The Duration of Trade Relationships

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1. Introduction

When countries trade, how long do their trade relationships last? Are they exchanging products over long or short periods of time? To answer these questions, Besedeš and Prusa (2006a; 2006b) and Besedeš (2008) have studied the duration of trade relationships. These studies have found that international trade relationships are far more fragile than previously thought. The median duration of exporting a product to the United States is very short, on the order of two to four years. More recently, Besedeš and Prusa have also shown that brief trade duration holds for developed and developing countries (Besedeš and Prusa, 2007).

The finding that most trade relationships are brief is important given that trade theories suggest that most relationships will be long-lived. Under the factor proportions theory, trade is based on factor endowment differences, and since endowments change gradually trade patterns are likewise expected to evolve slowly. Once a country develops a comparative advantage in a particular product, that advantage should last. This suggests that once two countries begin to trade a particular product, the relationship is likely to persist, as endowments are rarely subject to large shocks. Similarly, the continuum of goods Ricardian trade model suggests that most of the product dynamics will be confined to borderline or marginal goods. Most products are located far away from the margin and hence will be regularly exported (or imported). Only the goods near the margin should display fragility.

Models of trade dynamics such as Vernon's (1966) seminal product cycle theory also suggest that trade relationships will be long-lived. Technological leaders develop and export a product until others learn how to manufacture it and enter the market. As technology becomes more standardized, other countries will begin to produce and export the product. If follower countries have relatively low labor costs, they will eventually take over the market and push out the leaders. Product cycle models imply a fairly predictable pattern of trade dynamics where dynamics evolve either slowly or in a logical progression from developed to developing countries. Melitz's (2003) seminal paper also suggests that relationships will be relatively long-lived; once a firm makes its sunk cost investment to export, the ongoing cost of servicing a foreign market is modest; said differently, in the Melitz formulation once relationships are established they will tend to be robust.

Our results indicate that more is happening at the micro-level than suggested by the dominant theories of trade. Not only is there a remarkable amount of entry and exit in the US import market, but the period of time a country is 'in' a given product market is often fleeting. The vast majority of exporting relationships are only active for a short period of time. More than half of all trade relationships are observed for a single year and approximately 80 per cent are observed for less than five years. Relatively few relationships survive 10 years, but those that do account for a disproportionate amount of trade. The results are remarkably robust to a large number of alternative empirical specifications and data sets.

The results suggest that entering an export market—growth along the extensive margin—is no guarantee of long-term export presence. Most products sold by most countries to most destination markets will not be exported within a few years. These findings should spur trade economists to re-examine export incentives and should serve as a warning to exporters that breaking into a market is no guarantee that they will be servicing the market for more than a fleeting moment.

The remainder of the paper is organized as follows. In the next section we will discuss the data used and discuss how we define trade relationships, spells of service, duration, and so on. In Section 3 we present our main findings. In Section 4 we discuss the extent to which a matching model of trade can explain the duration phenomenon. In Section 5 we briefly mention recent work that applies Besedeš and Prusa's (date) approach to other datasets and which confirms our findings.

2. Trade Relationships and Spells of Service

Firm-level export and import transaction data are not widely available, so instead the empirical analysis is based on bilateral 'tariff line' import statistics. Using highly disaggregated data for duration analysis is imperative. The more aggregated the data, the more the analysis identifies industry trends rather than competitive dynamics at the product level. That country *c* in industry *j* has a long duration may tell us little about duration of commodity trade or underlying trade dynamics.

Line item data are the most disaggregated trade data widely available.[1] For most of our discussion we will focus on the United States as the destination market of interest. One limitation with using highly disaggregated trade data is that the product classification system was changed in 1989, so our product level analysis often appears into two distinct subsets: pre- and post-1989.[2] From 1972 through 1988 import products were classified according to the 7-digit Tariff Schedule of the United States (TS). Since 1989 imports have been classified according to the 10-digit Harmonized System (HS).[3] The United States is the only country we know of where line-item trade data are consistently available prior to 1989. We later use the more aggregated SITC bilateral trade data to create longer time horizons and also to check robustness of our disaggregated results.

Table 1: Summary Statistics

[1] US line item data has been compiled by Feenstra (1996) and was later augmented by Feenstra, Romalis, and Schott (2002). For other countries the UN's Comtrade database provides line-item bilateral trade data—http://comtrade.un.org/db/.
[2] Prior to 1989, countries had their own line-item classification systems.
[3] Many TS products are mapped into multiple HS codes and vice versa making it impossible to create a long product-level panel. As a robustness check, we also aggregate from the product level to the industry level data where we use the Standard International Trade Classification (SITC) industry codes to define trade relationships.

Table 1 - Summary Statistics

1972-1988	Observed Spell Length (years) Mean	Median	Estimated KM Survival Rate 1 year	4 year	12 year	Total Number of Spells	Total Number of Product Codes
Benchmark data							
TS7	2.7	1	0.67	0.49	0.42	693,963	22,950
Industry-level aggregation							
SITC5	3.9	1	0.58	0.37	0.31	157,441	1,682
SITC4	4.2	2	0.58	0.38	0.33	98,035	827
SITC3	4.7	2	0.60	0.40	0.35	43,480	253
SITC2	5.5	2	0.65	0.46	0.41	15,257	69
SITC1	8.4	5	0.78	0.64	0.60	2,445	10
TS7 Alternatives							
Modified Censoring	2.7	1	0.55	0.28	0.19	693,963	22,950
First Spell	2.9	1	0.70	0.57	0.53	495,763	22,950
One Spell Only	3.2	1	0.74	0.65	0.63	365,491	22,950
Gap Adjusted	3.3	2	0.73	0.58	0.49	593,450	22,950
1989-2001							
Benchmark data							
HS10	3.1	1	0.66	0.48	0.43	918,236	22,782
Industry-level aggregation							
SITC5	4.1	2	0.64	0.46	0.42	156,110	1,664
SITC4	4.4	2	0.65	0.48	0.45	92,566	768
SITC3	4.7	2	0.67	0.51	0.48	40,068	237
SITC2	5.3	2	0.71	0.56	0.53	14,373	68
SITC1	7.8	10	0.85	0.73	0.72	2,292	10
HS10 Alternatives							
Modified Censoring	3.1	1	0.61	0.39	0.33	918,236	22,782
First Spell	3.5	1	0.69	0.55	0.52	620,177	22,782
One Spell Only	4.2	2	0.72	0.63	0.61	415,851	22,782
Gap Adjusted	3.9	1	0.72	0.58	0.51	768,048	22,782

Note: Extract from Table 2 in Besedeš and Prusa (2006a)

We define a trading relationship x_{ei} as country e exporting a good x to a particular destination market, i for a continuous period of time. Our interest is to study the length of time until the relationship ceases to be active, an event we will refer to as a 'failure.' Calendar time is not as important as analysis time, which measures the length of time of continuous exporting. For each product and country pair we use the annual data to create spell data. For example, if country e exports good x to destination country i from 1976 to 1980 then relationship x_{ei} has a spell length of five years.

For each product we create a panel of countries which export the product to the United States As shown in Table 1 there are 693,963 (918,236) observed spells of service at the TS (HS) level. Both TS and HS datasets have a median spell length of one year and a mean spell length of about three years. We note that Table 1 also includes summary statistics for trade relationships created from the more aggregated SITC industry level data. In the top panel of the table we see that in the 1972–1988 period there are 157,441 observations at the 5–digit SITC level, 43,480 observations at the 3–digit level and just 2,445 observations at the 1–digit level. As expected, aggregating the data diminishes the ability to observe entry and exit—for the 1972–1988 period the mean spell length increases from 2.7 years in the 7–digit TS data to 3.9 years in the 5–digit SITC data to 8.4 years in the 1–digit SITC data. (Table 1 also includes some robustness results which we will discuss below.)

One complicating factor is that some trade relationships reoccur, exhibiting what we will refer to as multiple spells of service. A country will service the market, exit, then re-enter the market, and then almost always exit again. Approximately 30 per cent of relationships experience multiple spells of service in the disaggregated product level data. About two-thirds of relationships with multiple spells experience just two spells; less than 10 per cent have more than three spells. We begin by treating multiple spells as independent. While the assumption is made primarily in the interest of simplicity, we spend a great deal of time on alternative approaches to handling the issue and find the results are consistent across all methods.[4]

Once we begin to think of data in terms of spells it becomes apparent that we need to account for censoring, by which we mean losses from the sample before the final outcome is observed. Censoring is a result of two phenomena. First, we do not have information on trade relationships for the years before the beginning and after the end of the sample. All relationships active in either the first year or last year of our data will be classified as censored, as we are not certain how long they truly were active. Consider, for example, a relationship that starts in 2000 and is also observed in 2001 (the last year of our data). That relationship may indeed fail after two years but we simply are not sure. By classifying it as censored we interpret the duration of at least two years. Second, product definitions for the tariff codes are revised on an ongoing basis. Sometimes a single code is split into multiple codes and at other times multiple codes are refined into fewer codes. Unfortunately, there is no information to allow us to map old product codes systematically into new ones. We can observe when a code is changed but we cannot observe if the trade associated with that code ceased (a true failure) or is now classified under a new code. For the bulk of our analysis we choose to be cautious and classify all such changes as censored. Reclassified relationships are interpreted as having duration of at least *x* years (where *x* is the number of years when trade in the original code was observed). We are sure that some spells are classified as being censored when they were truly associated with either entry or exit. As a result, our benchmark results will overstate the true duration of a typical trading relationship.[5] We will also report alternative censoring approaches.

Once we have expressed the annual trade data into spell data and applied the censoring definitions, we can use well-developed survival analysis statistical methods to analyze the duration of trade. The Kaplan–Meier product limit estimator will be used to non-parametrically characterize the survivor function. Loosely speaking, the Kaplan–Meier estimator gives the fraction of spells that will survive at least *t* years. An important advantage of the Kaplan–Meier curve is that it is robust to censoring and uses information from both censored and non-censored observations.

We also use the Cox proportional hazards model to derive semi-parametric estimates for the factors determining survival. The Cox model is computationally convenient and allows us to consider survival as consisting of two parts: the underlying hazard function, describing how hazard changes over time, and the effect parameters, describing how hazard relates to other

[4] In Besedeš and Prusa (2006a) we discuss why the independence assumption is a reasonable starting place.
[5] Only the first type of censoring is present for SITC data.

factors. A particular advantage of the Cox model is that the baseline hazard is left unspecified and is not estimated.

3. Empirical Results

We begin by examining the benchmark 7–digit TS data and report our findings in Table 1. We report the 1-, 4-, and 12-year survival rates for benchmark product level data and also for the industry data. The table conveys several important lessons about duration of trade.

First and foremost, a very large fraction of relationships fail after only a year or two. For the benchmark TS data, only 67 per cent of relationships survive one year; 49 per cent survive four years; and 42 per cent survive 12 years. An almost identical survival experience is found in HS data. In fact, as we discuss below, a qualitatively similar experience is seen across all estimates. The evidence is quite clear: the typical US trade relationship is very short-lived.

The second important finding is the sharp decline of the risk of failure. It is quite high in the early years, but then rapidly falls once a trade relationship survives a threshold duration. As shown, a large number of relationships fail during the first four years, especially in the first year when the hazard rate is 33 per cent for TS data. However, after about four or five years failure becomes a lot less common. The hazard rate between year one and year five is an additional 30 per cent and just 12 per cent for the remaining twelve years.[6] The results indicate negative duration dependence—the conditional probability of failure decreases as duration increases. There is a type of a threshold effect. Once a relationship is established and has survived the first few years it is likely to survive a long time.

A picture of the estimated overall survival function is given in Figure 1—the upper figure is based on TS data and the lower figure is based on HS data. In both cases the survival function is downward sloping with a decreasing slope. We note that the Kaplan–Meier estimated probability of exporting a product for more than 17 years is 41 per cent. Almost exactly the same long-run survival rate is found in HS data. Said differently, taking into account both types of censoring, about 40 per cent of relationships will survive more than 17 years. This is noteworthy for at least two reasons. First, as discussed above, a remarkably large number of relationships fail within the first few years of service; only about half of all relationships will survive the four years. But, after the initial 'shake-out' the hazard rate falls dramatically. Second, a simple look at data reveals that less than two per cent of all trade relationships span the entire sample; that is, less than two per cent are present every year from 1972 to 1988 (TS data) or from 1998 to 2001 (HS data). From this vantage point, a 40 per cent long-run survival is superb. The explanation for the seemingly inconsistent results is the prevalence of censoring at the product level. Many relationships observed to the end are censored and are not classified as failures in benchmark results.

The impact of censoring due to product code changes can be identified if we estimate the Kaplan–Meier survival function using a modified censoring approach where we interpret all changes and reclassifications in TS codes as starts and failures (that is, we ignore the second type of censoring). This alternative approach leads to much more entry and exit, and as a result duration is significantly shorter than in the benchmark case: the median duration falls to just two

[6] In TS data more than 50 per cent of observed spells of service fail within the first four years, but over the next thirteen years about 7 per cent of spells fail.

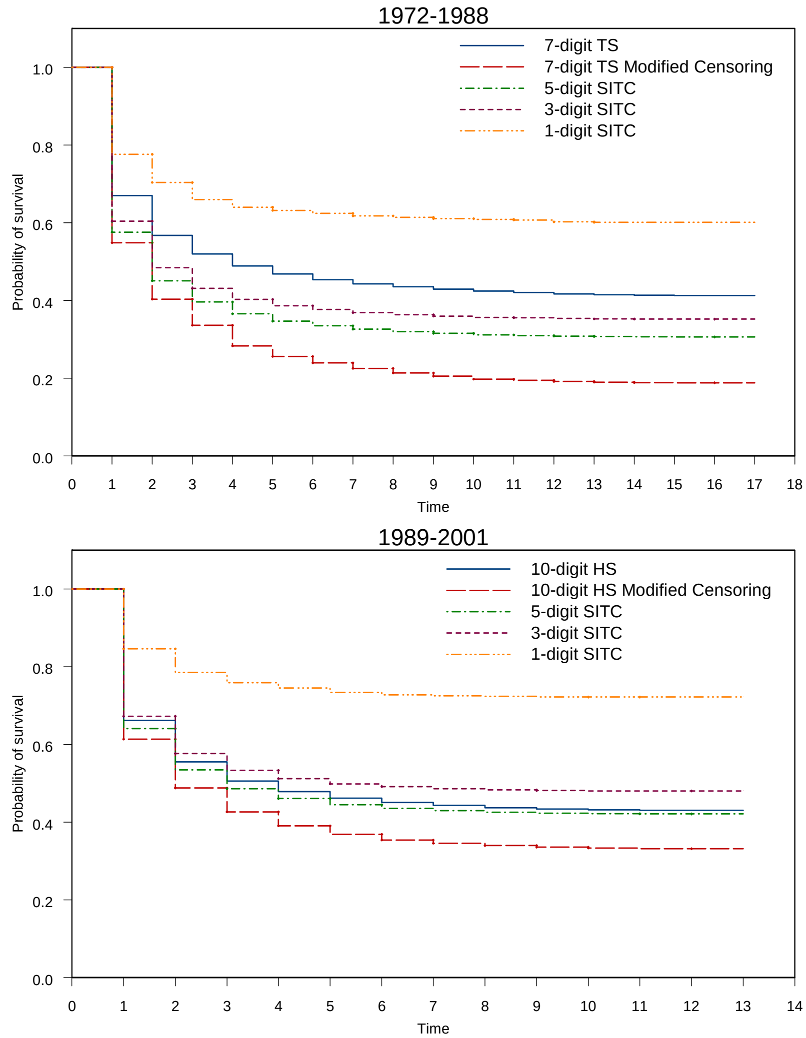
years as compared with four years, while the 75th percentile is just six years. The probability of exporting a product for more than 17 years under modified censoring is only 18 per cent—less than half the benchmark—but still considerably higher than the observed two per cent of trade relationships that span the entire sample. The first type of censoring accounts for the difference.

Besedeš and Prusa (2006a) also find that duration varies by source country and region with short-lived relationships characterizing trade by most countries. Short relationships are prevalent for both OECD and non-OECD countries although OECD trade relationships exhibit systematically longer survival.

There is compelling evidence that the results are robust to aggregation. We calculated spells of service using SITC industry (revision 2) definitions ranging from the 5–digit to the 1–digit level. Aggregation dramatically decreases the number of observed relationships, but the impact on duration is much more modest. The median survival time for SITC data is only two to three years until we aggregate to the 1– or 2–digit level. Within the SITC classification, higher levels of aggregation are associated with longer survival times (Table 1), but the impact on median survival time is modest until data are highly aggregated.

Figure 1 – Survival Functions for Product and Industry Level Data[7]

[7] Based on Figure 3 in Besedeš and Prusa (2006a)



The brevity of duration times for SITC data is surprising. The other surprising result is that as we aggregate from the product level to the SITC industry level the estimated probability of survival decreases. This paradoxical result is related to the unique censoring problems (numerous product code changes) only present at the product level. If we compare the SITC industry results to the modified censoring results using the product level data we see that that aggregation works as expected (Figure 1).

Two important lessons emerge from the SITC analysis. First, our benchmark censoring approach is overly cautious; we classify too many relationships as censored when they actually are failures. Second, SITC data confirm that short duration is not a result of overly fine parsing of the trade data. The aggregation exercise confirms that the main finding is not an anomaly. Most trade relationships are short-lived.

We considered several alternative approaches toward the issue of multiple spells. First, we simply limit the analysis to relationships with a single spell only. We find very little difference between distributions for single spell and benchmark data, especially for TS data. The estimated survival function for single spell data has a similar pattern as benchmark data: high hazard in the first few years followed by a leveling off of the survival function. We do find that the single spell data have significantly higher survival than the benchmark results, but we find that most of the difference is explained by the greater fraction of relationships that are censored in the single-spell data. When we re-estimate single spell data using the modified censoring approach we find the median survival time is now three years as compared with two years in the benchmark data. We also explored limiting the analysis to first spells—relationships with just one spell and the first spell of relationships with multiple spells. The results are generally similar to the single spell results and are available upon request.

Second, we considered the possibility that some of the reported multiple spells are due to a measurement error. Specifically, if the time between spells is short, it may be that the gap is mis-measured and interpreting the initial spell as 'failing' is inappropriate. It may be more appropriate to interpret the two spells as one longer spell. To allow for such misreporting, we assume a one-year gap between spells is an error, merge individual spells, and adjust spell length accordingly. Gaps of two or more years are assumed to be accurate and no change is made. In comparison with benchmark data, the average spell length is less than a year longer. The 1-, 4-, and 12-year survival rates in gap-adjusted data are about 7 to 9 percentage points higher than in benchmark data.

4. Does Short Duration Imply Poor Matches?

While it might appear on average that bilateral trade patterns are stable, a closer look at individual product trade patterns reveals that trade is fraught with failure—about half of all relationships fail shortly after they get started. The results suggest that relationship-specific investments might be important. To explore this possibility, we apply results from the Rauch and Watson (2003) matching model to trade duration data.

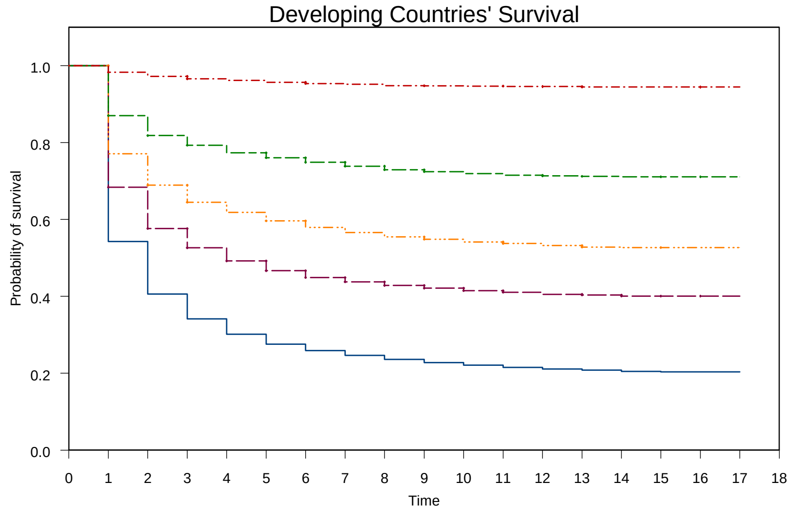
Details of the model can be found in Besedeš (2008) and Besedeš and Prusa (2006b); we briefly sketch the idea here. The model begins with the realistic assumption that trade between parties does not just happen by chance but rather begins with a search—a domestic buyer searches for a foreign supplier. After paying a search cost and being matched with a foreign supplier the buyer immediately observes the supplier's efficiency. The buyer cannot immediately ascertain, however, whether the foreign supplier will be successful in fulfilling a large order. If the supplier turns out to be unreliable, relationship-specific fixed cost investments are lost and the buyer must search again. Because of the risk of losing the lump-sum investment, the buyer might forestall making the investment and instead just make several small-volume purchases in order to learn about the supplier's reliability. If the supplier proves to be reliable, the buyer makes the investment necessary for a large order.

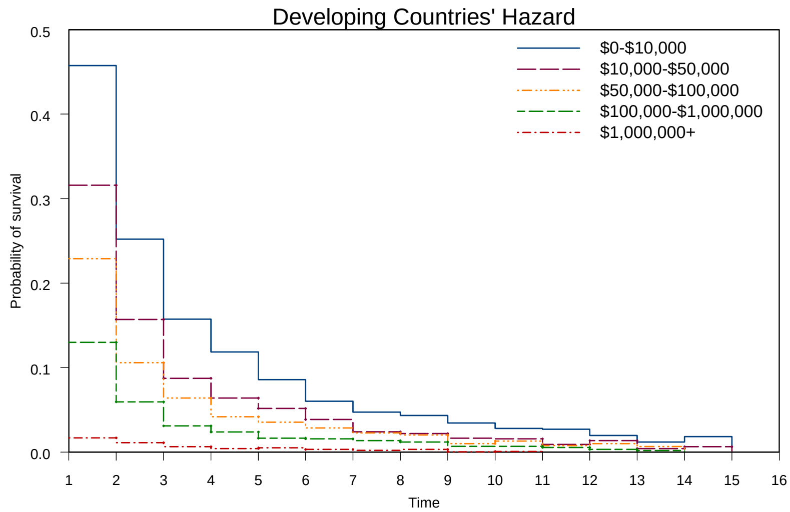
The model implies there are three possible actions for the buyer who has just been matched with a foreign supplier: start big (which means the relationship-specific investment was made), start small (which means sampling in order to determine the quality of the match), or reject the supplier. Besedeš (2008) identifies five implications of the Rauch and Watson (date) model as applied to formation and duration of US import trade: (1) some relationships will start with small initial order while others will start with larger ones, with larger ones enjoying an advantage in the form of a longer duration; (2) higher supplier reliability will result in a larger initial order and longer lasting relationships; (3) lower search costs increase initial order and duration; (4) a relationship is most likely to fail in its early stage; and (5) a small fraction of relationships will end with a buyer switching to a new supplier. Besedeš (2008) studies these implications using data on US imports from developing as well as developed countries. Rauch and Watson (2003) developed their model with developed country buyers searching for developing country suppliers. Besedeš (2008) shows that many features of those relationships hold for those between developing countries as well.

Since the model is silent on what constitutes a small initial order, Besedeš (2008) divides relationships into five groups based on initial order: (1) under $10,000; (2) between $10,000 and $50,000; (3) between $50,000 and $100,000; (4) between $100,000 and $1,000,000; and (5) those above $1,000,000. More than a half of all US import relationships start under $10,000, while only four per cent commence with more than $1,000,000 indicating that many import relationships commence in a 'testing the water' phase. Estimated Kaplan–Meier survival functions and corresponding hazard functions support the model's implications as seen in Figure 2. Relationships starting with larger initial orders exhibit consistently higher survival probabilities. Regardless of initial size, hazard rates for all relationships are the highest in early years and continuously decline. However, while they approach zero as relationships mature they never fully decline to zero indicating that some mature and successful relationships end when buyers switch to new suppliers.

Figure 2: **Survival and Hazard Functions by Initial Size**[8]

[8] Based on Figure 1 in Besedeš (2008)





Besedeš (2008) estimates the Cox proportional hazard model to examine the role played by supplier reliability and search costs as well as other factors. Supplier reliability is proxied by per capita GDP and a multiple-spell dummy. Search costs are proxied by distance, common language, contiguity, and the number of potential suppliers. Other explanatory variables include GDP, the percentage change in the real exchange rate, *ad valorem* transportation costs, an intermediate goods dummy, an agricultural goods dummy, the level of first year imports, and dummies for initial order size. Results are presented in Table 2. As is common in the survival literature, we present results in terms of hazard ratios. An estimated hazard ratio less (greater) than 1 implies the variable lowers (raises) the hazard rate. A ratio equal to 1 implies no impact on the hazard rate. Results indicate that higher supplier reliability and lower search costs decrease the hazard. Results also support the nonparametric estimates: as the size of the initial order increases, the hazard decreases. All else equal, relative to the smallest starting relationships, those starting with $10,000 to $50,000 have about a 30 per cent lower hazard, while the largest starting relationships have a roughly 92 per cent lower hazard.

Table 2: Cox Proportional Hazard Estimates for 1972–1988, 7-digit TSUSA Data

Table 2 - Cox Proportional Hazard Estimates for 1972-1988 7-digit TSUSA Data

		Developing Countries	Developed Countries
Distance	(unit = 1,000 kilometers)	1.015	0.964
Language dummy		0.970	0.811
Contiguous with USA		0.719	
Number of potential product suppliers		0.994	0.986
GDP per capita	(1995 US$, unit = $1000)	0.983	0.992
Multiple spell dummy		1.314	1.841
GDP	(1995 US$, unit = $100bil)	0.911	0.953
%Δ relative real exchange rate	(unit = 10%)	0.952	0.829
Ad-valorem transportation cost	(unit = 10%)	1.011	1.038
Intermediate goods		1.108	1.001*
Agricultural goods		0.895	1.030*
First year imports	(unit = millions $1987)	0.943*	0.969*
First year imports between $10,000 and $50,000		0.692	0.636
First year imports between $50,000 and $100,000		0.513	0.444
First year imports between $100,000 and $1,000,000		0.292	0.267
First year imports above $1,000,000		0.078	0.081
Observations		440,852	705,022
No. Subjects		193,855	230,382

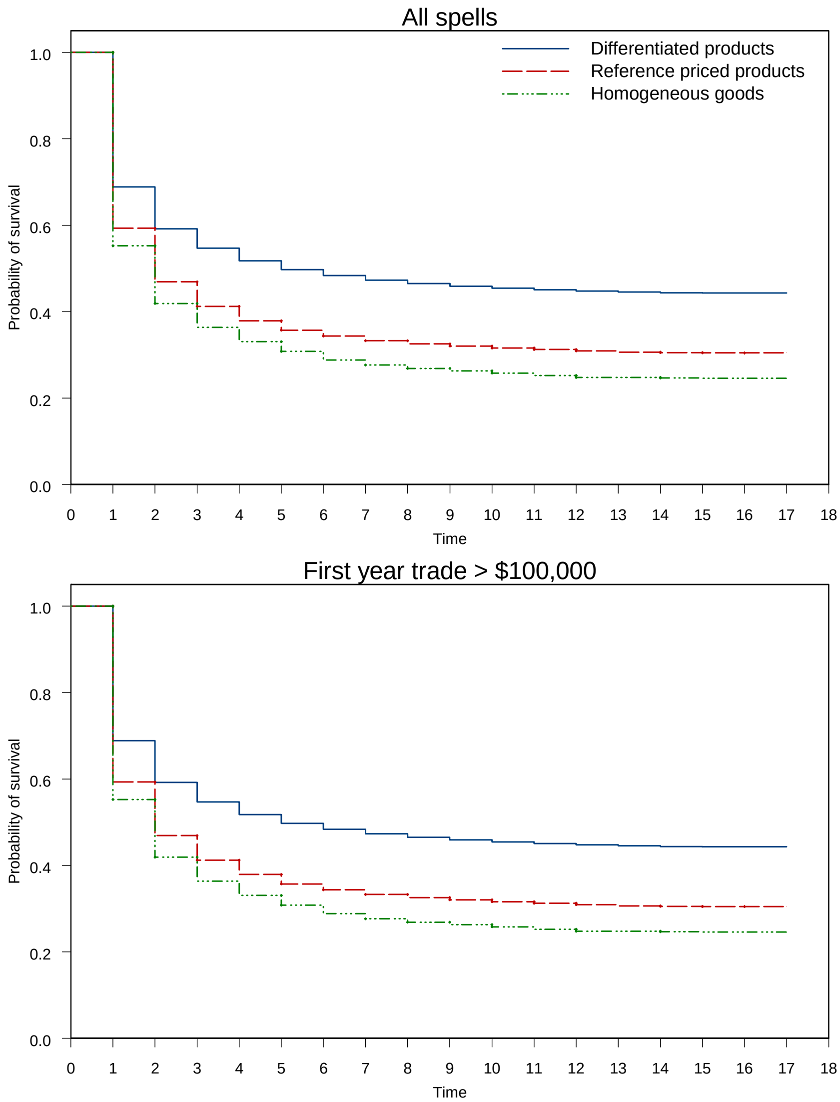
Stratified by regions and 1-digit SITC industries
Note: * denotes estimates not significant at the 1% level

Note: Extract from Table 3 in Besedeš (2008)

Besedeš and Prusa (2006b) examine the implications of the Rauch and Watson (2003) model for trade in homogeneous and differentiated products. They examine three implications: all else equal, (1) relationships starting with large orders will have longer duration; (2) a decrease in investment costs increases the probability that a relationship starts large; and (3) a decrease in search costs increases the likelihood that the buyer will opt to switch to a new supplier.

Homogenous goods (which are sold on organized markets) minimize the search cost the buyer is required to pay in order to find an appropriate supplier. Differentiated goods are not sold on organized markets and search costs will be considerably higher as the buyer has to go out and find an appropriate supplier. Likewise, it is reasonable to expect the relationship-specific investment will be smaller for homogeneous goods. These goods are standardized products which do not differ significantly across suppliers. Differentiated goods, with their multitudes of differences across many dimensions, will require the buyer to make larger relationship-specific investments. If one assumes that differentiated goods have higher search costs and require lower supplier-specific investments than homogeneous goods, then the model implies that holding initial purchase size constant, duration of relationships involving differentiated goods should be longer than those involving homogeneous goods. The model also implies that for each product type, duration of relationships starting with large orders should be longer than those starting with small orders.

Figure 3: Survival Functions by Type of Good[9]



We follow Rauch (1999) and classify commodities into three categories: homogeneous, reference priced, and differentiated. Rauch classified products traded on an organized exchange as homogeneous goods. Products not sold on exchanges but whose benchmark prices exist were classified as reference priced; all other products were deemed differentiated.

We begin by examining nonparametric Kaplan–Meier estimates of survival functions across product types. Estimates are graphed in Figure 3. As seen, median survival times are extraordinarily short: five years for differentiated products and two years for reference priced and homogeneous goods. Half of the trade relationships involving reference priced and

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[9] Based on Figure 1 in Besedeš and Prusa (2006b)

homogeneous goods fail during the first two years. We report the nonparametric Kaplan–Meier estimates of survival functions across product types in Table 3. As predicted by the model, differentiated products dominate the other product types in their survival rates, at any stage of a relationship. In year one, 69 per cent of relationships involving differentiated goods survive to year two, while only 55 and 59 per cent of relationships involving homogeneous and reference priced goods do so. By year four, these rates decline to 52 per cent for differentiated and 33 per cent for homogeneous goods. Between years four and 12 survival rates are stable declining by just 7 percentage points for each product type. The differences in survival across product types are statistically significant. Similar results are found for the HS data (lower part of the table).

Table 3 - Kaplan-Meier Survival Rates

	Differentiated Products			Reference Priced Products			Homogeneous Goods		
	Year 1	Year 4	Year 12	Year 1	Year 4	Year 12	Year 1	Year 4	Year 12
1972-1988 (7-digit TSUSA)									
Benchmark	0.69	0.52	0.45	0.59	0.38	0.31	0.55	0.33	0.25
Obs>$100,000	0.92	0.86	0.83	0.80	0.66	0.60	0.69	0.49	0.41
1989-2001 (10-digit HS)									
Benchmark	0.66	0.48	0.44	0.65	0.46	0.40	0.62	0.40	0.35
Obs>$100,000	0.92	0.85	0.83	0.86	0.75	0.71	0.76	0.59	0.55

Note: The survival functions across the product types within each dataset are statistically significant at the 1% level using the logrank test

Note: Extract from Table 2 in Besedeš and Prusa (2006b)

The model's predictions regarding starting size are also supported. In order to investigate whether small, valued spells are at greatest risk we filtered out small dollar-value observations; that is, we eliminated spells with trade in the first year below some minimum level. We then estimate survival functions for each product type after dropping the small-valued observations. In Table 3 we report survival rates based on dropping all observations where the value of trade in the first year of the spell was less than $100,000.

First, as seen in the second chart in Figure 3, when we restrict ourselves to the relationships that start large (initial trade values greater than $100,000) we find better survival; this result is predicted by the model. Said differently, survival functions shift up as we drop small observations. Spells that begin with small trade value are at greatest risk. This is true for all product types. For example, for differentiated goods the one-year survival rate increases from 69 to 92 per cent. This pattern holds for each product type in both time periods studied. As implied by the model, the larger the initial purchase, the longer the duration for each product type.

Second, the estimates provide no evidence that differences among product types are driven by small observations. Differences among product types grow as we eliminate the smaller-trade observations. When we restrict the sample to only those spells with initial transactions exceeding $100,000 the one-year survival rate is 92 per cent for differentiated and 69 per cent for homogeneous goods which compare with 69 and 55 per cent for the benchmark.

A limitation of the Kaplan–Meier estimates is that we cannot control for a myriad of factors that might be influencing duration. To control for other possible explanations of survival, we estimate the Cox proportional hazard model. The basic estimation model includes regressors designed to control for country and product characteristics that might influence duration. Details of these exogenous variables are found in Besedeš and Prusa (2006b); here we note that we control for GDP, *ad valorem* measure of transportation costs, the tariff rate, the change in the relative real exchange rate, the coefficient of variation of unit values, multiple spells, agricultural products,[10] and country fixed effects.

The findings are reported in Table 4. In the first column we report the benchmark estimates based on product level data. We are primarily interested in the product type estimates. Letting differentiated products be the benchmark, reference priced products have a 17 per cent higher hazard and homogeneous goods a 23 per cent higher hazard. The estimates strongly support what Figure 3 suggested: namely, product type matters. When we filter out spells that start small we find that our results are not driven by small-value spells. Compared to differentiated products, homogeneous goods face a 71 per cent higher hazard at the $100,000 cutoff level; reference priced products face a 59–155 per cent higher hazard.

Table 4 - Cox Proportional Hazard Estimates for 1972-1988 7-digit TSUSA Data

		Benchmark	Obs>$100,000
Ad-valorem transportation cost	(unit = 10%)	1.068	1.039
GDP	(unit = $100bil)	0.946	0.940
Tariff rate, 4-digit SITC	(unit = 1%)	0.979	0.945
%Δ relative real exchange rate	(unit = 10%)	0.906	0.897
Coefficient of variation of unit values		0.927	0.864
Multiple spell dummy		1.495	2.254
Agricultural goods		1.040	0.949*
Reference priced products		1.173	1.594
Homogeneous goods		1.226	1.712
Observations		1,140,896	356,141
No. Subjects		444,378	85,629

Country fixed effects inlcuded but not reported
Note: * denotes estimates not significant at the 1% level

Note: Extract from Table 3 in Besedeš and Prusa (2006b)

5. Related Empirical Support

Since the publication of Besedeš and Prusa (2006a) a growing literature has emerged analyzing the duration of export and import trade. Most of it follows the approach pioneered in Besedeš and Prusa (2006a) and summarized in this research note. The following is a brief synopsis of related work in this area.

Nitsch (2009) finds duration of German imports to be similarly short to duration of US imports. Using 8-digit product level data from he finds most trade relationships last only one to three years. Hess and Person (2009) find duration of imports of European Union members between 1962 and 2006 to be very short, with median duration of one year, and that imports from more diversified exporters, those exporting a greater number of products, exhibit a lower hazard. Hess and Person (2010) replicate the results of Besedeš and Prusa (2006b) and make a methodological contribution by showing

[10] Agricultural products are generally classified as homogeneous products, and since agricultural products are more likely to be subject to weather or disease disruption we include an agricultural dummy.

that discrete-time hazard models are better suited to trade duration data. This approach eliminates the reliance on the proportional hazard assumption of earlier papers (which is shown to be violated) while taking into account unobserved heterogeneity more robustly.

Besedeš and Prusa (2007) and Besedeš, et al. (2009) show that duration of exports from a number of Central and South American—the Asian Dragons countries as well as the US and EU countries—is very short. Namely, many relationships fail in their first year resulting in most countries having median duration of an export relationship at only one or two years. Examining duration of exports for a large number of countries, Brenton, Saborowski, and von Uexkull (2009) find evidence that learning-by-doing decreases the hazard of exporting of developing countries, while Jaud, Kukenova, and Strieborny (2009) find that financial development improves export survival of developing countries by reducing the costs of external finance to firms. Fugazza and Molina (2009) examine duration of exports of almost one hundred countries between 1995 and 2006 finding that developed countries, differentiated products, export experience, and the volume of exports all decrease the hazard of exporting.Minondo and Requena (2008) examine duration of exports of regions of Spain finding the median duration for all regions to be just one year and probability of survival rapidly decreasing. Volpe and Carballo (2008) examine export survival of newly exporting Peruvian firms and find their median export duration to be just one year. They also examine the impact geographical and product diversification play for survival and conclude geographical diversification is more important. Görg, et al. (2008) use data on exports of Hungarian firms at the 6–digit HS product level and find that the median duration is between two and three years. In slight contrast to Besedeš and Prusa (2006a; 2006b) as well as Nitsch (2009) and Volpe and Carballo (2008) who all find the hazard to be highest in the first year, Görg, et al. (2008)find the hazard of exporting initially increases and reaches its maximum between the third and fourth year, after which it decreases rapidly.

Using the same data as Görg, et al. (2008), Muraközy and Bekes (2008) examine differences between permanent and temporary trade, where temporary trade is defined as any trade relationship with duration under three years. They find that while the long-term survival rates for US and Hungarian trade relationships are similar, short-term survival rates are not. They offer a new explanation for temporary trade and short-lived relationships. Unlike Rauch and Watson (2003) and Besedeš (2008), where short duration is a consequence of uncertainty and 'testing the waters', Muraközy and Bekes find one-fifth of temporary trade to be the consequence of one-time asset and inventory sales. Caron and Anson (2008) examine duration of low-valued Brazilian exports. These are exports under $20,000 which can be exported using simplified export regulations available through many post offices in Brazil. Most of these exports are of short duration with the median of just one year. Fabling and Sanderson (2008) study duration of New Zealand's exports at the 5–digit SITC and 10–digit HS product level as well at the firm and firm-product level. They too find export duration to be short with median duration at one or two years across various levels of aggregation. They find duration at the firm level to be slightly longer than at the product level, which is likely due to firms changing the mix of products they export. Finally, Eaton et al. (2008) use Columbian firm-level data to examine export dynamics. While they do not estimate a duration model, they find that about half of Columbian firms exporting in any year tend to be new exporters who export low volumes and most of whom do not survive the first year.

6. Concluding Comments

In a series of papers Besedeš and Prusa (2006a; 2006b) and Besedeš (2008) have provided a novel approach to examining international trade, which provided trade economists and policy makers with a set of interesting and surprising facts. We have discovered that countries tend to trade most products for short intervals of time. Reassuringly, as verified by us and a growing number of other authors, the findings appear to be quite robust. Trade relationships remain short when we change the way relationships are measured, and when we control for multiple spells and censoring in different ways. There are a large number of short trade relationships in every industry and for every country studied to date. Trade is of short duration, whether one looks at highly disaggregated product-level data or moderately aggregated industry-level data.

Studying the duration of trade has also provided additional empirical evidence that trade in differentiated and homogeneous products is different. We have shown that a search cost model of relationship formation does a good job of explaining the formation and duration of trade as well as observed differences in trade in differentiated and homogeneous products (for example, differences in initial purchase size, duration, and so on). Our analysis suggests survival in export markets will be longer if a country trades in differentiated good rather than homogeneous products. Of course, this does not imply that exporters should focus exclusively on differentiated products as the work to date does not offer a full theoretical model of trade duration or its welfare effects. Our work suggests economists should incorporate search cost–network approaches into the dominant models of trade.

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