consensus is especially important because it provides circumstantial evidence for the robustness of the finding in the gravity literature that we discussed in the previous section.

[10] In other words, we only included in Table 1 studies that estimated a trade matrix (N x N). We will, however, also include the import and export demand models when we discuss the impact measure in the next section.

## 2.5 Trade potential estimates

This section summarizes and analyses estimates of trade potential in percent of observed trade as reported in the primary studies. Our sample consists of the 19 gravity studies reported in Table 1 and the 6 of the previously excluded studies that provided estimates of import and export demand for one country only based on its trade flows with many countries[11] Only 9 of the 25 studies report trade potential in percent of trade or provide sufficient details to calculate this measure.[12] Typically, trade potential calculations require a comparison between (changes in) predicted and observed trade flows or an estimated parameter that can be used to calculate the difference between predicted and observed trade flows. If a (change in) predicted flow was reported but the observed flow was not, we readily derived the observation from the data sources that we discuss in Section 3.1. The primary studies cover 7 individual countries[13] and the MENA region as a whole. One interesting observation is that recent trade potential estimates do not exist. The last study reporting on trade potential is Bader et al. (2012) that provide an analysis for the year 1999. To the best of our knowledge no study has yet covered trade potential in the context of the Middle East peace process in the current Millennium.

**Figure 5**
**Reported estimates of trade potential in percent of observed trade flow**
**(year is the year that has been analysed in the primary study)**




Sources: Arad et al. 1983, Arnon et al.1996, Arad et al. 1983, Arad et al. 1983, Bader et al. 2012, Ekholm, et al., 1996, El-Jafari 1997, Hashai 2004, Miniesy et al. 2003, Tovias, et al. 2007 and Wolde and Bhattacharya 2010.

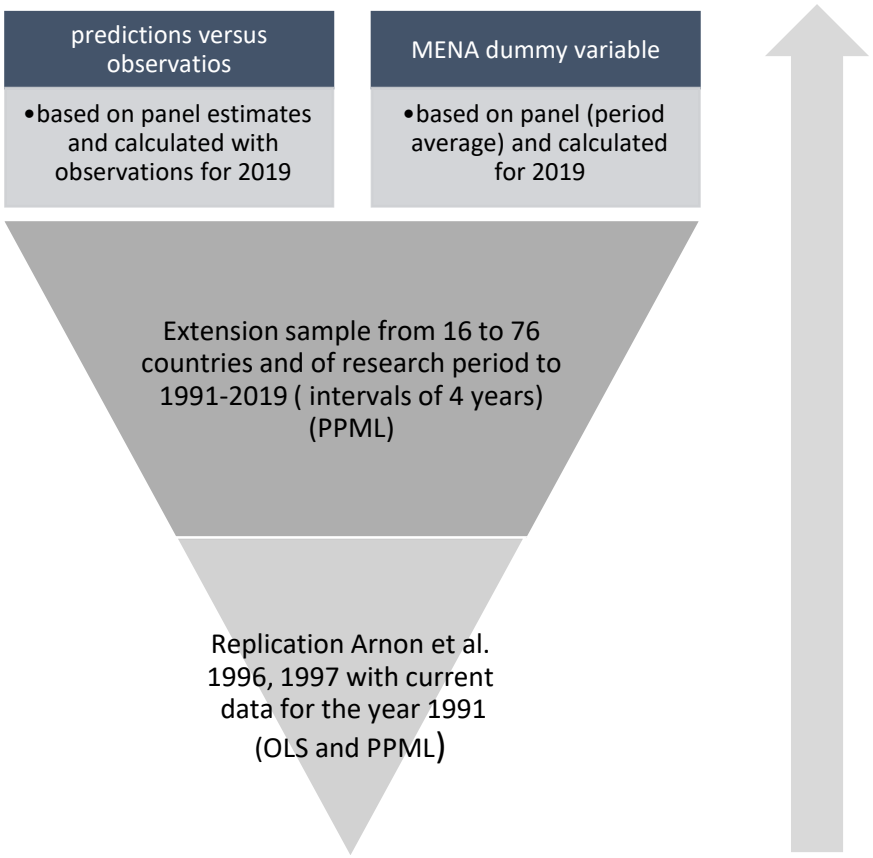
[11] Hashai (2004), Bank of Israel (2014), Al-Majali et al. (2018), El-Jafari (1997), Temurov and Kilicaslan (2016) and Saqfalhait et al. (2011).
[12] For example, World Bank (2014) provides only a graphical analysis. Some studies describe results only verbally.
[13] Egypt, Israel, Jordan, Lebanon, Palestine, Syria, and Turkey.

The range of estimates is considerable with a standard deviation of 141%, an average of 108% and a median of 49%. Discarding the study of Ekholm et al. (1996) that produces two of the extreme outliers reduces the standard deviation to 104%, the average to 83% and the median to a comparable 47%. For the individual country estimates the standard deviation is 34% (average 45%; median 44%).

# 3 Research strategy and data

In the empirical analysis we proceed in three steps (Diagram 1). We first replicate the study by Arnon, Spivak and Weinblatt (1996, 1997). As discussed in section 2.1 this research has been most impactful in terms of Google Scholar citations. The next step is to extend and update the sample and estimate a gravity model. We use these estimates in our assessments of trade potential following two rough and ready approaches in order to arrive at a range of estimates of the pot of gold of comprehensive peace settlement.

**Diagram 1**
**Research strategy**




## 3.1 Data

Since this is a replication, we include the variables in the original primary study (Arnon et al. 1996, 1997) with the exception of a country dummy for Jordan that we exclude because this will be covered by the country fixed effects estimates that we report. Observations were obtained from current data sources (as listed in Table 2) and could very well differ from the values used by Arnon et al., who have not given a very detailed description of their data. We collected

data from 1991 (as Arnon et al. analyse this particular year) and end in 2019 for practical reasons because it is the last year before the COVID 19 pandemic that distorted international trade flows significantly.

An important issue is the treatment of zero flows. Our data source reports the size of the bilateral trade flow in a range from 0.001 to US$ 4.2 billion, so small trade flows appear to be reporter and no actual zeros occur in the data set. The issue is how to treat the reported blanks that constitute a quarter of potential trade flows for our sample). It is not clear beforehand if the blanks are true zeros, missing observations or manipulated data.[14] We decided to substitute the blanks by zeros.

**Table 2**
**Data sources**

| Variable | Source | Min | Max | Std | Avg | Med |
|---|---|---|---|---|---|---|
| Exports | CEPII | 0.001 | 4.19+8 | 1.04+7 | 1,703,893 | 44,483 |
| Imports | CEPII | 0.001 | 4.82+8 | 1.05+7 | 1,737,922 | 47,303 |
| GDP | WDI / CEPII | 9.51 | 23.79 | 2.22 | 18.30 | 18.47 |
| Distance [a] | CEPII | 9.05 | 23.78 | 2.25 | 18.29 | 18.47 |
| Common language (dummy) | CEPII | 4.09 | 9.87 | 0.86 | 8.2 | 8.3 |
| RTA (dummy) | CEPII | 0 | 1 | 0.36 | 0.15 | - |
| Lindner effect [b] | GDP and population from CEPII | 0 | 1 | 0.44 | 0.25 | - |
| MENA (dummy) | See main text | 0 | 1 | 0.24 | 0.43 | - |

Notes: a Distance in kilometres (kms) between most populated cities.

b According to Linder's trade theory the degree of similarity between the growth domestic product or the per capita income levels defines trading pattern.[15] That means similar countries do more trade as compared to dissimilar countries. We captured this variable through the square of the difference in the levels of per capita GDP between exporting (i) and importing (j) countries. In this case, the Linder hypothesis suggests a negative and statistically significant coefficient as a smaller gap in per capita GDP between i and j countries associated with a greater volume of trade will be and vice versa.

## 3.2 Country sample

The countries selected for the extension of the sample from the original 16 to 76 was made based on the ambition to include all MENA region countries. The MENA is a region defined by geographical more than religious, social, cultural, or any other aspect. Yet there is no official definition of MENA, nor of the

[14] It is common that trade statistics are distorted in conflict situations and/or to hide strategically or politically sensitive information (van Bergeijk 1995).
[15] See Linder (1961).

countries included in it.[16] This research uses the widest definition of the MENA region based on definitions of the World Bank,[17] UNSTATS,[18] World Atlas,[19] and IMF[20] combined, thus a total of 37 countries.[21]

Furthermore, G20 countries, excluding the EU itself, and all other EU Member State countries, were added bringing the sample to total size of 76 countries. The decision to include all EU Member States derives from the high volume of both the EU and its Member States trade with Israel.

[16] The United Nations Regional Groups e.g., African; Asia and Pacific; Eastern European; Latin American and Caribbean (GRULAC); Western European and Others (WEOG) (see: https://www.un.org/dgacm/en/content/regional-groups).

[17] https://data.worldbank.org/country/ZQ accessed 14 October 2021.

[18] https://unstats-un-org.eur.idm.oclc.org/unsd/methodology/m49/, accessed 14 October 2021.

[19] https://www.worldatlas.com/articles/what-are-the-mena-countries.html, accessed 14 October 2021.

[20] Wolde H. and Bhattacharya, M.R. (2010) *Constraints on Trade in the MENA Region*. International Monetary Fund.; Davoodi, M.H.R. and Abed, M.G.T. (2003) *Challenges of growth and globalization in the Middle East and North Africa*. International Monetary Fund. Both papers consider Pakistan in their analysis of MENA region countries. Wolde and Bhattacharya (2010) conduct gravity analysis of trade performance in the MENA region with selection of 8 countries in the MENA region and 88 countries in total based on availability of criteria data. As such Pakistan is excluded from the model though addressed in the general discussion of the region.

[21] As there are no data available for Western Sahara it was excluded from the list of MENA countries.

# 4 Findings

Section 4.1 provides a replication in three steps. We start with an OLS estimate for 16 countries. We do not have the original data set and use the data collected as discussed in section 3.1. The second step provides a test of the impact of using OLS: we apply PPML to include the zero trade flows in the analysis. The third step investigates the impact of the relatively small sample that we increase from 16 to 76 countries. Next, we extend the research period from a cross section for 1991 to a panel for 1991-2019 (4-year interval periods).[22]

## 4.1 Replication

Table 3 presents the regression results of Arnon et al. (1996) and our replication. Columns (1) and (2) reproduce the results reported in the primary study for exports and imports, respectively. The primary study does not report the number of observations *N* and the *t*-statistic for the regional trade agreement dummy is reported as '(-)'.[23] The *t*-value for the constant term for the regression for imports is reported to be positive, but that is an obvious typo.

Columns (3) and (4) report our replication. The explanatory power of the original and the replication is similar (about 2/3 of the variation of the bilateral trade flows is explained). Original and replication agree on the signs of the estimated coefficients for exporter and importer GDP, distance and regional trade agreement, but disagree on the dummy for common language (negative and insignificant in the replication) and the Linder effect which in contrast to the original study is positive and highly significant in the replication. Distance comes out stronger in the replication. For regional trade agreements the sign is similar, while the size is smaller in the replication. Since the original does not report a *t*-value we cannot assess changes in the level of significance for this variable.

Table 4 reports the results if we make two innovations to the original design. For purpose of reference, we report the results of the replication in columns (1) and (2) of Table 4. Note that we report standard errors in Table 4, rather than the t-values reported in Table 3 (the original study reported t-values). First, in columns (3) and (4) we use PPML, an estimation method not yet available at the time ASW published their research, bringing in the information contained in the 39 zero export flows and 36 zero import flows. Second, we extend the country sample from 16 to 76 in column (5) and (6). This extended replication produces satisfactory results. The signs found in the replication confirm the original findings and in line with theoretical expectations. Typically, the replication finds more significant coefficients partly due to the larger number of observations. The main difference with the original study is in terms of significance. The Linder effect is insignificant in the replication; distance and RTA are significant.

[22] We have also checked for possible reverse causality and non-linearity in a model with lagged explanatory variables. Results were to a large extent similar.
[23] Neither issue is discussed in the primary study.

On balance the replication is sufficiently successful to use the replication as a basis for further investigation.

**Table 3**
**Arnon et al. (1996) Replication and comparison - Estimating the effects of Regional Trade Agreements OLS, 16 countries, 1991**

| | Arnon, Spivak, and Weinblatt (1996) ***Original*** | | This study ***Replication*** | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Method | OLS | OLS | OLS | OLS |
| Trade flow | Exports | Imports | Exports | Imports |
| Exporter GDP (ln) | 1.087 | 0.813 | 1.025 | 0.863 |
| | (19.5) | (13.6) | (11.4) | (10.0) |
| Importer GDP (ln) | 0.843 | 1.055 | 0.671 | 0.698 |
| | (15.1) | (17.7) | (8.9) | (8.4) |
| Distance (ln) | -0.24 | -0.20 | -0.96 | -0.77 |
| | (-1.7) | (-1.4) | (-4.7) | (-3.3) |
| Common language (dummy) | 1.84 | 1.99 | -0.10 | -0.42 |
| | (4.4) | (4.5) | (-0.2) | (-0.9) |
| Regional trade agreement (dummy) | 1.5 | 1.5 | 0.62 | 0.56 |
| | (-) | (-) | (1.9) | (1.8) |
| Linder effect | -0.034 | -0.027 | 0.030 | 0.027 |
| | (-2.2) | (-1.6) | (4.4) | (4.6) |
| Constant term | -15.88 | -15.43 | -12.53 | -11.29 |
| | (-14.0) | (12.7) | (-5.1) | (-3.7) |
| *N* | n/a | n/a | 201 | 204 |
| $R^2$ | 0.724 | 0.683 | 0.605 | 0.608 |

Note: *t* statistics in parentheses

**Table 4**
**Arnon et al. (1996) replication and extension for the year 1991 (OLS, PPML 16 and 76 countries)**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Estimation method | OLS | OLS | PPML | PPML | PPML | PPML |
| Number of countries | 16 | 16 | 16 | 16 | 76 | 76 |
| Trade flow | Exports | Imports | Exports | Imports | Exports | Imports |
| Exporter GDP (ln) | 1.03** | 0.86** | 0.76** | 0.77** | 0.70*** | 0.92*** |
| | (0.09) | (0.09) | (0.13) | (0.05) | (0.06) | (0.03) |
| Importer GDP (ln) | 0.67** | 0.70** | 0.89** | 0.51** | 0.92*** | 0.57*** |
| | (0.08) | (0.08) | (0.05) | (0.11) | (0.03) | (0.06) |
| Distance (ln) | -0.96** | -0.77** | -0.36** | -0.28** | -0.54*** | -0.52*** |
| | (0.20) | (0.23) | (0.11) | (0.09) | (0.06) | (0.06) |
| Common language (dummy) | -0.10 | -0.42 | -0.11 | -0.43 | 0.24 | 0.20 |
| | (0.42) | (0.45) | (0.30) | (0.32) | (0.16) | (0.15) |
| Regional trade agreement (dummy) | 0.62+ | 0.56+ | 0.78** | 0.26 | 0.74*** | 0.56*** |
| | (0.33) | (0.32) | (0.21) | (0.22) | (0.13) | (0.12) |
| Linder effect | 0.03** | 0.03** | 0.01 | -0.00 | 0.012** | 0.003 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.004) | (0.01) |
| Constant term | -12.5** | -11.3** | -15.8** | -7.57** | -13.47 | -10.70 |
| | (2.4)** | (3.1) | (3.2) | (2.4) | (1.54) | (1.3) |
| N | 201 | 204 | 240 | 240 | 4254 | 4254 |
| $R^2$ | 0.61 | 0.61 | 0.95 | 0.88 | 0.88 | 0.85 |
| Adjusted $R^2$ | 0.14 | 0.14 | 0.19 | 0.16 | 0.31 | 0.25 |

Note: Standard errors in parentheses
+ $p < 0.10$, * $p < .05$, ** $p < .01$.

## 4.2 Panel estimates

Table 5 presents the revisited model estimated for 76 countries with PPML and panel data for 1991-2019 in 4-year intervals. This clearly extends beyond what usually would be called a replication, because it uses observations that are from the perspective of the original study hidden in the future.

**Table 5**
**Panel PPML 76 countries, 1991-2019**

| | (1) | (2) |
|---|---|---|
| **Trade flow** | **Exports** | **Imports** |
| Exporter GDP (ln) | 0.69** | 0.65** |
| | (0.12) | (0.12) |
| Importer GDP (ln) | 0.57** | 0.56** |
| | (0.11) | (0.11) |
| Distance (ln) | -0.32** | -0.28** |
| | (0.07) | (0.07) |
| Common language (dummy) | 0.59* | 0.56** |
| | (0.15) | (0.14) |
| Regional trade agreement (dummy) | 1.19** | 1.12** |
| | (0.12) | (0.12) |
| Linder effect | 0.01 | 0.01 |
| | (0.01) | (0.01) |
| Constant term | -8.3 | -7.4 |
| | (6.0) | (5.8) |
| *N* | 41207 | 41207 |
| $R^2$ | 0.662 | 0.648 |
| $R^2$-adj | 0.63 | 0.64 |

Note: Standard errors in parentheses
*+ p < 0.10, * p < .05, ** p < .01.*

The findings in Table 5 constitute an extension of the sample, an update and new structure of the data as well as state of the art estimation technology. The aim of the extension along these dimensions is, as stated before, to fill the gap in the literature on trade potential that according to Figure 5 has been based on pre-2000 observations only.

## 4.3 Trade potential

Trade potential estimation is an art rather than a science because many assumptions need to be made and also because the modelling results, while important for any assessment need expert judgement based on the strength and weaknesses of the methods. Rather than providing a point estimate we provide a range so as to reflect the uncertainty that is inherent to trade potential estimation.

As identified during the systematic review we estimate the panel gravity PPML model for exports as well as for imports and use two different methods to arrive at estimates of the trade potential in the MENA countries. This approach generates some ballpark numbers for the 'pot of gold', that is: the potential gain in trade that could be reaped in the hypothetical world where MENA trades like the average country in our sample.

The first method deployed by Minisey et al. (2003) uses gravity forecasts $F_i$ and observations $O_i$ for the MENA countries to estimate the pot of gold (*PoG*)[24]. The forecasts show what trade levels could occur in a world where only the gravity forces are at play. For example, the level of a bilateral trade flow that now due to political constraints is very low or even zero.

$$PoG_1 = \sum_{i \in MENA} (F_i - O_i) \tag{1}$$

We use the model of Table 5 and observations for the explanatory variable for the year 2019 to generate forecasts for exports and imports. We express trade potential in percent of the observed trade flows (equation 2) in order to be able to compare our findings with the studies that we reviewed earlier (Figure 5).

$$\frac{PoG_1 = \sum_{i \in MENA}(F_i - O_i)}{\sum_{i \in MENA} \quad O\_i)]\!]} \tag{2}$$

The results of the simulation amount to 10% of intra MENA trade for the imports model and 21% of intra-MENA trade for the exports model, respectively.

The comparison of observed and predicted trade flows needs to be accompanied by another perspective, that is the question what would have happened if the MENA region had not been more open and not hampered by political constraints on trade. Such a what-if question is called a counterfactual. We, so to say, investigate what a hypothetical world would look like if the distinguishing trade-reducing characteristics of MENA could be lifted.

Following the method developed by van Bergeijk and Oldersma (1990) for the trade distortions in Europe at the eve of the fall of the Iron Curtain and the Berlin Wall we compare two forecasts: the forecast where we set the dummy variable *MENA* equal to 1 with the forecast where *MENA* = 0 (equation 3). Obviously, this is a very rough approximation that, moreover, provides an estimate of what is attainable if all MENA related distortions are lifted. It should thus be understood as an indication of the maximum for the range of the trade potential.

$$PoG_2 = \sum_{i \in MENA}\{F_i\ (MENA = 0) - F_i(MENA = 1)\} \tag{3}$$

[24] Some authors estimate a gravity model for a sample that does not include the country of interest and use the estimated parameters to generate out of sample forecasts for the country of interest.

We now use the model reported in Table 6 (the difference with Table 5 is that we now include a dummy for MENA; see also Miniesy et al. 2003) for an example of such an approach). To calculate trade potential, we compare the predictions to the counterfactual where we set MENA = 0 for all countries. Again, we express the results as a percentage of intra MENA trade (equation 4) in order to make our findings comparable to the studies that we reviewed earlier.

$$PoG_2 = \frac{\sum_{i \in MENA}\{F_i\ (MENA = 0) - F_i(MENA = 1)\}}{\sum_{i \in MENA}\{F_i\ (MENA = 1)\}} \qquad (4)$$

**Table 6**
**Model with MENA dummy**
**Panel PPML 76 countries, 1991-2019**

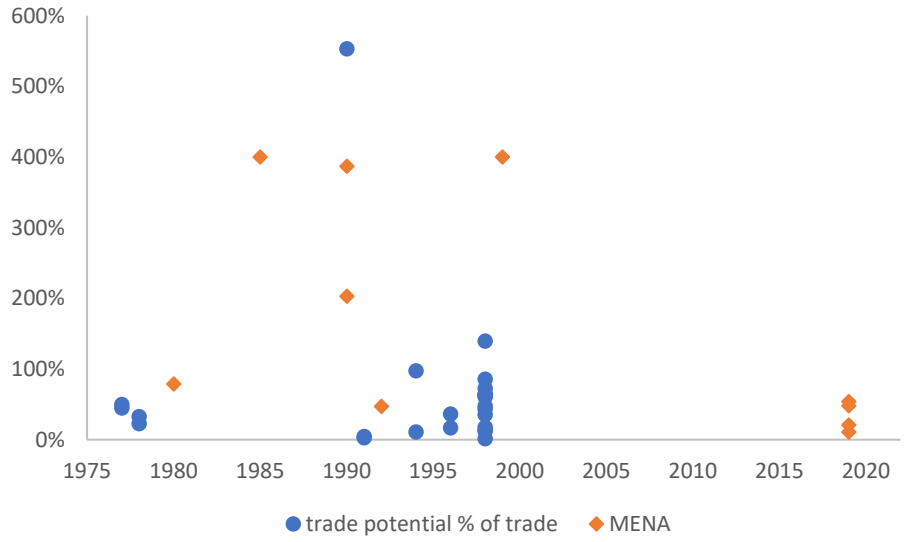
| | (1) | (2) |
|---|---|---|
| **Trade flow** | **Exports** | **Imports** |
| Exporter GDP (ln) | 0.664 | 0.623 |
| | (0.124)** | (0.121)** |
| Imprter GDP (ln) | 0.540 | 0.534 |
| | (0.117)** | (0.113)** |
| Distance (ln) | -0.318 | -0.286 |
| | (0.069)** | (0.070)** |
| Comon language (dummy) | 0.631 | 0.592 |
| | (0.146)** | (0.143)** |
| Regional trade agreement (dummy) | 1.205 | Not1.134 |
| | (0.123)** | (0.122)** |
| MENA (dummy) | -0.431 | -0.391 |
| | (0.253)+ | (0.238) |
| Linder effect | 0.010 | 0.010 |
| | (0.013) | (0.013) |
| Costnt term | -6.845 | -6.048 |
| | (6.154) | (6.000) |
| *N* | 41207 | 41207 |
| r2 | 0.660 | 0.647 |

Note: Standard errors in parentheses
*+ p < 0.10, * p < .05, ** p < .01.*

The results of the simulation amount to 48% of (forecasted) intra MENA trade for the exports model and 54% of intra-MENA trade for the imports model, respectively.

Figure 6 updates Figure 5 by including our findings for the year 2019. The 'pot of gold' in percent of intra MENA trade amounts to 10% to 54% (import based) and 21% to 48% (export based), respectively. These estimates are lower than those reported in the earlier literature. The conclusion, however, is still that an economically significant trade potential exists.

**Figure 6**
**Reported estimates of trade potential in percent of observed trade flow (year is the year that has been analysed in the primary study; 2019 refers to this working paper)**




## 5 Summary and conclusions

This paper followed a multimethod approach consisting of a systematic review (following the PRISMA protocol), a replication of one of the leading studies on trade potential in the region and a panel trade model.

We provided an innovative systematic review that does not only use the standard approach (search engine search) but also identifies primary studies by means of expert interviews. We identify 118 studies of potential relevance and identified best practices regarding gravity model. Moreover, we reviewed estimates on trade potential. In terms of citations reported in Google Scholar a study by Arnon, Spivak and Weinblatt (published in World Economy 1996) is the most influential paper on this topic. The last year for which a trade potential estimate according to our systematic review is available is 1999. This paper fills this gap by providing estimates for the year 2019.

We first replicate, extend, and update the study by Arnon, Spivak and Weinblatt taking best practices as identified by the systematic review into account. Based on the best practice identified in the systematic review we estimate a panel PPML gravity model for 76 countries and the years 1991-2019 inclusive. Next, we use two alternative approaches to estimate the intra MENA trade potential that could be reaped as a consequence of a geopolitically more stable and open Middle East. In the year 2019 this 'pot of gold' in percent of intra MENA trade amounts to 10% to 54% (import based) and 21% to 48% (export based), respectively. These estimates are lower than those reported in the earlier literature. The conclusion is that an economically significant trade potential still exists.

**Structured Summary of the Systematic Review**

*Background:* The low levels of intra-MENA trade have been acknowledged by the literature since the 1960s, with application of the gravity model as the prominent method to calculate the trade flows. The potential of trade flows and their effects on the Arab-Israeli conflict, especially the Palestinian-Israeli one, have been presented following each peace accord signed between Israel and other Arab countries, presenting the untapped potential of an open and peaceful Middle East. Yet the trade flows have been lastly estimated for 1999.

*Objectives:* Identification of (characteristics of) academic and grey literature on the trade potential of a peace settlement. Identification of best practices in econometric appraisal. Identification of trade potential.

*Sources*: Private knowledge and unofficial conversations, Google scholar, and interviews.

*Study eligibility criteria:* Included studies (19 in total) are all those grounded in the gravity theory estimating a trade matrix (N x N). Excluded studies (99 in total) are studies applying all other methods e.g., studies grounded in gravity theory but providing estimates of import and export demand for one country only based on its trade flows with many countries (1 x N); general equilibrium method; export (import) demand equilibrium; as well as studies that do not report original econometric findings.

*Study appraisal*: Review; double coded.

*Synthesis methods*: Narrative, tables and graphs.

*Key findings:* This research establishes the gravity model as the key method for evaluation of trade flows in the MENA region based on a three step, innovative systematic literature review of 118 studies in total, 99 excluded studies and 19 included. Findings: (i) Arnon, Spivak and Weinblatt (1996) is the most influential study in our sample in terms of google scholar citations (ii) no post 1999 estimates of trade potential exist (iii) only one third of the empirical studies provides numbers that inform our overview of trade potential estimates (iv) The range of estimates of is considerable with a standard deviation of 141%, an average of 108% and a median of 49%. For the individual country estimates the standard deviation is 34% (average 45%; median 44%).

*Implications:* There is a need for trade potential estimates for a more recent year. This conclusion is followed up in the working paper using identified best practice estimates (panel PPML gravity) for the year 2019.

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**# Studies selected in the systematic review (listed in Table 1)**

*** Studies mentioned in Appendix 2 (motivation for excluded studies)**


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# APPENDICES

## Appendix 1 PRISMA checklist (Moher et al. 2009)

| Section/topic | Item No. | Checklist Item | Reported in Page No |
|---|---|---|---|
| TITLE | | | |
| Title | 1 | Identify the report as a systematic review, meta-analysis, or both. | Title page; 3 |
| ABSTRACT | | | |
| Structured summary | 2 | Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number. | 2, 24 |
| INTRODUCTION | | | |
| Rationale | 3 | Describe the rationale for the review in the context of what is already known | 3 |
| Objectives | 4 | Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS) | 4-5 |
| METHODS | | | |
| Protocol and registration | 5 | Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number. | No protocol |
| Eligibility criteria | 6 | Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale. | 8-9; Table 1 |
| Information sources | 7 | Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched. | 5-7 |
| Search | 8 | Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated | 5-6; Figure 2 |
| Study selection | 9 | State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis). | 6-7 |
| Data collection process | 10 | Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators. | 10 |
| Data items | 11 | List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made. | 10-11; Figure 3 |
| Risk of bias in individual studies | 12 | Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the | 11-12 |

| | | | |
|---|---|---|---|
| | | study or outcome level), and how this information is to be used in any data synthesis. | |
| Summary measures | 13 | State the principal summary measures (e.g., risk ratio, difference in means). | Figure 4, 5 |
| Synthesis of results | 14 | Describe the methods of handling data and combining results of studies, if done, including measures of consistency | Figure 3, 4, 5 |
| Risk of bias across studies | 15 | Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies) | 6 (including footnote 5) |
| Additional analyses | 16 | Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified. | 14-16; Appendix 3 |
| RESULTS | | | |
| Study selection | 17 | Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram | 12-13; Appendix 2 |
| Study characteristics | 18 | For each study, present characteristics for which data were extracted and provide the citations. | 13; Figure 4; Appendix 3 |
| Risk of bias within studies | 19 | Present data on risk of bias of each study and, if available, any outcome level assessment | 15 |
| Results of individual studies | 20 | For all outcomes considered (benefits or harms), present for each study (a) simple summary data for each intervention group and (b) effect estimates and confidence intervals, ideally with a forest plot | Figure 5 |
| Synthesis of results | 21 | Present results of each meta-analysis done, including confidence intervals and measures of consistency | NA |
| Risk of bias across studies | 22 | Present results of any assessment of risk of bias across studies | NA |
| Additional analysis | 23 | Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression | NA |
| DISCUSSION | | | |
| Summary of evidence | 24 | Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (such as health care providers, users, and policy makers) | 24; Figure 6 |
| Limitations | 25 | Discuss limitations at study and outcome level (such as risk of bias), and at review level (such as incomplete retrieval of identified research, reporting bias) | 6 |
| Conclusions | 26 | Provide a general interpretation of the results in the context of other evidence, and implications for future research. | 23-24 |

# Appendix 2 Excluded studies and motivation

| | Study | Reason for Exclusion |
|---|---|---|
| 1 | Abugamea 2005 | VECM |
| 2 | Abugamea 2008 | SURE |
| 3 | Abugamea 2010 | CA |
| 4 | Albuginea 2019 | VECM |
| 5 | Abu-Qarn 2008 | RL |
| 6 | Agbahey et al. 2022 | AGE |
| 7 | Aix Group 2004 | NE |
| 8 | Aix Group 2005 | NE |
| 9 | Aix Group 2013 | NE |
| 10 | Al-Majali and Adayleh 2018 | GEE, GEI |
| 11 | Arcand and Secretariat, U.N.C.T.A.D. 2020 | MDH |
| 12 | Arnon, 2007 | NE |
| 13 | Arnon, 2013 | NE |
| 14 | Arnon and Bamya 2007 | NE |
| 15 | Arnon and Bamia, 2009 | NE |
| 16 | Arnon and Bamya (eds) (Aix Group) 2010 | NE |
| 17 | Arnon and Bamya (eds) (Aix Group) 2015 | NE |
| 18 | Arnon and Bamya (eds) (Aix Group) 2016 | NE |
| 19 | Arnon and Bamya 2017 | NE |
| 20 | Arnon and Spivak 1996 | NE |
| 21 | Arnon and Weinblatt 2001 | NE |
| 22 | Astrup and Dessus 2005 | CGE |
| 23 | Awadallah (MAS) 2011 | NE |
| 24 | Bank of Israel Research Department 2014 | GEE |
| 25 | Baskin and al-Qaq (Israel/Palestine Center for Research and Information-IPCRI) 1998 | NE |
| 26 | Botta 2010(a) | CGE |
| 27 | Botta 2010(b) | NE |
| 28 | Calì 2015 | LPM |

| | Study | Reason for Exclusion |
|---|---|---|
| 29 | Diwan and Shaban (eds) (MAS and World Bank) 1999 | NE |
| 30 | Economic Cooperation Foundation (ECF) 2013 | NE |
| 31 | El-Jafari 1995 | NE |
| 32 | El-Jafari 1997 | GEE, GEI |
| 33 | Elkhafif and Elagraa (UNCTAD) 2014 | NE |
| 34 | Eltalla 2016 | NE |
| 35 | El-Wassal 2012 | GMM |
| 36 | Fidrmuc et al. 2003 | NE |
| 37 | Gal and Rock 2018 | NE |
| 38 | Halevi 1999 | NE |
| 39 | Hashai 2004 | GEE |
| 40 | Hirschfeld (Economic Cooperation Foundation- ECF) 1992 | NE |
| 41 | Independent Evaluation Group (IEG) World Bank 2010 | NE |
| 42 | International Bank for Reconstruction and Development, World Bank 2017 | NE |
| 43 | Israel/Palestine Center for Research and Information (IPCRI) 2003 | NE |
| 44 | Israel/Palestine Center for Research and Information (IPCRI) 2005 | NE |
| 45 | Kashiwagi 2016 | NE |
| 46 | Kessler 1999 | NE |
| 47 | Khalidi and Taghdisi-Rad (UNCTAD) 2009 | NE |
| 48 | Kubursi and Secretariat, U. N. C. T. A. D. 2019 | NE |
| 49 | Makhool et al. (MAS) 2004 | MX |
| 50 | Ministry of Finance and Planning State of Palestine 2018 | NE |
| 51 | Ministry of National Economy and Applied Research Institute-Jerusalem (ARIJ) 2011 | NE |
| 52 | Missaglia and Valensisi 2010 | CGE |
| 53 | Missaglia and Valensisi 2014 | CGE |
| 54 | Misyef (MAS) 2017 | NE |
| 55 | Naqib and Secretariat, U. N. C. T. A. D. 1996 | NE |
| 56 | Naqib and Secretariat, U. N. C. T. A. D 1998 | NE |
| 57 | Nashashibi et al. 2015 | NE |

| | Study | Reason for Exclusion |
|---|---|---|
| 58 | Niksic et al. (World bank) 2014 | IO |
| 59 | Office of the Quartet (QQ) 2015 | NE |
| 60 | Office of the Quartet (QQ) 2016 | NE |
| 61 | Office of the Quartet Representative Tony Blair (OQR) 2011, April | NE |
| 62 | Office of the Quartet Representative Tony Blair (OQR) 2011, September | NE |
| 63 | Office of the Quartet Representative Tony Blair (OQR) 2012, March | NE |
| 64 | Office of the Quartet Representative Tony Blair (OQR) 2012, September | NE |
| 65 | Office of the Quartet Representative Tony Blair (OQR) 2013, March | NE |
| 66 | Office of the Quartet Representative Tony Blair (OQR) 2013, September | NE |
| 67 | Office of the Quartet Representative Tony Blair (OQR) 2014 | NE |
| 68 | Office of the Quartet Representative Tony Blair (QQR) 2015 | NE |
| 69 | Office of the United Nation Special Coordinator for the Middle East Peace Process (UNSCO) 2020 | NE |
| 70 | Peres Center for Peace and PALTRADE 2006 | NE |
| 71 | Samhouri 2016 | NE |
| 72 | Samour (MAS) 2016 | NE |
| 73 | Saqfalhait et al. 2011 | GEE, GEI |
| 74 | Schiff (World Bank) 2002 | CBA |
| 75 | Secretariat, U. N. C. T. A. D 1994 | NE |
| 76 | Secretariat, U. N. C. T. A. D. 2000 | NE |
| 77 | Secretariat, U. N. C. T. A. D. 2012 | NE |
| 78 | Secretary-General, U. N. and Secretariat, U. N. C. T. A. D. 2018 | NE |
| 79 | Secretary-General, U. N and Secretariat, U. N. C. T. A. D. 2019 | NE |
| 80 | Shawa and Secretariat, U.C.T.A.D. 1998 | NE |
| 81 | Shtayyeh 1998 | NE |
| 82 | The Aix Group 2015 | NE |
| 83 | Temurov and Kilicaslan 2016 | GEE, GEI, OT |
| 84 | Tovias and Al Khouri 2004 | PE |
| 85 | UNCTAD 1997 | NE |
| 86 | UNCTAD 2014 | NE |
| 87 | Vaggi and Baroud 2005 | NE |

| | Study | Reason for Exclusion |
|---|---|---|
| 88 | Valensisi and Missaglia 2010 | NE |
| 89 | World Bank 2002 | NE |
| 90 | World Bank 2003 | NE |
| 91 | World Bank 2004 | NE |
| 92 | World Bank 2014 | NE |
| 93 | World Bank 2015 | NE |
| 94 | World Bank 2018, March | NE |
| 95 | World Bank 2018, September | NE |
| 96 | World Bank Group 2017 | NE |
| 97 | World Bank Group 2019, April | NE |
| 98 | World Bank Group 2019, September | NE |
| 99 | World Bank Group 2021 | NE |

## Appendix 3 Code Book

**Citations**
Google scholar hits; total combined hits if different versions exist (e.g. journal article and working paper)

**Quality**
A top tier WoS
B other WoS
C non WoS article and book chapters
RP Report
WP Working paper

**Reason for exclusion**
AGE Applied General Equilibrium
BS Bilateral services
CA Cointegration analysis
CBA Cost benefit analysis
CGE Computable General Equilibrium
GE Growth equations
GEE Gravity export equation
GIE Gravity import equation
GMM Generalized Methods of Moments
IO Input output analysis
LPM linear probability model (time series)
MDH, Micro data household study
MX Macroeconometric model (Klein)
NE non econometric
NP Non Paper
PE Partial equilibrium
RL Review of literature
SURE Seemingly Uncorrelated Regression Equations
VECM Vector Error Correction Model

## Appendix 4 List of countries in the gravity analysis

**Countries marked @ are included in Arnon et al. (1996)**

Afghanistan
Algeria
Argentina
Armenia
Australia
Austria
Azerbaijan
Bahrain
Belgium
Brazil
Bulgaria
Canada
Chad
@China
Comoros
Croatia
Cyprus
Czech Republic
Denmark
Dijbouti
Egypt Arab Rep.
Eritrea
Estonia
@Ethiopia
Finland
France
Georgia
@Germany
Greece
Hungary
@Indea
@Indonesia
@Iran Islamic Rep.
Iraq
Ireland
@Israel
Italy
@Japan
@Jordan
Kuwait
Latvia
Lebanon
Libya
Lithuania
Luxembourg
Mali
Malta
Mauritania
Mexico
Morocco
Netherlands
Niger
Oman
Pakistan
Palestine
Poland
Portugal
Qatar
@Republic of Korea
Romania
Russia
@Saudi Arabia
Slovakia
Slovenia
Somalia
South Africa
Spain
@Sudan
Sweden
@Syria Arab Rep.
Tunisia
@Turkey
United Arab Emirates
United Kingdom
@United States
@Yemen Rep