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The Effect of Economic Integration on the Duration of Trade

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Abstract

The aim of this paper is to empirically investigate if there is a correlation between the duration of trade and economic integration. Theoretically, this is done by analyzing how economic integration affects sunk costs of exporting. Using the Kaplan-Meier methodology we calculate survival probabilities for German and Russian imports. Import data is derived at the 2-digit product level from 1993-2008 for Germany and from 1996-2008 for Russia. Our results show that Russia experiences longer duration than Germany. We argue that economic integration affects sunk costs of exporting, which in turn affects the duration of trade. As Germany is more integrated in the global economy, their market is characterized by low sunk costs. The Russian market, on the other hand, is characterized by a lower level of economic integration and thereby also higher sunk costs. The conclusion we reach is that economic integration affects the duration of trade by affecting sunk costs.

Keywords: duration of trade, economic integration, sunk costs, Germany, Russia

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1. Introduction

Trade relationships seem to be dynamic although most trade theories would argue that trade patterns change slowly. Researchers have made a great effort in explaining why a country pair starts to trade a certain product. At the same time, not a vast amount of research has been dedicated to why countries stop trading. A trade relationship starts when import goes from zero to positive. It is considered as having an end when the trade flow (the import) is again equal to zero. The *duration* is the length of the period from when the trade flow starts to when the trade flow ends. A greater understanding of trade durations could lead to and expedite economic growth. It is possible that finding explanations to why country pairs stop trading a certain product can be as important as the research on the factors that initiate a trade relationship.

Tibor Besedeš and Thomas J. Prusa presented the first research paper on the duration of trade in 2006 (Besedeš and Prusa, 2006a). They simply analyze the median duration of trade flows. In other words, they investigate how long time it takes until a trade flow of a particular product “dies”. The previous literature in this field is not extensive since it is a new perspective of analyzing trade dynamics. However, for the present there exists a consensus that durations are short in general. The length of trade durations is found to be between one and four years for different case studies.

The interesting question considering the findings on the duration of trade is; which factors affect the duration of trade, and how? A majority of previous research focuses on finding explanatory variables to the short durations. This paper focuses on the effect of economic integration.

The aim of this paper is to empirically investigate if there is a correlation between the duration of trade and economic integration. In order to see the effect of economic integration, a comparative approach on Russia and Germany has been applied. To investigate if economic integration can be seen as an explanation to the difference in the duration of imports, Germany and Russia have been chosen since they vary a lot regarding the level of economic integration. Germany is a member of the WTO, one of the founder members of the EU and has an extensive trade with foreign countries. The political and economical climate in the country is stable which leaves foreign countries certain about the market. As members of the

WTO and the EU, Germany adopts trade policies that are intended to facilitate trade and thereby lower trade costs. Russia, on the other hand, has only been open towards trade for merely 20 years and has under this paper's time period of analysis not been a member of the WTO or the EU¹. This makes Russia significantly less integrated in the global economy. Costs of exporting to Germany are thereby assumed to be lower than costs when exporting to Russia.

In order to observe the effect that economic integration may have, our empirical strategy is focused on how economic integration affects sunk costs of exporting. This paper argues that sunk costs are positively correlated with the length of the import duration. The explanation is found to be that a higher level of economic integration has a tendency to lower sunk costs. Germany is characterized by low sunk costs due to a high level of economic integration. A lower level of economic integration and thereby also higher sunk costs characterizes Russia, in comparison. This implies that Russia experiences longer import duration.

To date, there is only one paper, written by Besedeš (2011), that has had such a focus. It is a case study on how the establishment of NAFTA has affected export duration. Export duration from NAFTA-member countries differs significantly depending on whether the export is to other members of NAFTA or to non-member countries. As our paper analyzes the correlation between economic integration and the duration of trade by comparing two countries significantly different concerning economic integration, the perspective of this paper is distinctively separated from Besedeš's.

Import data from the United Nations Comtrade database for Russia and Germany, with the rest of the world as exporters, is used and covers the time period 1993-2008 for Germany and 1996-2008 for Russia. These years have been chosen in order to have as homogeneous a time period as possible. Prior to these years, both countries had to deal with huge economical as well as political issues. By using the Kaplan-Meier estimator², the conclusion that Russia experiences *longer* import durations than Germany is reached.

¹ Russia is however a member of other trade agreements (see section 3)

² The use of the Kaplan-Meier methodology constrains the possibilities to observe effects of different variables. However, this paper has a new perspective compared to previous research on the duration of trade and thereby a simple method is to prefer.

The paper is organized as follows. Section 2 describes previous research relevant on the subject. Section 3 describes Germany and Russia and their respective economic integration. Thereafter Section 4 is a discussion of expected results. Section 5 then follows, describing the methodology and data sample used in this paper. Section 6 presents and discusses the results, Section 7 then summarizes.

2. Previous Research on the Duration of Trade

The incentive countries may have to start trading with one another has been the central part of traditional trade theory. However, no theory on why trade stops and resumes has yet been presented. This contributes to a discussion about the duration of trade. There is not a vast amount of reports on this topic as the area of research is relatively new. A majority of the research reports have reached the same result; the duration of trade is usually short. The median duration of trade is found to be between one to four years. The focus in the existing literature is therefore on finding plausible explanations to the short-lived trade flows.

Earliest research is from 2006 and a paper by Besedeš and Prusa (2006a). They focus on the duration of US imports from 160 countries during the time period 1972-1988 at the 7-digit Tariff Schedule of the United States. Their results indicate that the duration of imports to the US is short, a majority having a duration of less than four years. They also find that the first trading years are the most critical ones. If a trade a flow succeeds to survive the first few years, the probability of failure decreases substantially (Besedeš and Prusa, 2006a). These conclusions are reached using the Kaplan-Meier methodology. The Kaplan-Meier estimator is used to calculate the time it takes until an event occurs. When used within the research of trade duration, it is used to estimate the time it takes for a *spell* to cease. A spell is a period of time with uninterrupted import of a given product (or product group) from a specific country. As the Kaplan-Meier estimator is the model used in this paper it will be described in greater detail in section four.

Besedeš and Prusa's first paper was merely an introductory paper on the topic and was the first to reach the conclusion that trade duration is short. In search for explanations, in the form of product characteristics, an additional paper was presented (Besedeš and Prusa, 2006b). As

the paper's aim is to analyze product characteristics' effect on the duration, variables for product characteristics possible affecting trade are created and a regression model is used. In the analysis, products are categorized into three groups depending on their characteristics (differentiated, homogenous and reference priced). Using a Cox proportional hazards model (Cox model) allows them to test these explanatory variables. The Cox model is a type of survival analysis model. In the context of trade durations, it can be used to estimate the effect that different country and product characteristics may have on the hazard rate of a spell failing. With use of the same data set as Besedeš and Prusa (2006a), they found that the duration of imports for homogenous goods is shorter than that for differentiated goods and that duration is positively correlated with the initial value of the trade flow. They also show that a depreciation of the exporter's currency, higher Gross Domestic Product (GDP), higher tariffs as well as lower transportation costs contribute to longer durations (Besedeš and Prusa, 2006b).

Although the Cox model may be convenient to use when analyzing the factors that can affect the duration of trade, there are three main reasons why it is inappropriate to use this model. Hess and Persson (2011b) present the following reasons:

- The data on trade is annually observed; the data sample therefore consists of several tied durations. In other words, spells are observed as if they are of the same length. This is something that the Cox model has difficulties handling and may lead to misleading results for the explanatory variables included in the regression.
- It is not able to observe differences on independent observations within the sample (referred to as unobserved heterogeneity). This can lead to a bias in parameters and therefore the observed pattern for a whole population may be different from patterns for individual observations.
- The Cox model assumes proportional hazards. The effects of explanatory variables on the hazard rate are assumed to be constant across the whole duration; this may not be empirically

correct and therefore may lead to bias in the estimated effect of explanatory variables.

Hess and Persson (2011b) present discrete-time models that are able to deal with unobserved heterogeneity, the assumption of proportional hazards and tied durations. Replicating the study by Besedeš and Prusa (2006b), Hess and Persson find empirical evidence in support of all the theoretical arguments raised against the Cox model.

Another paper by Nitsch (2009) investigates German imports between 1995-2005 at the 8-digit product level with data derived from Eurostat. Both a Cox model and Kaplan-Meier survival estimates are used to evaluate the data. His results are in line with the results presented by Besedeš and Prusa (2006a,b); differentiated goods face lower hazard rates, larger initial values increase the duration and the median trade duration is just one year. Nitsch argues that this may be a cause of the fact that differentiated products are non-standardized and therefore harder to substitute for, which stands in contrast to homogenous products where there are many producers on the market. This naturally leads to closer and longer trade flows for differentiated goods. GDP and common language are also found to lengthen the duration of trade (Nitsch, 2009).

Fugazza and Molina (2009) broaden the field of research by extending the Cox model. They allow the effects of different explanatory variables to differ over time. Thereby, they relax one of the three problems of using the Cox model; the assumption of proportional hazards. Their sample period is during 1995-2004 and they use data for 96 trading countries. Data is derived from the United Nations Comtrade database at the 6-digit level. The model includes exporters' GDP, initial size of exports, type of product and the fixed costs required to export as independent variables (Fugazza and Molina, 2009). The fixed cost in Fugazza and Molina's model is defined as the time (in days) it takes for the exporter to finish all the procedures required for exporting a product. They use data from the Doing Business project and conclude that high export costs increase the hazard rate. Results regarding their other dependent variables are all consistent with previous research (Fugazza and Molina, 2009). However, it should be noted that Fugazza and Molina are not consistent throughout their paper regarding terminology and therefore it is at times difficult to find clear conclusions.

Hess and Persson (2011a) analyze import data to EU-15 countries individually during the

sample period 1962-2006. The data sample is derived from the UN Comtrade database at the 4-digit level. As argued for, by Hess and Persson (2011b), a discrete-time duration model is used in the analysis where they control for both importer and exporter characteristics. Results indicate that EU imports face a median trade duration of just one year. The short durations are constant throughout the whole time period analyzed. Further, the hazard rate seems to be decreased when export is diversified, in the sense of number of products as well as number of markets.

To summarize, traditional trade theory explains when the countries will start trading and why, but not as often describes when countries stop trading and the reasons to it. The earliest research on the duration of trade (Besedeš and Prusa, 2006a) reached the conclusion that trade flows are short-lived in general. Thereafter, studies with the aim of finding explanatory variables have emerged. Variables identifying product and country characteristics that explain *differences* in duration have been presented but yet there is no theory explaining *why* durations are short.

2.1 Economic Integration and the Duration of Trade

Previous research within the field of trade duration has not to a great extent examined the effect that economic integration may have. However, a recent paper by Tibor Besedeš (2011) highlights the issue and investigates the role that the North American Free Trade Agreement (NAFTA) and returns to scale has on export duration. The data used in the paper is annual data on export flows for the member countries (Canada, Mexico and the US) from 1990 to 2007. The data for Canada and Mexico is derived from the UN Comtrade Database and for the US from the US Census *U.S Exports*. A probit model is used to exclude the assumption of proportional hazards, which otherwise has to be assumed when using the Cox model.

Prior to the enforcement of the NAFTA-agreement, the current member countries faced lower hazard rates when exporting to one another. A plausible explanation can be that the countries originally are natural trading partners; they are for example geographically very close to each other. The results of Besedeš indicate that the establishment of the NAFTA has increased the hazard rate for Mexico and the US. However, the increase of the hazard rate is not large

enough to make the hazard rate for exporting within NAFTA higher than the hazard rate when exporting to non-members. In other words, the agreement has increased the hazard rate, but the member countries can still experience a lower hazard rate when exporting within NAFTA compared to when exporting to non-member countries. One of the explanations for the increase in hazard rate for intra-NAFTA exports given by Besedeš is that more firms are persuaded to penetrate additional markets within the FTA, due to the reduced costs of supplying a larger market. However, some firms are not able to handle the new competition and this results in failure of a trade flow. A reason to why the members of NAFTA still experience a lower hazard rate for intra-NAFTA exports can be linked to Besedeš second approach in the paper; the role of returns to scale. When entering a larger market, firms can have a larger scale of production and increase productivity. This in turn leads to increased production and thereby increased exports for the countries within the free trade agreement (FTA). Further, Besedeš analyzes different sub periods within the time period of analysis and finds that the onset of NAFTA has had different affects on the hazard rate. This is a possible reflection of the fact that it takes time for firms to adjust to the affects that a FTA can have.

The role of returns to scale in export duration is the second point of the paper. Besedes finds that manufacturing products characterized by increasing-returns-to-scale exported from Canada and Mexico experience the highest hazard. For the US, this is true for natural resource products characterized by increasing-returns-to-scale. Mexico is the only country where a difference amongst the hazard rates for the three various product types is recognized. The results show that the lowest hazard rate is found for products categorized by increasing-returns-to-scale (Besedeš, 2011).

When looking at exports to non-member countries, a variable indicating the economic risk of an economy is included in the model. Results indicate that exports from the US to riskier economies are characterized by a lower hazard rate. This could reflect the effect that uncertainty may have on the decision to export. The decision to export to a riskier economy would first be taken once one is certain. This would result in a stable and perhaps more long-lived trade relationship. At the same time, the economic risk of an economy has no significant effect on the hazard rate on exports for Canada. For Mexico, the exports face a higher hazard.

The effect of the establishment of the FTA seems to differ amongst the three NAFTA-members. In contrast to other previous research on the duration of trade, this paper finds that

the effect of NAFTA is export specific rather than product specific. In other words, the results found concerning the hazard rate of different products is not dependant on product type but rather on the exporting country.

The main conclusions drawn by Besedes (2011) are that, first, economic integration may lead to increased hazard rates and thereby shorter trade durations, and two, that economic integration leads to lower hazard rate due to the fact that firms enjoy the benefits of a larger market.

3. Descriptions of the Countries under Study

The aim of this paper is to empirically investigate if there is a correlation between the duration of trade and economic integration. Our empirical strategy is to analyze how economic integration affects sunk costs of exporting and it is therefore vital to present trade agreements that Germany and Russia are engaged in. In this section their economic integration with the rest of the world will be described.

3.1 Germany

Germany is since 1990 a federal republic and consists of 16 states. It is situated in the northern middle of Europe and shares borders with Poland, Denmark, Austria, Switzerland, France, Luxembourg, Belgium, the Netherlands and the Czech Republic. For a long period of time Germany has been among one of the world's four largest economies and in 2008 their GDP was equivalent to approximately \$3,600,000 billion measured in current prices (IMF, 2011). It is, and has for a long time been, the primary industry country in Europe. As Germany is one of the European Union's greatest economies and founder, it has a vital role in the Unions political and economical agenda.

It is difficult to neglect the historic events during the second half of the 20th century when looking at the country's economy. During the post war period of the Second World War, the

country was economically weak. The country was divided in two parts; West and East Germany. West Germany managed to recover from the weak economic circumstances through structural reforms concerning labor, economy and technology. Meanwhile, East Germany adopted an opposite socialistic policy and did not recover from the aftermath of the war in the same pace as West Germany. 1990 is a historical year for the country- East and West Germany unified, leading to the formation of the Federal Republic of Germany. Concerning integration and future policies, this was an essential first step.

Germany is an interesting country to study due to its high level of integration, its extensive foreign trade and the country’s activity in bilateral as well as multilateral negotiations. Increased competition between firms and freer trade are policies that Germany argues for in trade negotiations and is an indicator of what policies Germany aims to achieve.

Table 1: Germany’s Main Trading Arrangements

Agreement	Members	Type of Agreement	Enforced
EU	Austria (1995), Belgium (1952), Bulgaria (2007), Cyprus (2004), Czech Republic (2004), Denmark (1973), Estonia (2004), Finland (195), France (1952), Germany (1952), Greece (1981), Hungary (2004), Ireland (1973), Italy (1952), Latvia (2004), Lithuania (2004), Luxembourg (1952), Malta (2004), the Netherlands (1952), Poland (2004), Portugal (1986), Romania (2007), Slovakia (2004), Slovenia (2004), Spain (1986), Sweden (1995) and the United Kingdom (1973)	Customs Union Monetary Union for the following 17 countries (year adopted): Austria (1999), Belgium (1999), Cyprus (2008), Estonia (2011), Finland (1999), France (1999), Germany (1999), Greece (2001), Ireland (1999), Italy (1999), Luxembourg (1999), Malta (2008), the Netherlands (1999), Portugal (1999), Slovakia (2007), Slovenia (2007) and Spain (1999)	1952
WTO	153 members in 2008	Based on rules agreed upon the members through negotiations	1995

Source: WTO (2008), The European Commission (2011a, 2012)

Germany is one of the founder members of the European Coal and Steel Community, the predecessor of the European Union. The cooperation started in the early fifties with the following six member countries; Belgium, France, Italy, Luxembourg, Netherlands and

Germany. Even if the union has experienced several expansions resulting in 27 current member countries, the founder members have been the driving forces within EU. The EU is a close cooperation and member countries have become more integrated throughout time in continuous steps. The possibly most important aspects of the integration process in the case of Germany is that: (i) EU is a customs union, meaning that free trade exists within the union and member countries have a common foreign trade policy, and (ii) 17 of the member countries, including Germany, have joined the currency union, the European Monetary Union (EMU). The latter was established in 1999 (bills and coins were in place by January 2002), during this papers sample period. A large amount of German imports come from other member countries of the EU. Four out of the country's five main trading partners are members of both the EU and EMU. The country that stands for the greatest amount of exports to Germany is the Netherlands, which stands for 12.4 percent of the total German imports. Thereafter France, Belgium, China and Italy come, with a decreasing share of Germany's total imports. At least 33.4 percent (the amount for France, Belgium, the Netherlands and Italy) of Germany's imports is traded without tariffs and non-tariff barriers to trade (The European Commission, 2009).

Germany became a member of the General Agreement on Tariffs and Trade (GATT) in 1951. GATT was merely a set of rules for Western economies after World War II and the predecessor to the WTO. In a global context, the WTO can be seen as the broadest multilateral trade institution. A membership is one of the first stages of integration to the global economy. One of the WTO's most important aims is to facilitate and increase the volume of trade. If the WTO manages to facilitate the trade process, by increasing transparency and supplying members with information, sunk costs of trade would be lowered. Even though this is one of the main aims of the WTO, there exists a discussion on whether or not this is empirically correct (see section 4 for further discussion).

GATT consists of a set of rules that affect countries trade policies. It regulates countries use of distorting measures; customs tariffs are generally the only trade instrument allowed with exception for agricultural goods, as long as quantitative restrictions and domestic measures are covered by Article XI and the national treatment rule (covered by Article III) (Hoekman and Kostecki, 2009, p.185). For members in the WTO there is always a maximum level of trade barriers allowed due to bound tariffs and the Most Favoured Nation (MFN) rule. The WTO also consists of a Dispute Settlement Body (DSB), which works as a forum for

resolving disputes. This could be thought to prevent countries from adopting unilateral measures in a dispute, which otherwise could be the case when a negotiating forum is not present (Hoekman and Kostecki, 2009, p. 89). Consequently, a membership in the WTO matters for both member and non-member countries as sunk costs are more transparent due to the policies of the organisation.

So, to summarize, Germany is to a large extent integrated in the global economy, its membership in the WTO and EU strengthens this statement. The country's trade policy is not either characterized by high tariffs or other non-tariff barriers to trade. Sunk costs associated with trading with the country are not considered to be high.

3.2 Russia

Russia is since 1991 a federation and is in terms of geographical size the world's largest country. In 2008 Russia's GDP was worth \$ 1,300,000 billion measured in current prices (IMF, 2011). Between 1922 and 1991 Russia was a part of the socialistic state, the Soviet Union. Apart from Russia, it consisted of 15 other republics, which became subsequent states when the Soviet Union collapsed in the end of 1991.

The Russian economy has undergone a large transition from a plan economy to a market economy since the collapse of the Soviet Union. The transition has been a step in the right direction concerning integration in the global economy. Although the country has undergone huge reforms, problems with corruption and bureaucracy have hampered the process. During the transition many functions of the former economy vanished; the old institutions disappeared and new institutions were not created since policy makers did not prioritize it and the knowledge of institutions' role in a market economy was nonexistent (European Bank for Reconstruction and Development, 2006). The institutional environment of a country cannot over night adapt to a market economy; this process takes time, especially for domestic institutions. Economical reform does not only call for development of existing institutions, but also for the creation of new institutions implementing new regulations. Russia's present institutional weakness can be seen as a result of the economic transition taking place in the 1990's (Broadman, 2004). Even though Russia has improved its institutions, existing

problems with corruption does not facilitate the necessary development of creating sufficient institutions supporting a market economy.

As for Russia’s integration process, it stands in sharp contrast compared to Germany’s process. Russia has not been a member of the WTO or the EU during the sample period. Russia applied for a WTO membership in 1993 and this was a step towards a more integrated nation. After 18 years of negotiations, Russia became a member of the WTO on the 16th of December 2011. However, Russia will be analyzed in this paper as not being a member of the WTO, since the time of analysis is prior to its membership.

Table 2: Russia’s Main Trading Arrangements

Agreement	Members	Type of Agreement	Enforced
CIS	Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Krygyz Republic, Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine and Uzbekistan	Free Trade Agreement	1994
CEZ	Belarus, Kazakhstan, Russian Federation and Ukraine	Free Trade Agreement	2004
EAEC	Belarus, Kazakhstan, Krygyz Republic, Russian Federation and Tajikistan	Customs Union	2000
The Partnership and Co-operation Agreement	EU and Russian Federation	-	1997

Sources: World Bank, WTO (2011), The European Commission (2011a, 2011b)

Even though Russia has not been a member of the WTO between 1996 and 2008, Russia has been engaged in two free trade agreements: the Common Economic Zone (CEZ) and the Commonwealth of Independent States (CIS). The CEZ was established in 2004 and the CIS in 1994. A FTA is an area that removes internal tariffs, i.e. members trade without variable costs due to tariffs. A customs union for trade in goods named the Eurasian Economic Community (EAEC) has been active since 1997. A customs union indicates a higher level of integration compared to a FTA. In addition to the removal of internal tariffs, member countries adapt a common external trade policy. The members of the various agreements are listed in table 2. It should be noted that the economies in which Russia has trade agreements with are

considerably smaller than the countries in which Germany is engaged with. Additionally, Russia has a number of bilateral trade agreements (WTO, 2011).

Even though Russia is not a member of the EU, it is closely engaged with it through a Partnership and Cooperation Agreement (PCA). It was established in 1997 and contains agreements on both political and economical issues. One of its main objectives has been to promote trade and cooperation between the EU and Russia. Within the PCA, the EU and Russia in 2003 established Common Economic Spaces (CES) with the aim to: i) reach a deeper economic integration through common rules on trade, ii) open markets, and iii) remove trade barriers. Further, Russia is dependent on exports from the EU, which in 2008 accounted for 43.9 percent of Russia's total imports (The European Commission, 2011c).

Prior to 1991 Russia was a closed economy and this can partially explain the underdevelopment of integration and foreign policy. During this paper's sample period (1996-2008), Russia has moved towards deeper integration, which is indicated by the trading relationships developed during the time of analysis. Russia is at present an open economy and is not characterized by high tariffs. However, the Russian market *is* characterized by deficient domestic institutions resulting in a complex tariff structure, corruption, and a lack of transparency and effectiveness (Chowdhury, 2003). This makes Russia an uncertain and costly market to penetrate. This uncertainty can work as a trade barrier; it takes time to analyze and get information about the market and henceforth it is costly to adapt products to the Russian market.

The most important conclusion to draw, for the purpose of this paper, is that Russia is significantly less integrated in the global economy than Germany. The Russian market is not characterized by transparency and predictability and sunk costs are higher when exporting to Russia than to Germany.

4. Economic Integration and the Duration of Trade

Economic integration is often referred to as the removal of trade barriers and non-tariff barriers to trade. The presence of barriers causes costs when countries engage in international

trade. Costs will thus most probably have an effect on the duration of trade. The following section will first describe how sunk costs could affect the duration of trade, thereafter how economic integration affects sunk costs and finally how economic integration affects the duration of trade by having an effect on sunk costs.

4.1 Theoretical Discussion and Empirical Hypothesis

In general terms, trade costs affect firms' decision to enter or exit an export market. In specific, sunk costs have an effect on how long time the exporter will serve a market. Sunk costs are unrecoverable and irrevocably committed to the investment (of imports in this paper) (Yang and Wang, 2001). More specifically, these costs can empirically be related to the work of establishing distribution channels and congregate information about the market structure. Sunk costs increase when the market is complex since it takes longer time to investigate the market structure. If a firms' exports cease to a specific country, the sunk costs persist but the fixed costs can be avoided by leaving the foreign market. Sunk costs can be seen as a once-for-all-cost, whilst fixed costs are costs that have to be payed every period and are futher not dependant on the volume. A new entrant to a market has to cover both fixed and sunk costs. Once the firm has paid the market entry costs, it will not exit the market until revenue minus variable costs have covered the sunk and fixed costs (Owen and Ulph, 2002). Consequently, this leads to *longer* trade durations; exporters will not cease exporting even though they experience an occasional loss since they reluctantly want to pay the sunk cost again if they re-enter the market. When the investment for a market asset increases, so does the probability of the relationship being utilised for a longer time (Rover et al, 2009). This reasoning can be supported by the argument put forward by Besedeš and Prusa (2006b). They briefly argue that higher sunk costs can be an explanation for longer durations; if it is costly to establish a relationship, the probability of a continued relationship will increase. In other words, higher sunk costs will plausibly lead to longer durations.

Different forms of economic integration and trade agreements have different effects on sunk costs of entering a market. Some forms of economic integration can reduce sunk costs by harmonizing markets and increasing transparency.

Many research papers investigate how countries' memberships in the EU and the WTO affect

trade. Caroline Freud presents a paper of the effects of an entry to the EU and the difference between the *founder* members and those whom entered later. Her results show that there is a difference in trade volumes; founder members trade more with each other than with countries that later joined the union. The explanation to her results can be that the sunk costs are lower between the founder members; they have already invested in each other's markets. The markets are harmonized and there is no need for analyzing the other market (a form of sunk cost) before exporting. Deeper integration will in this sense lead to lower sunk costs. This makes them commit to exporting more to those countries they are *certain* about and to which lower sunk costs are present.

As mentioned in section 3.1, Germany is a member of the EMU. Having a common currency with other EU-members can have an affect on sunk costs. The thought behind this is that exchange rate uncertainty decreases when having a common currency. This would naturally facilitate countries entering- and exit processes to the market since the problem with exchange rate uncertainty does not have to be taken into consideration. Exchange rate uncertainty can be seen as a sunk cost that is removed when having a common currency. Consequently, if this cost can be ignored it can be seen as if trade has been facilitated. More certain trade relations would make it easier to enter, leave and re-enter the market since one knows what's expected. On the other hand, common currency could make import duration longer since the risk of exchange rate shocks is removed. As mentioned before, the elimination of exchange rate *uncertainty* when introducing a common currency can be one possible explanation for lower sunk costs and the increased trade volumes.

Since Germany is a member of the WTO, the possible effect on costs should be considered. Being a member of the WTO can have (or not have), an effect on trade flows and volatility. Volatility, in this context, measures the stability of trade flows. The stability of trade flows indicates how much the value of the trade flow varies over time. Low volatility thus means that the trade flow is stable, i.e. the value does not vary much over time. Even though one of the WTO's main aims is to make trade flows more stable and predictable, previous research argues that being a member of the WTO does not lower the volatility of trade. Since the stability of trade flows does not increase, Rose argues that the WTO would not affect the *level* of trade either (Rose, 2005). If the WTO does not increase the stability of trade flows, this indicates that the value of trade flows is not constant over time. The value varies over time and therefore the probability of that the trade flow is equal to zero, is higher compared to if

the trade flow would be stabilized over time. In turn, this implies that short durations are more frequent when stability is low.

Concerning the WTO's effect on trade flows; research in this field is not consistent. Some papers argue that the WTO does not enhance trade, which could mean that costs are not lowered due to a WTO-membership (Rose, 2004). In contrast to these findings, other research papers show a robust and large positive effect on trade flows as a consequence of membership in the WTO. This would, in other words, indicate that costs would be reduced when being a member of the WTO (Subramanian and Wei, 2006).

The theoretical hypothesis concerning economic integration, sunk costs and duration is: low sunk costs for entering an export market will make it easier for firms to exit and re-enter the market. Since economic integration lowers the sunk costs of entering an export market, countries that are part of economic integration agreements will face a higher hazard of import flows dying.

In this paper, comparing survival rates for Germany and Russia will test this hypothesis. As argued, Germany is much more integrated in the world economy than Russia and we could therefore expect, given our theoretical hypothesis, that Russia experiences longer import durations than Germany. Our empirical hypothesis is thus as follows: Russia will face longer import durations in comparison to Germany.

5. Empirical Methodology

As this paper deals with the duration of imports, a type of survival analysis model is applied. The Kaplan-Meier methodology is used as an estimator in survival analysis. Survival analysis is used within several fields of research to estimate the time taken until an event occurs. In this paper, the Kaplan-Meier estimator will be used to estimate the survival probabilities of Russian and German import spells.

The estimator is used to calculate the survival estimates of a spell. A spell is defined as a

period of time with uninterrupted import of a given product (or product group) from one specific country. A trade relationship can consist of several spells. For example, a certain country can enter a market in for instance Germany, then it can exit the market and then re-enter again. This can then result in multiple spells within one trade relationship. Using the Kaplan-Meier estimator within the context of trade durations, spells can be seen as individual observations. When a spell ceases, i.e. when observed import ends during a trade relationship, it is referred to as a *failure*.

The Kaplan-Meier estimator is used to calculate the unconditional probability that a spell will survive year t . In order to interpret the Kaplan-Meier estimator correctly, it is important to note that year t denotes the duration of the spell and not the calendar year. Calendar time is different from analysis time. In other words, when $t=1$, it does not refer to 1993 (for Germany) or 1996 (for Russia) but rather to the fact that a spell has been active for one year; independent of in which calendar year it was initiated.

If the spell has not ceased at the end of the sample period, there is an uncertainty concerning when the spell actually ceases. The Kaplan-Meier estimator is robust towards this and the problem is known as right-censoring. In the data sample for this paper, if spells have not ceased prior to 2008, they are referred to as censored.

The estimated survivor function takes the following form:

$$\hat{S}(t) = \prod_{t_i \leq t} (n_i - d_i / n_i)$$

where t_i is the survival time and n_i is the number of spells at risk of failing prior to t_i . The number of failures is denoted by d_i . Censoring is being considered due to the fact that n_i is the number of spells *at risk* at the beginning of each year i . In other words, n_i is the number of survived spells from the previous year, minus the number of censored spells. In this way the Kaplan-Meier estimator makes use of information from both censored and non-censored spells.

Previous research primarily uses the Cox model in their analyses, enabling the researcher to include explanatory variables. This is not possible when only making use of the Kaplan-Meier

estimator and is thus clearly one of the disadvantages with using this method in the context of trade durations³. However, it is beneficial to use the Kaplan-Meier estimator due to the fact that it yields a non-parametric estimate of the survivor function $S(t)$. It does not take on a predetermined form; the information is directly derived from the data sample used in the specific case.

5.2 Data

In order to analyze German and Russian imports from all countries, data on imports from the United Nations Comtrade database is used. For Germany, annual data is derived for the years 1993-2008 and for Russia the corresponding is for the years 1996-2008. Import data for Russia is not available prior to 1996; therefore we have different time periods for the two countries. The Standard International Trade Classification (SITC) revision 3 classifies the level of aggregation. The trade data in this paper is used at the 2-digit level creating 162307 observations. Due to time-and space-constraints, a narrower product level is not used. Further, the advantage of using SITC is that the products are not reclassified during sample periods. Reclassifications would cause a censoring problem.

The focus in this paper is to analyze data for bilateral trade relationships in a descriptive way with Germany and Russia as importers and the rest of the world as exporters. Import data is used in order to minimize data problems. Exports are self-reported which results in a higher possibility that export data is misreported. Theoretically, we have used the exporters perspective in order to get the import data for Germany and Russia. Therefore data on imports tends to increase the robustness.

If a mean value would to be calculated, it would be found problematic that Russia's time period of analysis is only 13 years meanwhile the corresponding time period for Germany is 16 years. However, this is not a problem when using the Kaplan-Meier estimator. This simply means that survival estimates for Russia will not exist after 13 years; it does not affect the survival estimates robustness for earlier years. This is an advantage of using Kaplan-Meier

³ If it would be desirable to include explanatory variables, one of the models described by Hess and Persson (2010b) could be applied.

survival estimates when analyzing and comparing samples with different maximum durations.

6. Empirical Results

The observed spells for imports to Germany in the beginning of year one are counted to 19 410 spells. The data sample for Germany analyzes a time period of 16 years, therefore the minimum value of a spell is 1 year and the maximum value 16 years. The mean duration of imports to Germany is 5.47. When calculating the mean, censoring is not taken into account and therefore the mean gives a misleading picture of the durations of the spells. The standard deviation is high which indicates that the distribution of the true value of individual durations is widely spread in relation to the mean. A high standard deviation indicates a lower robustness in the results.

Table 3: Descriptive Statistics for Germany

<i>Variable</i>	<i>Observed spells</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>Min</i>	<i>Max</i>
Duration	19 410	5.47	6.01	1	16

The number of observed spells for imports to Russia are counted to 10 671, a lower number than for Germany. This is however not surprising due to the fact that Germany has data for additionally three years. The mean duration for imports to Russia is 5.25 years. This however gives an incorrect measure, as mentioned above. For Russia, the minimum duration of a spell is 1 year and the maximum is 13 years. The mean for Russia is therefore lower than it would have been if the maximum length of a spell had been 16 years. This gives an incorrect picture of the duration of imports when comparing Germany and Russia. However, as described in section 5, this is not a problem when using the Kaplan-Meier estimator. For Russia, as for Germany, the standard deviation is high which indicates that even in this case the distribution of the true value of individual durations is widely spread in relation to the mean.

Table 4: Descriptive Statistics for Russia

<i>Variable</i>	<i>Observed spells</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>Min</i>	<i>Max</i>
Duration	10 671	5.25	5.02	1	13

Table 5 shows results for the Kaplan-Meier survival estimates, i.e. the unconditional probability of surviving each year. A high value of the survivor function indicates a larger number of spells surviving. In this table, *fail* indicates the number of spells that have ceased at the end of the year. After the first year, 7 596 of the spells have failed. Thereafter the failures decrease at a decreasing rate. *Net lost* is the number of censored spells. The value for *net lost* in year one is 761. In other words, 761 spells were censored after a duration of one year. This is the number of spells commenced during the last year of observation, 2008. For these spells it is only known that import has begun, however it is unknown when the import resumes- it therefore only contributes to the survivor function the first year and is thereafter censored. Furthermore, the standard error is very low during all years, which indicates that the distribution of numbers is relatively low. The 95 percent confidence interval in table 5 indicates that the interval is narrow; the distribution is low and the estimate is relatively reliable. This makes the results robust.

The value of the *survivor function* for year one implies that a large number of spells fail during the first year. Almost 40 percent of the spells fail the first year; 61 percent of the spells survive the first year. The estimated Kaplan-Meier survival rate for year two is 49 percent, which means that approximately 52 percent of the spells have failed during the first two years. By observing the number of failed spells for every year it can be seen that the greatest difference in number of failures is between year one and two, approximately 12 percent. The survival rate difference between four years and five years is around 2.5 percent and the difference between fourteen and fifteen years is just 0.25 percent. This indicates that a large amount of spells fail during the first year, in comparison to the number of failures in the following years. Year one can therefore be seen as the year with the highest risk. In other words, if a spell survives year one, the risk of failing decreases at a decreasing rate. After sixteen years approximately 30 percent of the spells have survived and 70 percent have failed during the sample period, resulting in 4 023 spells left out of 19 410. The median duration for a spell is two years, this is found at the first year at which the survival function takes a value lower than 0.5.

Table 5: Kaplan-Meier Survival Estimates for Germany

<i>Time</i>	<i>Beginning total</i>	<i>Fail</i>	<i>Net lost</i>	<i>Survivor function</i>	<i>Standard error</i>	<i>95 % Confidence interval</i>	
1	19 410	7596	761	0.609	0.0035	0.602	0.616
2	11 053	2247	345	0.485	0.0036	0.478	0.492
3	8 461	962	202	0.430	0.0036	0.423	0.437
4	7 297	519	138	0.340	0.0036	0.392	0.406
5	6 640	418	118	0.374	0.0036	0.367	0.381
6	6 104	277	106	0.357	0.0036	0.350	0.364
7	5 721	181	128	0.346	0.0036	0.339	0.353
8	5 412	145	114	0.337	0.0035	0.330	0.344
9	5 153	87	110	0.331	0.0035	0.324	0.338
10	4 956	64	223	0.327	0.0035	0.320	0.334
11	4 669	49	75	0.323	0.0035	0.316	0.330
12	4 545	37	85	0.321	0.0035	0.314	0.327
13	4 423	47	101	0.317	0.0035	0.310	0.324
14	4 275	45	103	0.314	0.0035	0.370	0.321
15	4 127	33	71	0.311	0.0035	0.304	0.319
16	4 023	0	4023	0.311	0.0035	0.304	0.318

Table 6 displays the Kaplan-Meier survival estimates for Russia. It can be seen that even in the case of Russia a large number of spells, more than 30 percent, fail during the first year.

This is however a lower percentage than the corresponding for Germany. The median duration for a spell is here three years.

Approximately 56 percent of the spells have survived after two years which means that 44 percent has ceased. The largest percentile differences between all years is noticed between year one and two, around 11 percent. Between years eleven and twelve the difference in number of failures is only 0.17 percent. In other words, the first year seems to be the most critical one for a spells survival. The risk of a spells failure follows the same trend for Russia as for Germany; it decreases at a decreasing rate. When the sample period is over, there are approximately 40 percent spells have not yet ceased and 60 percent of the spells have failed.

Concerning the standard error and the confidence interval, the same accounts for Russia as for Germany. This indicates a robust result.

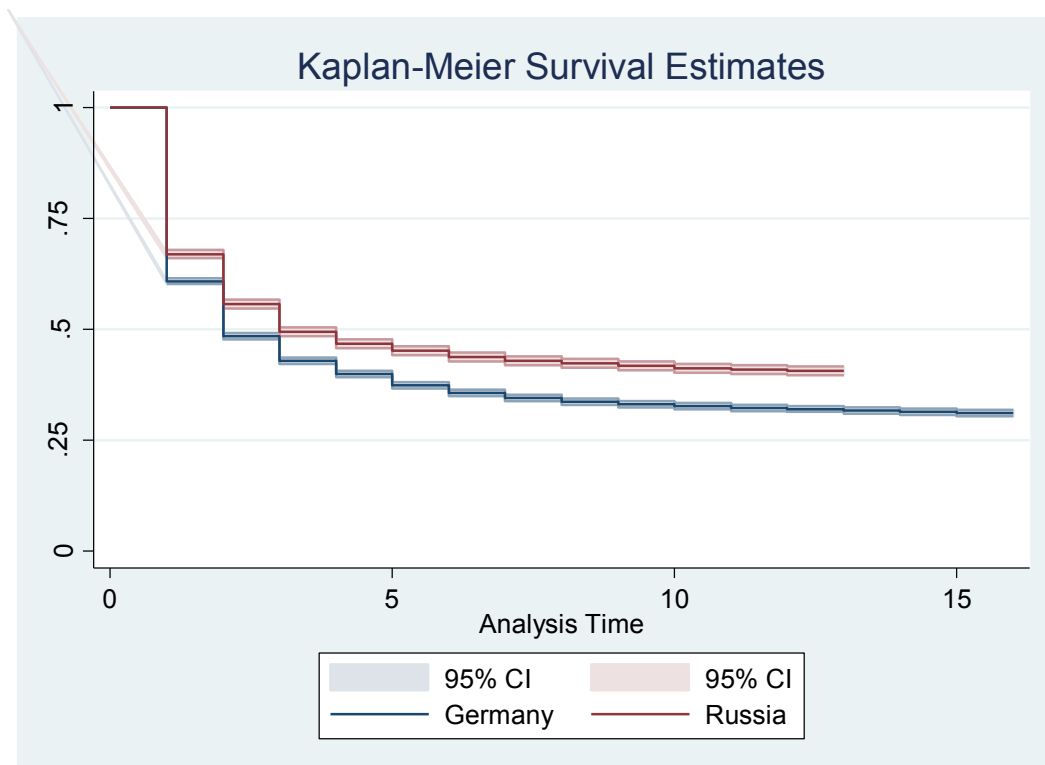
Table 6: Kaplan-Meier Survival Estimates for Russia

<i>Time</i>	<i>Beginning total</i>	<i>Fail</i>	<i>Net lost</i>	<i>Survivor function</i>	<i>Standard error</i>	<i>95 % Confidence interval</i>	
1	10 671	3524	561	0.670	0.0046	0.661	0.679
2	6 586	1111	284	0.557	0.0049	0.547	0.566
3	5 191	575	200	0.495	0.0050	0.485	0.505
4	4 416	243	154	0.468	0.0050	0.458	0.478
5	4 019	137	132	0.452	0.0050	0.442	0.462
6	3 750	113	102	0.438	0.0050	0.428	0.448
7	3 535	75	97	0.429	0.0050	0.419	0.439
8	3 363	47	103	0.423	0.0050	0.413	0.433
9	3 213	38	172	0.418	0.0050	0.408	0.428
10	3 003	41	127	0.412	0.0050	0.402	0.422

11	2 835	23	49	0.409	0.0051	0.399	0.419
12	2 763	12	58	0.407	0.0051	0.397	0.417
13	2 693	0	2693	0.407	0.0051	0.397	0.417

Graph 1 displays the results that can be found in table 3 and 4. It shows the survival rates on a yearly basis. There is a distinct difference between the survival estimates for Russia and Germany. It can be seen that Russia has higher survival estimates than Germany for all years up to 13 years. Moreover, the largest survival rate difference amongst Germany and Russia is during year two. Thereafter the curves decrease with roughly the same decreasing rate. The median duration of the spells for both Germany and Russia can easily be identified from graph 1 as the first year where the survival rate is less than 0.5, i.e for Germany the median is two years and for Russia the median is three years.

Graph 1: Kaplan-Meier Survival Estimates for Germany and Russia



6.1 Discussion of Results

Our research shows that import durations are relatively short for both Russia and Germany. The findings in this paper support Besedeš and Prusa's (2006a) first article about durations. Firstly, durations are in general short. The median duration for German imports is two years and the corresponding for Russia is three years. Secondly, the first trading years are the most critical ones. For Germany, approximately 40 percent of the spells have a duration of one year. The corresponding amount of spells for Russia that have a duration of one year is approximately 30 percent. For both countries, the survival rate thereafter decreases at a decreasing rate, i.e. if a relationship manages to survive the first years it is likely that it will survive a long time. Hess and Persson (2011a) conclude that the European Union's median duration of imports is approximately one year during the whole sample period, which is quite similar to the results found here for Germany.

Previous research on trade duration and economic integration has been used in order to find explanations to the observed difference. The result found in this paper is consistent with the hypothesis; low sunk costs for entering an export market will make it easier for firms to exit and re-enter the market. It should be noted that the two countries' GDP differ a large amount. Germany is almost double the size of Russia's GDP. For our results this indicates that the difference in survival estimates is underestimated, as previous research has found that higher GDP leads to longer duration.

Besedeš paper (2011) that analyzes the effects of NAFTA is the only existing paper within the field of research that relates to this paper's approach. Besedeš compares how the hazard rate for member countries' exports differ, depending on if exports are to member countries or non-member countries. His results indicate that NAFTA both increases and decreases the hazard rate. He explains that the increase in hazard rate for intra-NAFTA exports could be due to the fact that more firms are persuaded to enter the foreign market when the FTA is enforced. This could be the fact for the EU as well. As the EU is enlarged, and thereby also the German market, the market expands and firms have to adjust. This could lead to benefits for firms with products characterized by increasing-returns-to-scale, and henceforth also lead to exit for some firms. This partially supports our results. However, Besedeš analyzes two other factors and therefore does not to a great extent discuss the effects of economic integration. In addition, as this paper compares the duration of imports for two countries without making a

distinction depending on the source country of the imports, it is in a sense difficult to compare the two papers.

The results are consistent with the hypothesis that higher sunk costs due to a lower level of economic integration leads to longer durations. Germany's participation in the WTO and the EU leads to lower barriers to trade and thereby lower costs of importing. A large amount of their trade is therefore not subject to tariffs or other non-tariff barriers to trade. As the case may be for Russia, trade relationships that involve small values may not be initiated due to uncertainty of the Russian market. The uncertainty can act as a selection process sorting out small valued trade flows, i.e. trade flows with short duration. Summarized, the fact that higher trade costs leads to longer durations and the fact that economic integration probably reduces trade costs will in turn imply that deeper integration results in shorter duration. This is one of the plausible explanations for the finding that Germany experiences shorter import durations than Russia.

6.1.1 The Effect of Inadequate Institutions

High tariffs and non-tariff barriers to trade are the usual costs associated with trade. However, as the discussion above argues; there exist costs in other forms other than regular tariffs. The following discussion will argue that the inadequate institutional environment *within* Russia acts as a barrier to trade. Both Germany and Russia has undergone economic reforms in the past and this has had different impacts on domestic institutions. In Germany, institutions that existed during the pre-reform era could work as a base for new institutions, which were to be developed to adjust to new regulations. Russia, on the other hand needed to create new institutions functioning in a market economy (Carlin, 2010). Russia remains weak institutionally, and as mentioned in section 3.2, problems with corruption etc. do not seem to facilitate the process of creating adequate institutions easing economic processes.

The tasks of institutions are many but are most oftenly defined as informal and formal rules of behaviors, existing to enforce policies and regulations (Chepeta, 2007). Institutions do this by providing different actors in the economy with information. In this sense, institutions can ease economic processes, such as trade, by reducing uncertainty- and transaction costs. However, how well institutions actually reduce costs depends on the efficiency and quality of them.

Well functioning and effective institutions can lower transaction costs by ensuring that regulations actually lead to the wanted behaviour; they help economic actors adjust to regulations and facilitate the process of enforcing contracts. For an economy in transition, this is especially important. If institutions not are present to ease the adjustment; the adjustment to global standards takes longer time. It is first when institutions are able to implement regulations and policies that economic reforms towards a market economy have an actual affect. The difference in quality of institutions is partially dependent on i) how effective a government is on implementing regulations, and ii) corruption (Jansen and Nordås, 2004). Corruption causes uncertainty and problems with transparency in government policies and this in turn can complicate the creation and the tasks of domestic institutions. The efficiency of a market therefore tends to increase along with the development of institutions.

In other words, during the time period of analysis for this paper, Russia's lack of functioning domestic institutions and the presence of a complex tariff structure has in turn lead to high sunk costs for countries exporting to Russia. In line with previous argumentation; this results in a higher barrier to trade i.e. higher sunk costs, and in turn, leads to longer duration of imports for Russia and thus can partially explain the results found in this paper. Therefore, we want to stress that economic integration is probably one of several important factors when it comes to explaining why Russia faces longer duration than Germany.

7. Summary and Conclusion

The aim of this paper has been to empirically investigate if there is a correlation between the duration of trade and economic integration. In order to observe the effect of economic integration we have first looked at the effect of economic integration on sunk costs and thereafter the effect of sunk costs on trade duration. The Kaplan-Meier methodology has then been used to calculate survival rates for German and Russian imports; two countries that differ significantly concerning economic integration.

The results in our paper indicate that economic integration has an effect on the import duration. Our theoretical hypothesis has been that low sunk costs for entering an export

market will make it easier for firms to exit and re-enter the market. Further, we argue that higher sunk costs are present at a lower level of economic integration. Our empirical hypothesis has therefore been that Russia will face longer import durations in comparison to Germany. Our results support our hypothesis; Russia experiences longer import duration than Germany. The shorter duration for German imports, when compared to Russian, can be explained by lower sunk costs due to deeper economic integration. Furthermore, we argue that the weak institutional environment within Russia has a negative effect on trade. The lack of effective institutions can be seen as a secondary effect on durations. As a consequence, higher sunk costs lead to longer trade durations for Russia compared to Germany.

Using the Kaplan-Meier methodology creates some limitations. For example, we are not able to use any explanatory variables in our model. To include economic integration and domestic institutions as explanatory variables in a regression model could be an example of further research. A comparison of Russian imports before and after its WTO accession is another example. However, as there is almost no other paper that has the same perspective on the duration of trade, this paper could contribute to a first approach of the subject.

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