Trade Facilitation: Bringing Kazakhstan Closer to the EU

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Abstract

Kazakhstan is looking to deepen its political and economic ties with the European Union. This can likely be accomplished by increasing trade between the two entities. And an effective way of boosting trade may be to harmonize and simplify trade procedures – otherwise known as trade facilitation. This paper investigates how the volume of Kazakhstan's exports to the EU is likely to be affected by Kazakhstan pursuing trade facilitation. This paper also estimates how large this effect is likely to be, and simulates the impact on Kazakhstan's exports to the EU given different levels of trade facilitation. The empirical analysis is conducted using a gravity model of international trade, which is estimated using the fixed effect Poisson Pseudo-Maximum-Likelihood (PPML) method. The results indicate that trade facilitation could lead to a substantial increase in the volume of Kazakhstan's annual exports to the EU.

Keywords: *Trade Facilitation, Kazakhstan, Gravity Model, Export Volumes*

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1. Introduction

Kazakhstan is part of the newly created Eurasian Economic Union (EEU)[1] – an entity dominated by the much larger Russian economy. This has, however, has not prevented Kazakhstan from looking to deepen its ties with the European Union (EU). This seemingly contradictory move is part of the country's "multi-vectored" foreign policy, in which it aims to balance its relations with different foreign powers in order to safeguard its sovereignty (Starr, 2014).

An effective way for Kazakhstan to move forward in its relationship with the EU is by increasing its trade with the EU. This has proven fruitful in the past; Kazakhstan and the EU concluded negotiations on an enhanced Partnership and Cooperation Agreement on October 9, 2014, as a result of two decades of growing economic ties (Norling, 2014).

Owing to Kazakhstan's membership of the EEU, and the tense relationship between the EU and Russia, it is unlikely that there will be any tariff reductions between Kazakhstan and the EU. This means that, in order to boost trade, other measures must be taken. One such measure is trade facilitation, which in this paper is defined as improving and simplifying trade procedures.

The literature on trade facilitation emphasizes its economic benefits. Cumbersome trade procedures are a non-tariff barrier to trade that increases the costs of exports and imports. Several empirical studies find that trade facilitation greatly boosts trade flows, particularly in developing countries. It seems likely that Kazakhstan – where it in 2014 cost 5285 USD, and took 79 days, to export a 20-foot container, in

[1] Kazakhstan, Belarus, Russia, Armenia, Kyrgyzstan and Russia are members of the EEU. For more information, see Eurasian Economic Commission (2015).

comparison to 795 USD and 6 days in Denmark (World Bank, 2015a) – would have much to gain from pursuing trade facilitation.

This paper investigates how the volume of Kazakhstan's exports to the EU is likely to be affected by Kazakhstan pursuing trade facilitation. This paper also estimates how large this effect may be. Finally, the effects of various levels of trade facilitation on Kazakhstan's exports to the EU are simulated.

To our knowledge, very few studies (if any) have estimated the effects of trade facilitation for Kazakhstan. This, evidently, also holds true for the effects of trade facilitation upon Kazakhstan's trade with the EU. Our hope is that this paper will help inform decision makers when contemplating which policies to pursue.

First, an overview is given of the concept of trade facilitation, how it can be measured, the effects of trade facilitation in economic theory, and of the state of trade facilitation in Kazakhstan. Trade facilitation is operationalized as the cost to export a 20-foot container. This indicator is retrieved from the World Bank (2015b) Doing Business Database. Second, a literature review is conducted that examines previous studies on the topic of trade facilitation. Third, the gravity model – which is used to calculate the effects of trade facilitation – is explained, a suitable gravity equation is specified and methods of estimating the gravity model are discussed. This study uses fixed effect Poisson Pseudo-Maximum-Likelihood (PPML) and fixed effect Ordinary Least Squares (OLS) to estimate the gravity equation. Finally, the results obtained by estimating the gravity model are discussed and scenarios are simulated that look at the potential effects of various levels of trade facilitation on the volume of Kazakhstan's exports to the EU. Our results indicate that trade facilitation would have a substantially positive impact on Kazakhstan's exports to the EU.

2. What is Trade Facilitation? Definitions, Measurements and Effects

2.1 Defining Trade Facilitation

There is little agreement on the definition of trade facilitation. WTO defines trade facilitation as "the simplification and harmonization of international trade procedures" (OECD, 2005). The UN Center for Trade Facilitation and Electronic Business (UN/CEFACT) espouses a similar definition of trade facilitation: "the simplification, standardization and harmonization of procedures and associated information flows required to move goods from seller to buyer and to make payment" (UNECE, 2012).

Authors such as Wilson, Mann and Otsuki (2005) broaden the concept and argue for a four-point definition of trade facilitation that includes "(1) port efficiency, (2) customs environment, (3) own regulatory environment and (4) service sector infrastructure", as this captures some of the non-tariff barriers most directly detrimental to trade. The World Bank echoes this broader definition (World Bank, 2005).

This study adopts the narrower WTO definition of trade facilitation, i.e. the simplification and harmonization of international trade procedures. We will also use the WTO definition of trade procedures: "activities, practices and formalities involved in collecting, presenting, communicating and processing data required for the movement of goods in international trade" (OECD, 2005).

Narrow definitions of trade facilitation are used in several studies of the effects of trade facilitation, such as Bourdet and Persson (2014), OECD (2012) and Felipe and Kumar (2010). Using a definition that has been used in other studies is useful as it facilitates the comparison of results.
The narrow definition offers enough specificity to inform policymakers of the effects of a limited set of measures. The broad definition does not. For

instance, if a government is given information that trade facilitation according to the broader definition boosts trade, it would have difficulties determining where to start. Should they build more roads or reduce documentation requirements? The components of the broader definition of trade facilitation are certainly likely to impact trade, but from a policy point of view, it would be better to estimate the effects of improving these components separately, so that the costs and effects of various policies can be compared.

2.2 Measuring Trade Facilitation

Trade facilitation will be measured as the cost to export a representative good, in accordance with the World Bank's (2015b) Doing Business database and the section called Trading Across Borders. This measurement is also used in other studies on the effects of trade facilitation, such as Dennis and Shepherd (2011).

The indicator is an estimate of costs incurred as a good passes through four stages on its way to the port of exit (World Bank, 2015d):

Table 1. Components of the Cost to Export Indicator

Documentation	Customs clearance and inspections	Inland transport and handling	Port and terminal handling

These costs include "costs for documents, administrative fees for customs clearance and inspections, customs broker fees, port-related charges and inland transport costs." (World Bank, 2015d). The more complicated trade procedures are, the larger the cost to export indicator is likely to be. This in turn means that the cost to export indicator is well aligned with our chosen definition of trade facilitation, i.e. that the indicator is likely strongly correlated to the efficiency of trade procedures. As Dennis and Shepherd (2011) state, "The indicator thus provides a useful cross-section

of information in relation to a country's approach to trade facilitation." Note however that the measurement only covers official fees, and does not take into account e.g. bribes.

When measuring the cost to export, several assumptions about the business and good in question are made in order to make the indicator is comparable between countries (World Bank, 2015d):

Table 2. The Cost to Export Indicator: Assumptions

The business	The good
• Is located in the economy's largest business city • Is a private, limited liability company • Conducts export and import activities but does not have any special accreditation, such as an authorized economic operator status • Is 100 per cent domestically owned	• Travels in a dry-cargo, 20-foot, full container load that weighs 10 tons and is valued at 20 000 USD • Does not require refrigeration or any other special environment • Does not require any special phytosanitary environmental safety standards other than accepted international standards • Is one of the economy's leading export or import products

In order to limit the scope of this paper, we will focus on exports rather than imports (or trade in both directions). One reasons for studying the effects on exports rather than the effect on imports is that exports are often, and perhaps to a larger extent than imports, associated with economic growth and development. See, for instance, Shirazi and Abdul Manap (2005). Also, policymakers are often, for various reasons, more interested in increasing exports rather than imports. This is not to say that imports are unimportant – the opposite is true. The welfare gains from trade can be argued to stem as much from imports as they do from exports. Moreover, as noted in Nordås et al (2006), "manufactured exports contain a considerable amount of imports". Nonetheless, it is likely the case that Kazakh policymakers are more interested (if only for political reasons) in boosting exports rather than imports.

There are some potential problems relating to the indicator. The cost to export data is not based on empirical findings, but is instead an estimate based on information provided by "local freight forwarders, shipping lines, customs brokers, port officials and banks" – making it vulnerable to errors. However, as Djankov (2010) states, freight forwarders handle around 85 per cent of all foreign trade and have excellent knowledge of the requirements relating to conforming to regulations, the time it takes transport goods, etc.

Another issue concerning measurement, which is pointed out in Bourdet and Persson (2012)[2], is that the data is based on a relatively uncomplicated good, and that it does not for instance take the country of origin, or other products requiring more documentation, into account. This means that there is a risk that the measure underestimates the average costs faced when exporting goods. This is especially problematic in cases where goods that are not transported by container (e.g. oil or gas) make up a large portion of trade (e.g. Kazakhstan). Moreover, if an exported good uses imported inputs, the trade-related costs faced by the firm may be much larger than captured in the cost to export data (Nordås et al, 2006).

It is also problematic that the measured cost to export is the same for a country's trade with all other countries, even though the true cost to export varies for every given trading partner (Persson, 2012). It is for instance more expensive to export to a country that requires more documents to be filled in. This may be a problem, for instance, when estimating the effects of reducing the cost to export on trade with a country, as the true cost to export to this particular country may be different than the cost shown by the indicator. This, however, may not be as large of a problem for Kazakhstan, as the country is not party to many

[2] Bourdet and Persson (2014) refer to another measurement from the World Bank Doing Business database, the time to export indicator. However, the same assumptions are made about both measurements, so the same problems apply.

trade agreements (Asian Development Bank, 2015), and exporters may therefore face a more uniform set of requirements regardless of export destination.

For Kazakhstan, and other landlocked countries, the cost linked to crossing the border and travelling through neighboring countries to reach the closest port are also included in the indicator (World Bank, 2015d). This means that the country in question is unable to unilaterally affect a portion of the cost to export, as it also depends on trade facilitation in its neighboring countries. This is important to remember when interpreting the results of the gravity model and when making policy recommendations.

As seen in Table 3, there is quite large cross-sectional variation, but less time-series variation, in the time to export data. The lack of time series variation is problematic for econometric reasons, as it makes it difficult to control for unobserved heterogeneity (Bourdet & Persson, 2014, p. 679).

Table 3. Cost to Export: Descriptive Statistics

Year	2005	2006	2007	2008	2009	2010	2011	2012
Min	390	390	390	450	450	450	450	435
Max	4867	4867	4867	5367	5497	5902	5902	8450
Average	1219	1212	1205	1343	1372	1392	1414	1468
Std dev	735	728	722	814	839	873	887	1035

Source: World Bank (2015b) Doing Business Database

An alternative measurement of trade facilitation is the World Bank's Logistics Performance Index (LPI). It measures six logistical factors that are thought to influence trade flows (World Bank, 2015e). These are: customs efficiency, quality of trade and transport infrastructure, ease of arranging competitively priced shipments, quality of logistics services, the ability to track consignments, and the timeliness of shipments. These

factors are measured on a scale from one to five, with five being the best possible score. The individual factors are then combined and create a single "LPI score" – also on a scale from one to five. This measurement, however, captures many more factors than what is included in our definition of trade facilitation. Another argument against using the LPI in this particular study is that it suffers from many of the same issues as the cost to export indicator, while it covers even fewer years (World Bank, 2015e).

Other alternative indicators, also from the World Bank (2015b) Doing Business Database, include the documentation required as well as the time required to export a representative good (the same assumptions are made as in the case of the cost to export indicator). The indicator that measures the documents required to export can be seen as measuring fixed costs, as the same amount of documents (more or less) likely have to be filled in regardless of whether a company exports 1 or 10 containers. Regardless, even if more documents have to be filled in, it is probable that the additional cost of filling in another document decreases after one has learned/acquired the capacity to complete one such document. This indicator therefore only captures a very small part of our definition of trade facilitation.

In contrast, the time to export indicator as well as the cost to export indicator capture a broader spectrum of costs associated with inefficient trade procedures. The time to export indicator can be argued to both capture fixed and variable cost as it measures the time it takes to fill in documents (the fixed cost) and e.g. the time a container is stuck in customs (a variable cost, as this cost increases with the amounts of containers exported). The same goes for the cost to export indicator, as it both captures the cost to fill in documents (more of a fixed cost, as the cost to per documents is likely lower the more documents one fills in) and the costs to go through customs and inspections (more of a variable cost).

When estimating the effects of trade facilitation, a robustness test will also be conducted using the time to export indicator in order to make sure that that the estimated results of trade facilitation are not solely due to peculiarities in the cost to export indicator.

In sum, the cost to export indicator is a flawed variable, but is still probably one of the best (together with the time to export indicator) proxies for the level of trade facilitation. It is important to keep these issues in mind when interpreting the results of the gravity equation.

2.3 Trade Facilitation in Economic Theory

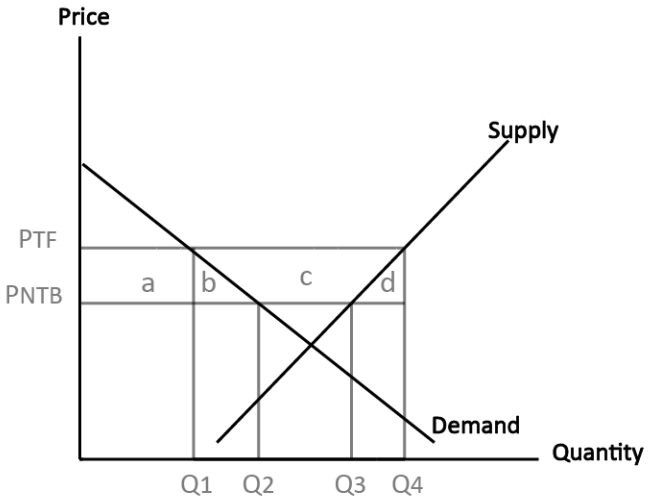
Economic theory identifies several factors that shape trade flows, such as relative factor abundance, technological differences, or consumers' preference for variety (van Marrewijk, 2012). Poor infrastructure and inefficient trade procedures can also be seen as factors that influence trade flows, as they make trade more expensive and therefore constitute barriers to trade. These costs can be divided into direct and indirect costs: the direct costs stem from e.g. complying with rules and filling out complex forms, while the indirect costs are caused by delays in transportation, which may for instance cause deterioration of goods (Persson, 2012). Trade facilitation is concerned with reducing both direct and indirect costs.

2.3.1 Trade Facilitation: Impacts on Trade

Poor infrastructure and inefficient trade procedures can be viewed as non-tariff barriers to trade (NTBs) – they reduce the amount of trade without generating revenues for the government (Baldwin & Wyplosz, 2012). One simple and effective way of illustrating the effect of tariffs and NTBs is through a partial equilibrium analysis of supply and demand on a given market (Baldwin & Wyplosz, 2012).

In order to simplify the analysis, we assume that we are dealing with a small exporting country that cannot affect world prices. As illustrated in Figure 1, domestic supply of the good is given by the supply curve, and domestic demand for the good is given by the demand curve. Initially, we have an economy with barriers to trade. The price faced by consumers and producers in the country is P_{NTB}. The point of consumption is where the demand curve intersects P_{NTB} (P_{NTB} is equal to P_{TF} minus the cost incurred by the NTB). The amount produced domestically is found where P_{NTB} intersects the supply curve. The amount exported is found at Q_3 minus Q_2. After the removal of the barriers to trade, consumers will consume the amount Q_1 at the world price P_{TF} (at the intersection between the world price and the demand curve), and domestic producers will supply Q_4 at the price P_{FT}. Exports will be given by Q_4 minus Q_1:

Figure 1. Effect of NTB for a Small Country



Thus, there is a decrease in domestic consumption, an increase in domestic production, an increase in exports, an increase in the domestic price, and the world price is unchanged. The change in the country's total welfare is calculated as the sum of the changes in domestic producer and consumer surplus. The producer surplus increases by *(a+b+c)*, and the

consumer surplus decreases by *a* and *b*, leaving the country with a net welfare gain of *c*.

Moreover, the analysis could be conducted for a larger country that has the power to affect world prices. The large (exporting) country would also face an unambiguous increase in welfare given the removal of NTBs (Baldwin & Wyplosz, 2012). Therefore, given that a country pursues trade facilitation and reduces its NTBs, it will increase its traded volume, and also increase its welfare.

The above analysis is similar to that used when analyzing the effects of tariffs or exports taxes on trade and welfare. The main difference between the two cases is that tariffs and export taxes generate revenue for the government, which offsets some of the welfare losses that appear after the market is distorted. This difference means that tariffs can – in some cases – theoretically be shown to have positive welfare effects (Baldwin & Wyplosz, 2012).

Several studies have been conducted that highlight other trade-related effects of trade facilitation. Trade facilitation has been shown to increase diversification in imports and exports (Persson, 2012). Martinez-Zarzoso and Márquez-Ramos (2008) show that trade facilitation has differing affects across sectors as well as between developing and developed countries. For instance, delays in transport have a larger impact on technology-intensive products than on most other products.

2.3.2 Trade Facilitation: Impacts on FDI, Tariffs Revenues, and SMEs

There are also other economic effects of trade facilitation, and several authors argue that trade facilitation may have different effects for developing and developed countries, and that it may affect FDI as well as tariff revenues (Engman, 2005).

For instance, Hellqvist (2003) emphasizes the importance of trade facilitation for developing countries. He argues that developing countries have relatively more to gain than their developed counterparts, as developing countries are often more dependent upon tariff revenues to cover government expenditures. Trade facilitation increases trade, and therefore also tariff revenues. Another important factor is that developing countries have a higher share of SMEs than developed countries, and that SMEs generally find it more difficult to deal with burdensome customs regulations than larger companies.

However, it is not clear whether trade facilitation increases or decreases FDI to a country, given that barriers to import may induce a multinational firm to relocate to a country in order to bypass these barriers, while at the same time barriers to export may make it less attractive to invest, as they reduce the profitability of investing in a plant with the goal of exporting to other markets. Moreover, it may be difficult to source intermediate goods. However, even though FDI is becoming ever more important, the research in this field is seemingly non-existent (Persson, 2012).

3. Trade Facilitation in Kazakhstan

Kazakhstan suffers from cumbersome trade procedures, despite having pursued some limited trade facilitation. In its *Trade Facilitation and Logistics Development Strategy Report*, the Asian Development Bank emphasizes the need to improve Kazakhstan's "physical infrastructure and transport facilities, their institutional policies and regulations, as well as the operational capacity of the logistics industry" in order for the country to reach its potential. The country lacks expertise in containerization, customs laws are complicated and change frequently, and roads are of varying quality (Kie & Akhmet, 2009).

Further complicating trade in Kazakhstan is the lack of cooperation between the country and its neighbors. Nordås et al (2006) estimate that this lack of cooperation increases the time to export a good by between 25 to 40 % for the countries of Central Asia. Moreover, over "50 % of the time for cargo moving from Almaty to Europe (through Moscow), for example, is spent waiting at border facilities".

Another factor that impairs trade are the many bribes required when transporting goods (Nordås et al, 2006). This is particularly relevant with regard to the chosen proxy for trade facilitation. The cost to export indicator only includes official costs, and thus omits bribes and other corruption related costs that are incurred when for instance passing through customs. The cost to export indicator may for this reason underestimate the costs of exporting a good in Kazakhstan.

The poor state of trade facilitation in Kazakhstan is captured in the cost to export indicator. In 2012, it cost 4 685 USD to export a container from Kazakhstan to the port of exit. Only South Sudan (5 335 USD), the Central African Republic (5 491 USD), Chad (5 902 USD), and Tajikistan (8 450 USD) register a higher cost to export (World Bank, 2015b). Note that a portion of the 4 685 USD that it costs to export in Kazakhstan are due to costs incurred while transporting the good through neighboring countries.

An illustrative comparison can be made between Kazakhstan and other countries of similar GDP per capita. Table 4 displays the cost to export for Kazakhstan and other countries from the upper-middle income country bracket, as defined by the World Bank (2015e). One might expect that countries at a similar level of development have a more or less similar level of trade facilitation. As can be seen in table 4, this is not the case. Note, however, that a portion of the cost to export for Kazakhstan stems from costs occurred while traveling through neighboring countries. The

cost to export a container from Kazakhstan to the port of exit is higher than in all other upper-middle income countries (World Bank, 2015b):

Table 4. Cost to Export for Upper Middle Income Countries, 2012

Country	Cost to export (USD)	Country	Cost to export (USD)
Kazakhstan	*4685*	Dominican Republic	1040
Iraq	3550	Costa Rica	1030
Azerbaijan	3430	Suriname	1000
Venezuela, RB	2590	Turkey	990
Colombia	2255	Palau	970
Gabon	1945	Marshall Islands	945
Angola	1850	St. Vincent and the Grenadines	935
Namibia	1800	Peru	890
Argentina	1650	Hungary	885
South Africa	1620	Seychelles	876
Bulgaria	1551	Montenegro	855
Maldives	1550	Jordan	825
Ecuador	1535	Tunisia	773
Belarus	1510	Tonga	755
Jamaica	1500	Albania	745
Romania	1485	Mauritius	660
Iran, Islamic Rep.	1470	Fiji	655
Serbia	1455	Panama	615
Mexico	1450	Thailand	585
Macedonia, FYR	1376	China	580
St. Lucia	1375	Malaysia	435
Belize	1355	American Samoa	..
Dominica	1340	Cuba	..
Grenada	1300	Libya	..
Algeria	1260	Turkmenistan	..
Lebanon	1080	Tuvalu	..

Important to note for Kazakhstan is the large share of oil and gas in its total exports. In 2014, around 93 % of Kazakhstan's exports to the EU consisted of oil and gas (EU Commission, 2015a). When estimating the effects of trade facilitation, we estimate the effects of reducing the cost to export a representative container – and not the cost to export other goods, such as oil. Given the importance of oil in Kazakhstan's exports, this means that we may underestimate the true potential of trade facilitation. To address this issue, we would have wanted to include an indicator that

captures barriers to the export of oil in our estimation of the gravity model. Alas, such an indicator does not yet exist.

4. Literature Review

Wilson, Mann and Otsuki (2003) analyze the effects of trade facilitation on trade and GDP per capita in the Asia-Pacific. They define trade facilitation as including: "port efficiency, customs environment, regulatory environment, and e-business usage", and estimate the effects of these factors upon trade flows using a gravity model. The study uses a variety of indices (such as the port efficiency index, the port facilities and inland waterways index, the air transport index, the irregular payment index, etc.) when creating their indicators for the four factors that make up trade facilitation. Exporter specific fixed effects are used in order to control for unobservable factors that are specific for different countries. In order to control for endogeneity, the regression is re-estimated using time-lagged variables. The study finds that improving all four individual factors has positive impacts upon trade – although to varying degrees. Simulations are also conducted in order to illustrate the potential effects of trade facilitation.

Iwanow and Kirkpatrick (2007) study the effects of trade facilitation on trade performance. They operationalize trade facilitation as "a weighted average of two perception-based indicators taken from the *Global Competitiveness Report* which are: hidden export barriers, and irregular payments in export and imports. In addition, they also construct an index of trade facilitation using data on the number of documents required, the time necessary to comply with all procedures required, and the cost associated with all the procedures required, to export/import goods, from the *Doing Business* database. A gravity equation is then estimated using 5-year panel data from the years 2000–2004, in which 78 countries are included. The method of estimation used is the Heckman two-step

procedure, which helps deal with the problem of zero trade flows. Their results show that, all else equal, a 5 % improvement in trade facilitation leads to a 5 % increase in exports.

Djankov, Freund, and Pham (2010) estimate how time delays affect trade using a single difference gravity equation. The study uses cross-sectional data encompassing 146 countries in 2005, and is based on a World Bank questionnaire concerned with the perception of trade costs among freight-forwarding companies. When estimating the equation, only similar exporters are compared, which according to the study eliminates the need to control for multilateral resistance for both the exporters and importers. Their main conclusion is that an additional day's delay in shipping a product "reduces trade by over 1%". Another result of relevance to Kazakhstan is that they find that the effects are even larger for landlocked countries on "time-sensitive agricultural and manufacturing products." Moreover, they note the importance of cutting time delays for developing countries, as the delays there are often large, and their removal could therefore lead to significant economic gains.

Using the Logistics Performance Index (LPI), Filipe and Kumar (2010) examine the role of trade facilitation in Central Asia. The study is conducted using a gravity model. The equation is calculated using both the exporting and importing countries' LPI, so the estimated gains in trade are given improvements in both countries. An improvement in the LPI by "up to halfway of the distance between each country's LPI and the average of all countries in the sample", leads to significant gains in all Central Asian countries' total trade with the rest of the world: from an increase of 28.4 % in Azerbaijan, to 46.8 % in Kazakhstan, and 62.5 % in Tajikistan.

Bourdet and Persson (2014) use the time to export indicator to investigate whether trade facilitation effects "(i) bilateral volumes of exports and (ii) the number of products exported" from non-EU Mediterranean countries

to the EU. The gravity model includes multilateral resistance terms, in accordance with Baier and Bergstrand's 2009 paper. The main method of estimation is fixed effect Pseudo-Maximum-Likelihood (PPML). The study finds that trade facilitation has a significant impact upon the level of exports. A 1 % decrease in the time it takes to comply with import procedures leads to an increase in exports from non-EU Mediterranean countries to the EU with 0.33 %, while a 1 % decrease in the time it takes to comply with export procedures leads to a 0.56 % increase in exports.

In conclusion, a large body of economic literature confirms the positive effects of trade facilitation on trade. However, several different methodologies have been employed, and there is considerable variation in everything from the proxy/indicator of the level of trade facilitation to the specification and estimation of the gravity model.

This review only discusses a portion of the literature on trade facilitation. For a more comprehensive overview of the literature on trade facilitation, see Persson (2012).

5. Empirical strategy

5.1 The Gravity Model

The gravity model is a common method of analysis in international economics. The model, which was introduced by Tinbergen in 1962, takes inspiration from Newton's theory of gravity: the amount of trade between countries trade is in proportion to the size of their economies and the distance between them (Bacchetta et al, 2012, p. 103).

In its initial formulation (see equation 1), the gravity model takes a multiplicative form, where the value of exports, X_{ij}, from country i to j are in proportion to a non-country specific constant, A (that can for instance, represent the level of global trade liberalization), a variable Y_j that

represents the factors that make up the importer's demand (the country's GDP is often used as a proxy), a variable Y_i that represents the factors that make up the exporter's supply (again, e.g. GDP), and a variable D_{ij} that represents bilateral trade costs between i and j (e.g. the distance between the largest centers of commerce in the two countries, respectively), and ε_{ij} is the error term. In order to simplify the estimation of the gravity model, the equation is often expressed in its natural-logarithmic (and linear) form (see equation 2), as this enables the use of OLS (Bacchetta et al, 2012, p. 104):

$$X_{ij} = A^{\beta 0} Y^{\beta 1}{}_i \, Y^{\beta 2}{}_j / D^{\beta 3}{}_{ij} \quad (1)$$

$$lnX_{ij} = \beta_0 lnA + \beta_1 lnY_i + \beta_2 lnY_j - \beta_3 lnD_{ij} + \varepsilon_{ij} \quad (2)$$

(Shepherd, 2012)

The logarithmic version of the model makes interpretation of the estimated coefficients simple, as they can be viewed as elasticities. This is, however, not the case for the estimated coefficients for dummy variables. The elasticities are in this case found by calculating $exp(b)–1$, where b is the estimated coefficient in question (Bacchetta et al, 2012, p. 106).

The classical gravity model has proved valuable in predicting trade flows between countries ever since its inception. As Anderson (2011) states, "generally, across many applications" around "80 – 90% of the variation in the flows is captured by the fitted relationship."

The gravity model has been criticized for lacking a basis in economic theory. In response, several authors, such as Anderson (1979) and Bergstrand (1985), have shown that the model can be incorporated into already existing theoretical frameworks. Moreover, Anderson & van Wincoop (2003) and Baier & Bergstrand (2009) have improved the theoretical foundation of the gravity model by adding so called remoteness and multilateral resistance variables. These variables fulfill the same

function: they capture multilateral barriers to trade, i.e. those between a country and all its trading partners, in contrast to bilateral trade barriers that refer barriers between a specific pair of countries (Adam & Cobham, 2007). The remoteness variable is widely used when estimating the gravity model (Gómez & Milgram Baleix, 2012). It is considered to be less theoretically sound than the multilateral resistance variables, but is also much easier to compute (Baier & Bergstrand, 2009).

A commonly used formula for the remoteness variable (which is employed when creating the remoteness variables in this study) is:

$$Rem_{it} = \sum_j dist_{ij} / (GDP_{jt}/GDP_{wt}) \quad (3)$$

(Bacchetta et al., 2012, p. 113)

Where $dist_{ij}$ is the bilateral distance between two countries, and (GDP_{jt}/GDP_{wt}) is the country in question's share of world GDP. Using remoteness variables or multilateral resistance terms makes the gravity model more theoretically sound, as it recognizes that trade depends on both costs of trading between two countries as well as the costs of trading with third countries. For instance, country *X* is importing a certain good from country *Y* and country *Z*. If the bilateral trade barriers decrease between country *X* and *Y*, this will decrease the multilateral trade resistance for country *X*. This will also likely lead to imports increasing from *Y* to *X*, while imports decrease from Z to *X* as they become more expensive relative to those from *Y*. Meanwhile, the level of bilateral trade resistance remains the same between *X* and *Z*. Thus, the level of trade between two countries depends on both multilateral trade resistance as well as bilateral trade resistance (Adam & Cobham, 2007).

5.2 Specification of the Gravity Model

In order to estimate the effects of trade facilitation on Kazakhstan's exports to the EU, we specify a gravity model where imports to each

EU27-country, from each non-EU upper-middle income country, is the dependent variable. The regression is estimated using panel data from 2005 to 2012. The main independent variable of interest to this study is the cost to export as it is meant to capture the effects of Kazakhstan pursuing trade facilitation in the export sector. Other independent variables are the importer's GDP, the exporter's GDP, the exporter's and importer's GDP per capita, the distance between the country pairs' largest cities, dummies for whether the country pair is a part of the same PTA, if the export country is landlocked, if the country pair shares a common official language, if the country pair shares colonial history, and if the country pair shares borders. Moreover, an exporter specific remoteness variable as well as a year and an importer fixed effect are also included. ε_{ijt} is a disturbance term. i is the exporter, j is the importer, and t signifies time. The equation is expressed in its natural log form in equation 4[3]:

$$lnImport_{ijt} = \beta_0 + \beta_1 lnCost_{it} + \beta_2 lnGDP_{it} + \beta_3 lnGDP_{jt} + \beta_4 lnGDPpc_{it} + \beta_5 lnGDPpc_{jt} + \beta_6 lnDist_{ij} + \beta_7 PTA_{it} + \beta_8 Landl_i + \beta_9 Lang_{ij} + \beta_{10} Colony_{ij} + \beta_{11} Border_{ij} + \beta_{12} Remoteness_{it} + \tau_t + \lambda_j + \varepsilon_{ijt} \quad (4)$$

A list of the variables and their sources are found in section A1 of the appendix.

The chosen variables are some of the most commonly used in the gravity model literature. These variables are widely considered to give the model a good fit (Bacchetta et al, 2012) and (Shepherd, 2012). The use of these commonly employed variables makes this paper easier to compare to other studies.

The dependent variable, $Import_{ijt}$, is imports to each individual EU27-country (Croatia did not join until 2013, and is therefore not included), from each individual non-EU upper-middle income country. Import values

[3] Note that the equation is estimated in its original multiplicative form when using PPML.

are expressed in nominal USD, and the data is from Eurostat (2015a). The data is originally displayed in nominal Euros, and Eurostat's (2015b) historic data on the USD-Euro exchange rate from was used transform the variable.

$Cost_{it}$, as discussed in 2.2, is a measure of the cost to move a representative good from factory to port. This variable is intended as a proxy for the level of trade facilitation. A lack of trade facilitation adds to the costs of trading. The variable is therefore expected to have a negative impact on imports to the EU. The variable is from the World Bank's (2015b) Doing Business Database.

The exporting country's as well as the importing country's GDP, GDP_{it} and GDP_{jt} are, as is customary, used as proxies for the importing country's supply and the exporting country's demand. Both the importer's GDP and exporter's GDP are expected to have positive effects on imports to the EU, as a larger GDP signifies a larger demand for imports or a larger supply of exports, respectively. The GDP data is expressed in nominal USD, and is from the World Bank (2015a) Development Indicators Database.

$GDPpc_{it}$ and $GDPpc_{jt}$ are the exporter's and importer's GDP per capita, respectively, in nominal USD. This variable is likely to impact the level of trade because per capita incomes are likely to affect preferences regarding what types of goods to export or import (for instance low quality or luxury goods) (Markusen, 2010). Moreover, given all else equal (and that we also include total GDP in the specification), the effects of changes in GDP per capita should be regarded as the effects of changes in the country's total population. It is unclear, however, whether this variable has a positive or a negative impact upon exports. The data is from the World Bank (2015a) Development Indicators Database.

$Dist_{ij}$ measures the distance in kilometers between the country pairs' largest cities (by population). This type of variable is, as mentioned in 5.1, one of the most common proxies for trade costs. It is expected to have a negative impact on imports to the EU. The data is from the CEPII (2015a) database.

PTA_{it} is a dummy variable that takes the value one when the exporting country is a member of a preferential trade agreement (PTA) with the EU. It would be superfluous to use a separate dummy for PTAs between each exporting country and importing (EU) country, as all EU countries share a common external trade policy. PTAs are intended to reduce trade costs between signatories, for instance through the reduction of tariffs or the harmonization of trade procedures (WTO, 2015a). This variable is therefore expected to have a positive effect on imports to the EU. The variable has been created manually using information on the EU's trade agreements found on the website of the EU Commission (2015b).

Similarly, $Landl_i$, is also a dummy variable intended to capture trade costs. The variable takes the value one when the country in question is landlocked, and zero when it is not. Landlocked countries lack direct access to ports, which likely increases transport costs. The variable is thus expected to have a negative impact on imports to the EU. The data is from the CEPII (2015b) database. A landlocked variable for the importing country is not used, as this would be perfectly collinear with the importer specific fixed effect, as it does not vary with time.

As mentioned in 4.1, sharing a common language may decrease trade costs between two countries, as communication becomes simpler and cheaper. The dummy variable $Lang_{ij}$ adopts the value one when the country pair shares a common official or primary language, and zero when they do not. The variable is expected to have a positive impact on imports to the EU. The data is from the CEPII (2015a) database.

Countries that share colonial history are likely to, on average, trade more than countries that do not. This is in part because countries that share colonial history often have similar institutional frameworks, which in turn reduces trade transaction costs (de Sousa & Lochard, 2008). The variable $Colony_{ij}$ assumes the value one when the bilateral pair shares colonial history, and zero when they do not. The data is from the CEPII database (2015a).

$Border_{ij}$ – another dummy variable – adopts the value one when the country pair has a common border. Sharing a common border is likely to decrease trade costs. The data is from the CEPII (2015a) database.

$Remoteness_{it}$ is a variable intended to capture multilateral trade resistance. The remoteness variable also helps the problem of exporter-specific unobserved heterogeneity and makes the model more theoretically sound (see section 5.1). The remoteness term is constructed according to the method presented in Bacchetta et al. (2012) (see equation (3)). This variable is computed using data from the World Bank (2015a) and CEPII (2015a). We would also have liked to use an importer specific remoteness variable. However, since the variable does not vary much over time, it is nearly perfectly collinear with the importer specific fixed effect, and is dropped.

To account for variations between years, a year dummy, τ_t, is included. This variable is intended to capture various year-specific events that may affect the level of trade, such as a financial crisis, which are not accounted for by the other variables. It is unclear whether this variable affects trade positively or negatively. Also, to help solve the problem of unobserved heterogeneity between importers, λ_j is included. λ_j is an importer-specific fixed effect. The importer fixed effect also helps capture multilateral trade resistance for the importing countries. An exporter-specific fixed effect is not used in the baseline model because such a variable would capture the

effects of the cost to export variable (see discussion in 5.3). The exporter fixed effect would nearly be perfectly collinear with the cost to export, as the cost to export does not vary sufficiently over time. However, as mentioned above, the presence of an exporter specific remoteness variable reduces the problem of exporter specific unobserved heterogeneity.

In order to test the robustness of the results obtained from estimating equation (4), an estimation will also be made using an alternative proxy for trade facilitation (the time to export). We will also estimate the equation using a one-year lagged cost to export variable in place of the regular cost to export variable, in order to test whether the results are robust in the presence of endogeneity. See section 5.5 for further information.

5.3 Determining the Sample of Exporting Countries

As mentioned above, data on the imports to 27 EU countries from all non-EU upper-middle income countries are used when estimating the effects of trade facilitation in Kazakhstan. It is generally preferable to use a sample consisting of many countries when running a gravity model, even if one is only interested in the impact on a single country (Bacchetta et al, 2012, p. 120).

Choosing a suitable sample of countries is a difficult task as there are (to our knowledge) no clearly defined criteria with which the researcher can choose countries. It is important to pick countries that are likely to be affected similarly by the variable of interest (i.e. trade facilitation). Also, unobserved heterogeneity may emerge if countries are chosen that have different determinants of trade, as the omitted variables may be correlated to the observed variables.

One might argue that the effects of trade facilitation depend on factors such as how well important societal institutions function. For instance,

reducing the documents required to export a good may not affect trade as much in a country where the state is unable to ensure property rights as in countries that do ensure them. The structure and level of development in the economy may also matter. Conducting trade facilitation and reducing the costs to trade may not spur trade as much if the economy cannot provide the appropriate labor force or inputs, as companies may then not be able to expand their output and thus export more.

The level of income is often considered to be a "broad measure of economic development (quality of institutions, etc.)" (Amin & Haidar, 2013). It is for this reason that this study uses countries from the same income classification (defined by the World Bank, 2015f) as Kazakhstan to estimate the effects of trade facilitation. These countries likely share several important commonalities with Kazakhstan and the estimated effect of the cost to export should be an acceptable approximation of these effects in Kazakhstan.

For a complete list of the members of the upper middle-income group, see table 4. These countries all have a GNI per capita between 4 126 and 12 745 USD (World Bank, 2015f).

Another option would have been to estimate the regression using Central Asian states, which could also be argued to be similar to Kazakhstan. Using geographic proximity to determine the sample has been used in other studies (Felipe & Kumar, 2010). However, trade facilitation data only exists for four Central Asian countries, and there is no great cross-sectional (or time-series) variation in the cost to export for these countries, which makes it difficult to estimate the effects of trade facilitation. Moreover, it may in fact be the case that these countries are not sufficiently similar to Kazakhstan to justify using the effect estimated using this sample of simulate the effects of trade facilitation upon

Kazakhstan's exports. For instance, Kazakhstan is several times wealthier than most of its neighboring countries (World Bank, 2015a).

In sum, our method of choosing which countries to include in the sample has some limitations. However using this sample of exporters should, if the above assumptions of what determines the effects of trade facilitation hold, generate estimates that can readily be applied to Kazakhstan.

Given an indicator of trade facilitation that covers a larger period of time, we may have been able to narrow down the sample of exporting countries, only choosing those that are even more similar to Kazakhstan. Unfortunately, we have not been able to find such an indicator.

5.4 Addressing Potential Issues with the Data

In order to reduce the risk of missing or faulty data, we use data over imports rather than exports, as it is considered more reliable (WTO, 2012). This data has been downloaded from Eurostat (2015). Data on the cost to export, the time to export, and the exporter's and importer's GDPs and GDPs per capita are downloaded from the World Bank database (2015). World Bank data is widely used in gravity models (and in economic research in general), and is generally considered to be very reliable. Data over several of the gravity model dummies as well as data over bilateral distance are retrieved from CEPII (2015). CEPII data is used in a wide array of papers on the gravity model, and is also considered to be reliable.

5.5 Method of Estimation

Just as there are many different ways of specifying the gravity equation, there are many ways of estimating it. Each method has its own advantages and disadvantages. Some common problems when estimating the gravity equation include unobserved heterogeneity, endogeneity, heteroskedasticity and zero trade flows between two countries (Gómez-Herrera, 2013, p. 1087). The main method of estimation in this study is

fixed effect PPML. The regression is also estimated using fixed effect OLS, in order to test the robustness of the results and to facilitate comparisons with other studies.

5.5.1 Unobserved heterogeneity

When estimating gravity models, one often deals with unobserved heterogeneity (Bacchetta et al, 2012, p. 107). Unobserved heterogeneity emerges when the model is incorrectly specified due to there being unobserved differences between individuals (countries and/or bilateral country pairs in this case). This can cause the estimation to become biased (Dougherty, 2011, p. 345).

Unobserved heterogeneity may also be caused by the presence of multilateral resistance to trade (see section 5.1 for a discussion on multilateral resistance) (Shepherd, 2012). This source of unobserved heterogeneity can be addressed by using remoteness or multilateral resistance variables (Anderson & van Wincoop, 2003).

The problem of unobserved heterogeneity (and therefore also multilateral resistance to trade) can be solved by using panel data and by adopting a fixed effect model (e.g. fixed effect OLS or fixed effect PPML). Fixed effects can be used for countries, years, or bilateral pairs. In the case of the gravity equation, the "…fixed effects estimator assumes the existence of an unobserved heterogeneous component that is constant over time and which affects each individual of the panel in a different way." (Gómez-Herrera, 2013, p. 1091).

However, using a fixed effect models comes at a cost. For instance, using an exporter fixed effect makes it impossible to estimate the effects of exporter-specific variables that do not vary over time, as they would be perfectly collinear with the fixed effect. This, as Bourdet and Persson (2014) state, would make it "unwise to include such fixed effects because

they would capture almost all of the trade procedure effects which we are trying to assess." A better option may in this case be to use an exporter specific remoteness variable (Bacchetta et al, 2012).

5.5.2 Endogeneity

The presence of endogeneity in a model means that one or more explanatory variables are correlated with the error term. If this is the case, our estimates will be inconsistent (Shepherd, 2013, p. 41). There are several causes of endogeneity, such as a measurement error, simultaneity or omitted variables (Dougherty, 2011, p. 333).

In our gravity equation, it is not unreasonable to think that a higher amount of exports from a country may increase political pressure to improve the trade environment, which in turn reduces the *cost to export*. Because the *cost to export* variable may be dependent upon the amount of exports, the *cost to export* variable is also by extension affected by the factors captured in the error term – thus leaving us with an explanatory variable that is correlated to the error term.

Including fixed effects can, as is the case with unobserved heterogeneity, help solve the problem with endogeneity. However, it is not a perfect solution as it only removes endogeneity that is caused by omitted variables. Another solution is to use instrumental variables (IV) for each potentially endogenous variable. The IV must be exogenous to the error term. Moreover, for the IV to be effective, it has to be highly correlated to the suspected endogenous variable that it replaces. The equation can then be estimated using 2SLS (two stage least squares). However, it is difficult to find instruments that perform well, and weak instruments create other problems of their own (Otsuki, 2003, p. 14). Using time-lagged versions of the potentially endogenous variable is an alternative way of addressing the problem of endogeneity (Bacchetta et al, 2012, p. 118). The reason that this may reduce the problem of endogeneity is that the previous year's

level of trade facilitation is less likely to be affected by this year's amount of imports than this year's level of trade facilitation. However, it is worth noting that using a one-year lagged variable reduces the years for which cost to export data is included from 8 to 7, which is problematic given the already low time-series variation.

5.5.3 Heteroskedasticity

The presence of heteroskedasticity makes the estimation inefficient (i.e. makes the estimated standard errors unnecessarily large). Heteroskedasticity emerges when the variance of the error term is not constant for all observations. Heteroskedasticity is a common problem when estimating gravity equations (Shepherd, 2013, p. 51).

A simple solution to the problem of heteroskedasticity is to use robust standard errors (Shepherd, 2013, p. 28).

However, when estimating a logarithmic form of the gravity equation (which is necessary in order to use OLS) one "changes the property of the error term, thus leading to inefficient estimations in the presence of heteroskedasticity." (Gómez-Herrera, 2013, p. 1092). If OLS is used on the equation in its logarithmic form when there is heteroskedasticity, the estimation will be rendered inconsistent (Santos Silva & Tenreyro, 2006). In this case, robust standard errors do not solve the problem. Instead, this problem can be solved using a non-linear method of estimation, such as PPML, which was suggested by Santos Silva & Tenreyo (2006). Santos Silva and Tenreyo (2006) also show that the PPML method is more efficient than other non-linear methods such as non-linear least squares (NLS). The PPML method is also used other studies on the effects of trade facilitation, such as Bourdet and Persson (2012, 2014).

5.5.4 Zero trade flows

When using OLS one must use the natural log of the import variable. This poses problems in cases when there is no trade between two countries, as the log of 0 is undefined. This means that these observations have to be dropped, upon which case the estimation may yield inconsistent results (Bacchetta et al, 2012, p. 112). A simple solution to this problem is to use a non-linear model such as PPML, as this removes the need to transform the import variable using the natural log (Santos Silva & Tenreyro, 2006).

5.5.5 Choice of methods of estimation

Thus, in order to address the challenges listed above, the gravity equation will be estimated using several different methods. Robust standard errors are used in all estimations, which reduces the issue of heteroskedasticity.

The main method of estimation for the baseline gravity equation (4) is a fixed effects PPML model. Fixed effects for years and importers are included. The use of PPML the need to take the log of imports, which means that we avoid the issue of zero trade flows. The year and importer fixed effects capture the unobserved heterogeneity for importers and over years. Also, the exporter specific remoteness variable addresses (however does not necessarily completely remove) the issue of unobserved heterogeneity between exporters. This method will also be used when conducting robustness tests with other variables. We would have liked to include an importer specific remoteness variable. There is, however, low time series variation in the variable, and the variable is nearly perfectly collinear with the importer fixed effect.

The above estimation does not control for unobserved heterogeneity between country pairs. In order to address this issue and test the robustness of the main results, equation (4) is also estimated using pair fixed effects. All bilateral variables are dropped when estimating this model, as they are perfectly collinear with the fixed effect.

Unfortunately, the above methods do not control for endogeneity. In order to test the robustness of the results in the presence of endogeneity, the baseline method of estimation will also be applied on equation (4), but with the crucial difference that a one-year lagged cost to export variable is used instead of the regular cost to export variable.

Many studies on the effects of the gravity model use fixed effect OLS rather than a fixed effect PPML model. We will for this reason also estimate equation (4) using year and importer specific fixed effects. However, this method does have major drawbacks in comparison the PPML method, both when it comes to dealing with zero trade flows and heteroskedasticity.

In sum, by using the above-described methods, we are able to address all of the previously listed issues. This does not guarantee, however, that the estimates are fault free. For instance, while the remoteness variable does reduce the unobserved heterogeneity between exporters, it does not completely remove it.

6. Results

6.1 Baseline model: Importer- and year fixed effect PPML

The baseline model is estimated using importer and year fixed effects PPML. The results are found under (a) in table 5. The results from this regression will be used to simulate the effects of trade facilitation on Kazakhstan's exports to the EU. The estimated coefficient for cost to export variable is -2.249, which means that it displays the expected sign, i.e. that a reduction in the cost to export increases exports from Kazakhstan to the EU. It is possible to interpret the regression coefficients

as elasticities[4], which means that a one per cent reduction in the cost to export will lead to a 2.249 per cent increase in Kazakhstan's exports to the EU. This result is significant on a one per cent level.

The estimated effect of bilateral distance also confirms our predictions – the larger the distance between two countries, the less they trade on average. The estimate is significant at the one per cent level. The estimated coefficients for the GDP of the exporting country (significant on the one per cent level), whether the exporting country is a member of a PTA with the EU (significant on the one per cent level), and for whether a bilateral pair shares a common border (significant on the 10 per cent level) also display the expected positive effect. The estimated coefficients for whether two countries share a common primary or official language or a common colonial history also show the expected signs, but are not significant.

The estimated effect of the importer's GDP is negative, which means that the result is contrary to economic theory. The estimate, however, is not significant. The poor estimate is likely due to the combination of relatively low time series variation in the GDP data and the use of importer-specific fixed effects.

The estimated coefficient for the importer's GDP per capita displays a significantly (on the one per cent level) positive result, while the exporter's GDP per capita is estimated to have a negative impact on exports from Kazakhstan to the EU (this result is, however, not significant). It is not wholly clear what we expect the effect of changes in GDP per capita to be

[4] Note however that this is not the case for dummy variables – the elasticities of the dummy variables are found by using the formula exp(b)–1 where b is the estimated coefficient.

on Kazakhstan's exports to the EU. On the one hand, a decrease in GDP per capita should be seen as, all else equal, population growth (as we already include the entire country's GDP). This is likely to have a positive impact on trade. On the other hand, changes in GDP per capita can also signify changes in preferences – and it is unclear how these affect trade.

The only result that goes clearly against our theoretical predictions is the estimated effect of being landlocked on exports to the EU. One may expect that, all else equal, being landlocked will lead to fewer exports, as shipping is more expensive than for coastal countries. However, the estimated effect of being landlocked is positive and significant on a one per cent level. We have no foolproof explanation for this. But it may be that the landlocked dummy captures other effects than just being landlocked, which then leads to the confounding result.

6.2 Robustness test I: Importer and year fixed effect OLS

We also estimate equation (4) using importer and year fixed effect OLS. The results are displayed under column (b) in table 5. The estimated effect of the cost to export is also negative, and significant on a one per cent level, which strengthens our hypothesis that reducing the cost to export will lead to more exports from Kazakhstan to the EU.

The estimated coefficients of the exporter's GDP, bilateral distance, membership of a PTA with the EU are, as in (a), all positive and significant. This further confirms our predictions. The effect of the importer's GDP is also negative and is not significant.

Table 5[5]. Regression Results: The Impact of Trade Facilitation on Kazakhstan's Exports to the EU

Dependent variable: Imports to the EU in nominal USD	Poisson (a)	OLS (b)	Poisson (c)
Cost to export	-2.249***	-1.844***	-0.105*
	(0.215)	(0.161)	(0.0552)
Bilateral distance	-0.748***	-1.916***	
	(0.185)	(0.276)	
GDP (exporter)	0.391***	0.622***	0.00678
	(0.0268)	(0.0234)	(0.115)
GDP (importer)	-0.303	-0.849	-0.271
	(0.274)	(0.624)	(0.263)
GDP per capita (exporter)	-0.108	1.082***	0.425***
	(0.118)	(0.149)	(0.0770)
GDP per capita (importer)	0.542***	0.688	0.496***
	(0.196)	(0.427)	(0.153)
Common border	0.799*	0.0944	
	(0.484)	(0.837)	
Common official language	0.142	-0.0957	
	(0.456)	(0.531)	
Common colonial history	0.274	1.266**	
	(0.288)	(0.517)	
PTA with the EU	0.697***	1.560***	
	(0.187)	(0.147)	
Landlocked (exporter)	1.939***	2.663***	
	(0.222)	(0.279)	
Observations	9680	8369	9264
Adjusted R^2		0.399	
Remoteness (exporter)	Yes	Yes	No
Importer fixed effect	Yes	Yes	No
Year fixed effect	Yes	Yes	Yes
Pair fixed effect	No	No	Yes

[5] *** Symbolizes significance at the 1 % level, ** at the 5 % level and * at the 10 % level. Robust standard errors are presented within parenthesis below the estimate of each coefficient. The dependent variable is imports in nominal USD in all cases except for regression b, where the natural log of imports is used. Dummy variables have not been transformed using the natural log, while continuous variables have been transformed using the natural log.

As is the case with (a), the estimated effect of common colonial history is positive. The difference to (a) is that this effect is now significant on a five per cent level (which strengthens theoretical predictions). The estimated effect for whether two countries share a common border is the same (positive) as in (a), and is also not significant. In contrast to (a), the estimated coefficient for sharing a common official language is negative. The result, however, is not significant. The effect on exports of being landlocked is positive, somewhat confoundedly, positive and significant, as in (a).

The main difference between (a) and (b) is that the exporter's GDP per capita is positive in (b), and also significant on a one per cent level. The effect of the importer's GDP per capita is positive (as was the case in (a)), but not significant this time. It is somewhat unclear how to explain, and interpret, this result.

6.3 Robustness test II: Pair and year specific fixed effect PPML

Estimation (c) is conducted using a pair and year fixed effect PPML model. All bilateral variables are dropped when estimating this model, as they are perfectly collinear with the pair fixed effects. The remoteness and landlocked variables are dropped, as they are constant within group.

The estimated effect of the cost to export on Kazakhstan's exports to the EU is, once again, negative, which further strengthens the result obtained in (a). The estimated coefficient is, however, only significant on a ten per cent level this time. In other words, the cost to export is robust even in the presence of pair specific unobserved heterogeneity. Other variables show the same sign as in (a), with the exception of the exporter's GDP per capita, which is positive and significant on a one per cent level.

6.4 Robustness test III: Lagged Cost to Export

Estimation (d) is made using an importer and year fixed effect PPML model. The difference between this model and (a) is that a one-year lagged cost to export variable is used instead of the regular cost to export variable.

The estimated coefficient for the one year lagged cost to export variable is negative, and significant on the one per cent level. This means that the estimated effect of cost to export in (a) is likely robust, even in the presence of endogeneity. The signs of all other estimated coefficients are the same as in (a).

6.5 Robustness test IV: Time to Export

The final robustness test, model (e), is estimated using an importer and year fixed effect PPML (same method as in (a)). The difference is that this estimation is run using the time to export indicator in place of the cost to export indicator.

The estimated effect of the time to export indicator is negative, in line with economic theory. However, this result is not significant.

Other estimates are in line with (a). Exceptions are the exporter's GDP per capita (positive and significant on the one per cent level), and the effect of a common official language (negative in this case, but not significant).

Table 6. Regression Results: Continued

Dependent variable: Imports to the EU in nominal USD	Poisson (d)	Poisson (e)
1 year lagged cost to export	-2.372***	
	(0.225)	
Time to export		-0.0673
		(0.0862)
Bilateral distance	-0.834***	-0.380*
	(0.197)	(0.229)
GDP (exporter)	0.394***	0.315***
	(0.0279)	(0.0188)
GDP (importer)	-0.213	-0.277
	(0.285)	(0.266)
GDP per capita (exporter)	-0.00241	-1.629***
	(0.128)	(0.156)
GDP per capita (importer)	0.448***	0.527***
	(0.170)	(0.184)
Common border	0.734	1.302**
	(0.504)	(0.583)
Common official language	0.185	-0.480
	(0.467)	(0.407)
Common colonial history	0.252	0.429
	(0.294)	(0.265)
PTA with the EU	0.707***	0.726***
	(0.206)	(0.113)
Landlocked (exporter)	2.029***	0.520***
	(0.221)	(0.165)
Observations	8470	9680
Adjusted R^2		
Remoteness (exporter)	Yes	Yes
Importer fixed effect	Yes	Yes
Year fixed effect	Yes	Yes
Pair fixed effect	No	No

6.6 Summary of the Results

All estimations confirm the theoretical prediction that trade facilitation increases exports from Kazakhstan to the EU. The only exception is regression (e), where the time to export was used, and where no significant result was found.

The estimated coefficients for the other gravity variables are, to a large extent, in line with theoretical predictions. Bilateral distance (significant in all cases), the exporter's GDP (significant in all cases but one), sharing a common border (significant in two out of four cases), sharing common colonial history (significant in one out of four cases) and being a part of a PTA with the EU (significant in all cases) show the expected (positive) sign across the board.

The effects of sharing a common official or primary language are not significant in any case. This is likely due to low variation in the data (few countries in the sample share a common language). The estimated effect of the importer's GDP is also not significant in any case. This likely due to the use of importer specific fixed effects. The estimated effects of the importer's and exporter's GDP per capita vary between regressions. It is somewhat challenging to interpret these results, as we neither predict the effects of GDP per capita to be unambiguously positive nor negative.

The most confounding result regards the effects of being landlocked on Kazakhstan's exports to the EU. The effect of being landlocked is estimated to be positive in all cases. We cannot find an explanation for this result, other than that the variable may capture some other unbeknownst to us positive effect.

6.7 Simulating the effects of trade facilitation in Kazakhstan

The effects of trade facilitation on Kazakhstan's exports to the EU are simulated using the estimated elasticity for the cost to export obtained in regression (a), as this method, for reasons outlined in section 5.5, is likely to be the most reliable method of estimating the gravity equation. Our other estimates show that this result is robust.

Note that the exact quantitative effect of trade facilitation, might, however, be slightly different than our chosen estimate (we obtained elasticities ranging from -2.249 to -0.105 depending on the method of estimation). The results obtained from the simulation are therefore not to be interpreted as the exact quantitative effect of trade facilitation, but are rather meant to give an approximate idea of the potential of trade facilitation. Moreover, the simulation is only valid if the assumption holds that the returns to trade facilitation are constant. Also, as Bourdet and Persson (2014) mention, simulations obtained using this method are not general equilibrium results.

The cost to export a container was in 2014 5 285 USD (World Bank, 2015g). The estimated elasticity for the cost to export is -2.249 (i.e. a one per cent reduction of the cost to export will lead to a 2.249 per cent increase in Kazakhstan's exports to the EU). Reducing the cost to export by 100 USD (i.e. a 1.89 per cent decrease in the total cost to export), will therefore lead to a 4.25 per cent increase in Kazakhstan's annual exports to the EU. Kazakhstan's total exports to the EU amounted to 23 900 000 000 Euro during 2014 (EU Commission, 2015a).

By how much would Kazakhstan's annual exports to the EU increase given that Kazakhstan is able to initiate a reform that reduces the cost to export down from 5 285 USD to the global average of 996 USD? And by how much would Kazakhstan's exports to the EU increase if Kazakhstan

were able to bring the cost it takes to export down best practice (410 USD)? These questions are answered in table 7:

Table 7. Simulating the Effects of Trade Facilitation

	Scenario 1: Global average	Scenario 2: Best practice
Required reduction in the cost to export	4289	4875
Increase in Kazakhstan's annual exports to the EU (%)	182 %	207 %
Increase in Kazakhstan's annual exports to the EU (nominal USD)	43 565 517 500	49 517 812 500

As the simulation shows, there are (to say the least) substantial gains to be made by pursuing trade facilitation in Kazakhstan. Again, it is important to note that the simulation does not give us the exact quantitative effect of trade facilitation, but rather gives us an idea of its potential effects.

The cost to export variable might for instance be strongly correlated with other barriers to trade. If these barriers to trade have been left out of the specification of the gravity model (which is the case for e.g. barriers to the export of oil, as no suitable data is available), this might lead to an inflated estimation of the effects of reducing the cost to export.

7. Summary and Policy Implications

This study answers the question of how the volume of Kazakhstan's exports to the EU is likely to be affected by Kazakhstan pursuing trade facilitation. We also estimate how large this effect is likely to be, and simulate the effects of Kazakhstan a) lowering the cost to export to the global average, and b) lowering the cost to best practice.

Using the cost to export a 20-foot container as a proxy for trade facilitation, we find that trade facilitation is likely to have a substantial and positive impact on Kazakhstan's exports to the EU. This qualitative result is obtained by estimating gravity equation (equation (4)) with fixed effect PPML, and is confirmed by three out of four robustness tests.

Estimating the baseline gravity model with fixed effect PPML, we find that reducing the cost to export in Kazakhstan by 100 USD increases Kazakhstan's annual exports to the EU by approximately 4.25 per cent. And as the cost to export from Kazakhstan was 5 285 in 2014, there are likely large gains to be made.

There are, however, as mentioned throughout the paper, several caveats to keep in mind, and one should be careful to interpret the simulated results as the exact quantitative effects of trade facilitation. Both the chosen proxy for trade facilitation and the methods of estimation have limitations. For instance, while we reduce the problem of exporter-specific unobserved heterogeneity by using remoteness variables, the problem is not completely removed.

Given that trade facilitation is likely to boost Kazakhstan's exports to the EU, and that trade has proven to be a fruitful method of deepening political ties between Kazakhstan and the EU (Norling, 2014), trade facilitation could perhaps also be incorporated into Kazakhstan's "multi-vectored" foreign policy. The "multi-vectored" foreign policy is based on Kazakhstan guarding its sovereignty by, amongst other things, moving closer to the EU and reducing its dependence on Russia.

The positive effects of trade facilitation on Kazakhstan's trade to the EU may also be a reason for Kazakhstan to intensify efforts to join the WTO,

as the organization offers technical assistance for improving trade facilitation (WTO, 2015b).

In order to translate the information presented in this study into concrete policy, further research should be conducted that compares the gains of trade facilitation to the costs of pursuing said policies. See, for instance, OECD (2005) for more information about the costs of pursuing trade facilitation.

Research on the costs of trade facilitation should be conducted in tandem with research that estimates the effects of more specific reforms, such as reducing the time spent waiting at the border, in order to help policymakers pursue the most cost efficient course of action. Unfortunately, more data is needed before such research can be conducted.

Finally, as reducing the cost to export is likely boost Kazakhstan's exports to the EU, and that some of the cost to export from Kazakhstan is incurred while transporting goods through neighboring countries, Kazakhstan may also want to consider ways of improving trade facilitation in the region. One way to do this is to request that the Asian Development Bank – which both has technical expertise and a regional mandate (Asian Development Bank, 2014) – ramps up work with trade facilitation in Central Asia.

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9. Appendix

A1. Variables and Data Sources

Variable	Definition and Data Source
Imports	Imports in nominal USD. Data source: Eurostat (2015a). Converted from Euros using data from Eurostat (2015b).
Cost to export	Cost to export a 20-foot container from the largest city to a port of exit. Data source: World Bank (2015b)
Time to export	Time to export a 20-foot container from the largest city to a port of exit. Data source: World Bank (2015b)
Bilateral distance	Distance in km between the two largest cities in two countries. Data source: CEPII (2015a)
GDP	Data source: World Bank (2015a)
GDP per capita	Data source: World Bank (2015a)
Remoteness	Calculated using equation 3, with GDP data from the World Bank (2015a) and data on the bilateral distance from CEPII (2015a).
Common border	Dummy variable that is equal to unity if two countries share a common border. Data source: CEPII (2015a)
Common official language	Dummy variable that is equal to unity if two countries share a common official or primary language. Data source: CEPII (2015a)
Landlocked	Dummy variable that is equal to unity if a country is landlocked. Source: CEPII (2015b)
PTA with the EU	Dummy variable that is equal to unity if a country is a member of a PTA with the EU. Computed by the authors using information from the European Commission (2015b)

A2. Exporting and Importing Countries

Exporting countries		Importing countries	
Kazakhstan	Dominican Republic	Austria	Ireland
Iraq	Costa Rica	Belgium	Latvia
Azerbaijan	Suriname	Bulgaria	Lithuania
Venezuela, RB	Turkey	Cyprus	Luxembourg
Colombia	Palau	Czech Republic	Malta
Gabon	Marshall Islands	Denmark	The Netherlands
Angola	St. Vincent and the Grenadines	Estonia	Poland
Namibia	Peru	Finland	Portugal
Argentina	Seychelles	France	Romania
South Africa	Montenegro	Germany	Slovakia
Maldives	Jordan	Greece	Slovenia
Ecuador	Tunisia	Hungary	Spain
Belarus	Tonga	Italy	Sweden
Jamaica	Albania	United Kingdom	
Iran	Mauritius		
Serbia	Fiji		
Mexico	Panama		
Macedonia	Thailand		
St. Lucia	China		
Belize	Malaysia		
Dominica	American Samoa		
Grenada	Cuba		
Tuvalu	Libya		
Algeria	Turkmenistan		
Lebanon			