

April 15, 2018

**On the Duration of Trade in Services:
Evidence from Germany**

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Abstract

This paper examines the duration of trade in services. Analyzing highly disaggregated data for Germany, covering the period from 2001 to 2010 in monthly frequency, we identify determinants for the length of trade relationships and compare our results with findings for merchandise trade. Similar to goods trade, we find, for instance, that survival probabilities are affected by initial transaction size, the type of service, market structure and various country characteristics.

JEL Code: F10; F14

Keywords: survival; hazard; relationship

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Motivation

- German merchandise imports, 2004
 - o 9,756 products
 - o 236 countries
 - o 206,727 country-product-pairs
- most of those trade relationships are short-lived
 - o 49,923 (~24%) non-existent in 2005 (died)
 - o 49,530 (~24%) non-existent in 2003 (new)
 - o 24,703 (~12%) in 2004 only (one-year spell)

Related Literature

- Besedeš/Prusa (CJE 2006, JIE 2007)
 - US imports, 1972-2001
- Gopinath/Rigobon (QJE 2008)
 - price duration at US border, 1994-2005
- Nakamura/Steinsson (QJE 2008)
 - stickiness of US consumer prices

Theoretical Background

- Heckscher-Ohlin
o differences in factor endowments
- Sunk costs
o pricing-to-market

Theoretical Background

- Rauch's network/search costs hypothesis:
 - immigrants
 - Chinese networks
 - homogeneous/reference price/differentiated products
- Rauch/Watson (IJIO, 2003):
 - differentiated products involve smaller initial purchases
 - differentiated products are traded longer
 - duration increases with initial purchase size

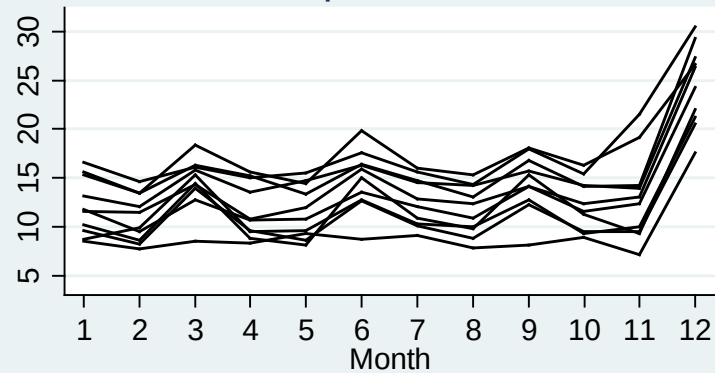
Data

- German international trade in services (ex-/imports)
- 2001-2010
- highly disaggregated
 - firm- (transaction-)level
 - monthly
 - 138 types of services
 - country of destination/origin
 - gross coverage
 - 9,006,653 observations
- combine with other data from various sources

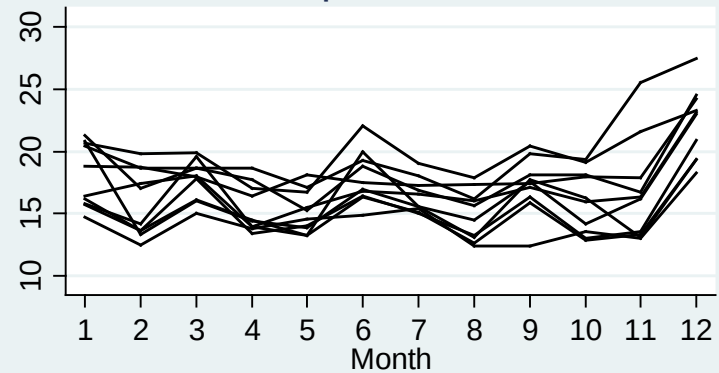
German Trade in Services, 2001-10

Monthly Pattern

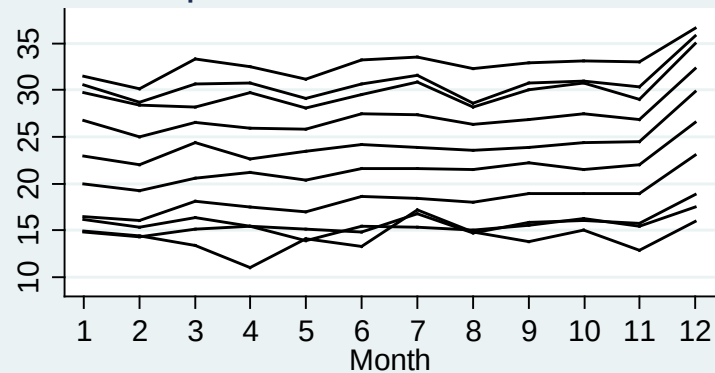
Total Exports, bn. euros



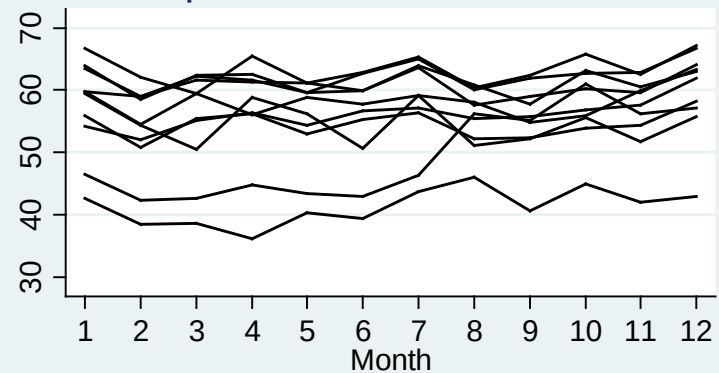
Total Imports, bn. euros



Export Transactions, thsds.



Import Transactions, thsds.



Data: Additional Background

- Source: Deutsche Bundesbank
- transactions between residents and non-residents
 - cross-border trade
 - consumption abroad
 - presence of natural persons
 - not: commercial presence
- mandatory
- reporting threshold: 12,500 €
- taxes included

Data

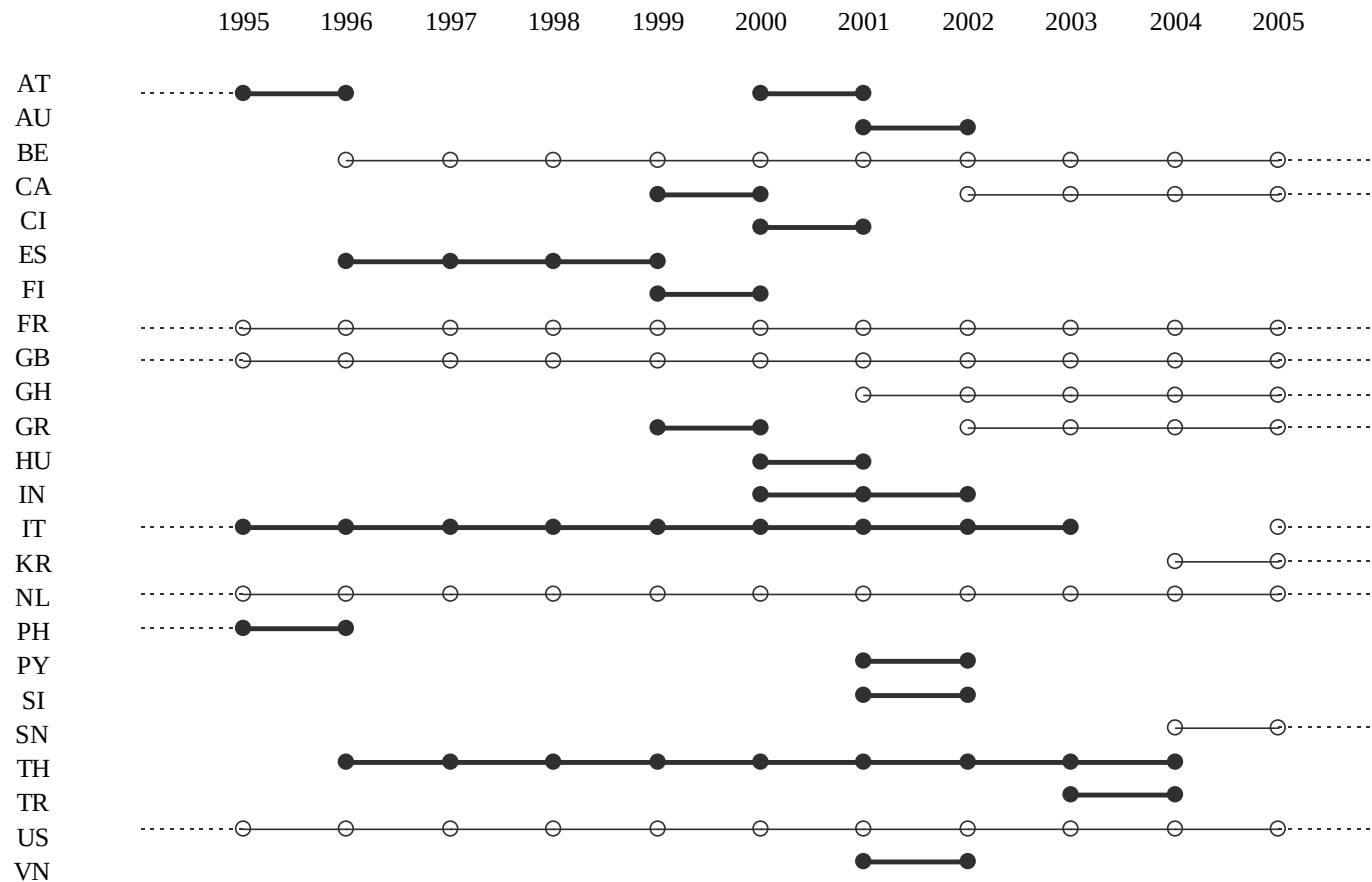
many useful ways of characterizing services trade
(→stylized facts):

- characterizing firms
- number of markets served
- number of services provided

here: length of (continuous) trade relationship (spell)

Hypothetical Example (firm-service-country triplet)

Firm id: 2008X110; Type of service: Patents, licences, inventions, processes (technical know-how)



Types of Aggregation

various types of (dis-)aggregation:

- time (monthly/quarterly/yearly)
- service (12 categories)
- country

pairs: firm-country; service-country; country

effects on results

Firms

Year	Exporters		Importers		Ex-&Importers	
	No of firms	% Total	No of firms	% Total	No of firms	% Total
2001	1,996	7.1	21,729	77.1	4,452	15.8
2002	2,804	8.9	24,097	76.4	4,624	14.7
2003	2,877	9.1	24,222	76.5	4,583	14.5
2004	2,842	9.8	22,398	74.2	4,831	16.0
2005	2,955	10.1	20,992	71.6	5,363	18.3
2006	3,512	11.6	20,738	68.6	5,991	19.8
2007	4,204	13.2	20,854	65.7	6,700	21.1
2008	4,442	13.7	20,758	64.0	7,217	22.3
2009	4,302	14.1	18,996	62.2	7,227	23.7
2010	4,512	14.9	18,442	60.7	7,417	24.4

Services

Category	Exports				Imports			
	firms	%	bn.€	%	firms	%	bn.€	%
Transport	4,994	12	399	29	20,049	12	372	26
Insurance	1,373	3	322	24	6,490	4	324	22
Other bus. serv.	13,196	33	233	17	48,366	30	287	20
R&D	2,828	7	102	8	9,557	6	92	6
Comp./inform.	3,555	9	80	6	13,851	9	76	5
Construction	3,172	8	78	6	9,862	6	56	4
Financial serv.	2,821	7	61	5	5,952	4	39	3
Other	4,043	10	47	3	24,140	15	87	6
Communication	688	2	30	2	4,185	3	44	3
Personnel	1,765	4	11	1	9,088	6	15	1
Travel	1,513	4	4	0	11,902	7	69	5

Countries

Country	Exports				Imports			
	Firms		Value		Firms		Value	
	No	%	bn.€	%	No	%	bn.€	%
US	7,744	5	213	16	23,732	6	244	17
UK	8,477	5	164	12	26,405	6	185	13
Switzerland	9,131	6	111	8	25,480	6	103	7
Netherlands	7,586	5	101	7	20,251	5	113	8
France	7,461	5	72	5	18,520	4	93	6
Austria	7,297	4	55	4	19,587	5	77	5
Italy	5,870	4	52	4	14,881	4	53	4
Japan	2,591	2	36	3				
Spain	4,779	3	35	3	12,170	3	54	4
Belgium	5,315	3	34	3	12,667	3	38	3

Margins of Trade

Decompose firm-level trade into extensive and intensive margins:

$$\log X_{it} \equiv \log N_{it} + \log S_{it} + \log x_{it} ,$$

$$\text{with } x_{it} \equiv X_{it} / (N_{it} S_{it})$$

Margins of Trade (annual)

	2001-2010			
	Value of exports	No of services	No of countries	Exports per dest/serv
Value of exports	1.000** (0.000)	0.078** (0.002)	0.247** (0.002)	0.676** (0.003)
Observations	95,104	95,104	95,104	95,104
R-squared	1.000	0.353	0.660	0.959
	2001-2010			
	Value of imports	No of services	No of countries	Imports per dest/serv
Value of exports	1.000** (0.000)	0.162** (0.001)	0.266** (0.001)	0.572** (0.002)
Observations	278,235	278,235	278,235	278,235
R-squared	1.000	0.576	0.689	0.931

Description of Spells (monthly, full sample)

	Spells	Subjects	Spells per Subject			Observed Duration				Survival Time		
			Avg	Mdn	Max	Avg	Min	Mdn	Max	25%	50%	75%
X, firms-service-country	1,133,389	265,656	4.27	2	43	2.42	1	1	120	1	1	2
M, firms-service-country	3,141,215	890,655	3.53	2	46	2.04	1	1	120	1	1	2
X, firm-country	880,255	174,095	5.06	3	44	2.62	1	1	120	1	1	2
M, firm-country	2,146,117	466,350	4.60	2	49	2.34	1	1	120	1	1	2
X, service-country	67,647	9,090	7.44	4	41	6.35	1	1	120	1	1	3
M, service-country	95,949	13,270	7.23	4	40	6.85	1	1	120	1	1	3
X, country level	1,424	284	5.01	1	30	17.47	1	2	120	1	2	6
M, country level	1,367	305	4.48	1	35	20.77	1	2	120	1	2	8

Description of Spells (yearly, full sample)

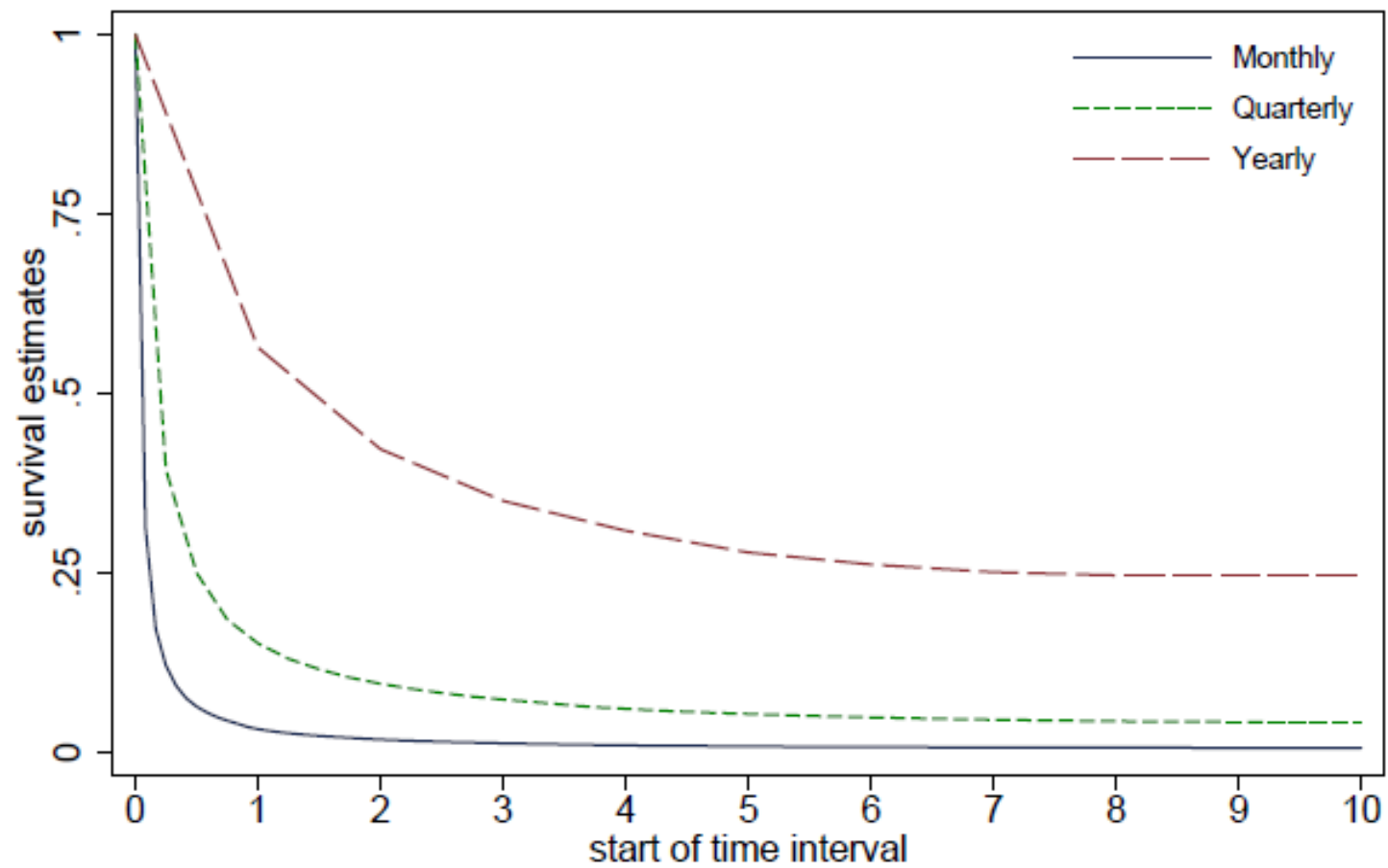
	Spells	Subjects	Spells per Subject			Observed Duration				Survival Time		
			Avg	Mdn	Max	Avg	Min	Mdn	Max	25%	50%	75%
X, firms-service-country	323,742	265,656	1.22	1	5	2.21	1	1	10	1	2	.
M, firms-service-country	1,081,318	890,654	1.21	1	5	1.90	1	1	10	1	2	4
X, firm-country	218,301	174,095	1.25	1	5	2.49	1	1	10	1	3	.
M, firm-country	592,706	466,350	1.27	1	5	2.26	1	1	10	1	2	.
X, service-country	12,406	9,090	1.36	1	5	4.53	1	3	10	2	.	.
M, service-country	18,192	13,270	1.37	1	5	4.65	1	3	10	2	.	.
X, country level	339	284	1.19	1	4	7.15	1	10	10	.	.	.
M, country level	358	305	1.17	1	5	7.56	1	10	10	.	.	.

Median Duration by Service

(yearly, full sample, exports, firms-services-country)

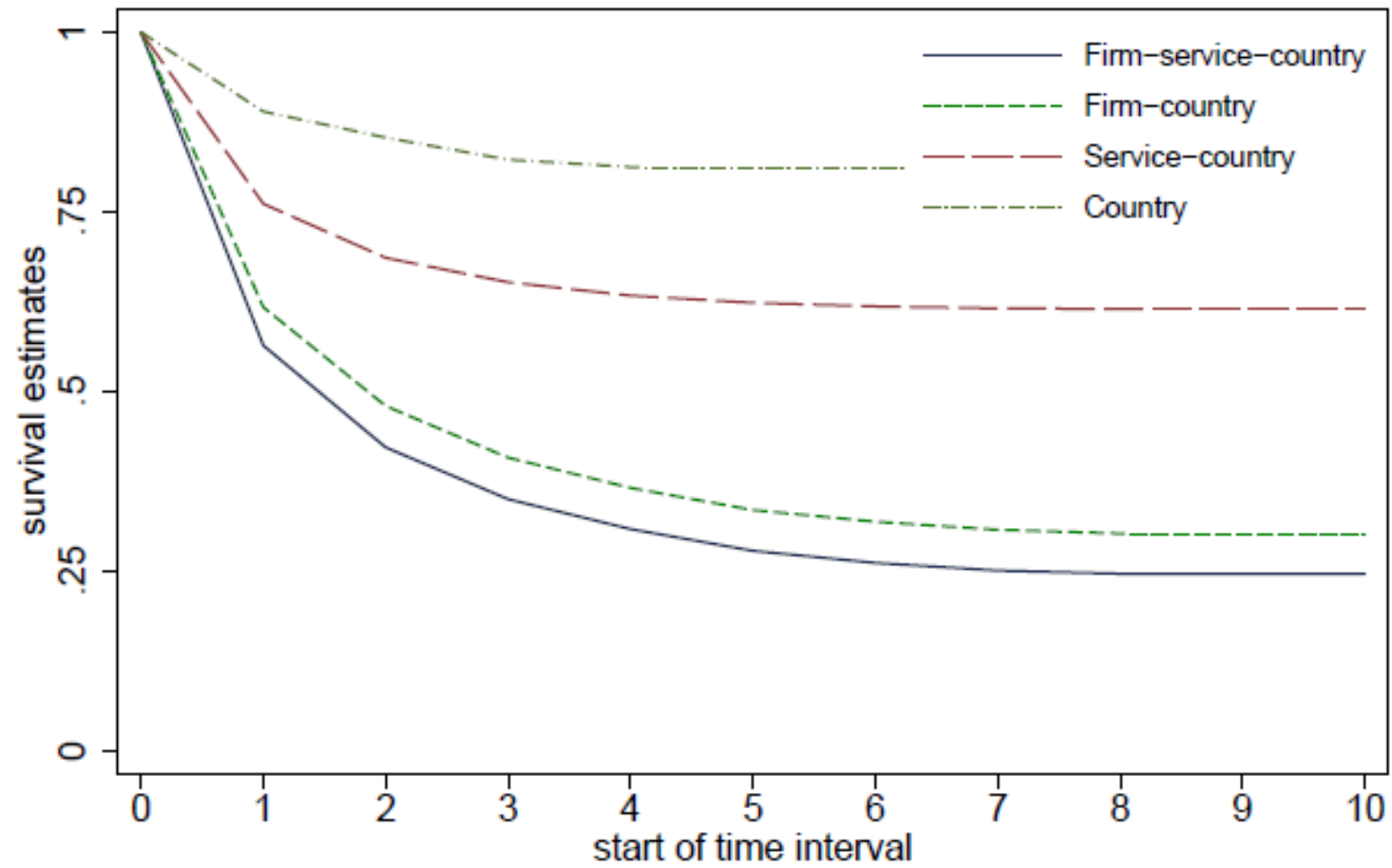
Service	No left censoring			With left censoring			
	Avg	Mdn	Max	Avg	Min	Mdn	Max
Travel	1.20	1	5	1.76	1	1	10
Transport	1.20	1	5	2.51	1	1	10
Insurance	1.27	1	5	2.42	1	1	10
Financial serv.	1.24	1	5	2.53	1	1	10
Communication	1.17	1	4	2.81	1	2	10
Construction	1.30	1	5	2.04	1	1	10
Comp./inform.	1.19	1	4	2.33	1	1	10
R&D	1.25	1	5	2.33	1	1	10
Other bus. serv.	1.20	1	5	2.08	1	1	10
Personnel	1.20	1	5	2.04	1	1	10
Other	1.19	1	5	2.00	1	1	10

Exports survival, firm-service-country, different time units



With left censored spells, with non-service transactions

Exports survival by aggregation, yearly data



Methodology

aim: explain duration

$$\text{Length}_i = \alpha + \beta X_f + \gamma Z_c + \varepsilon_i$$

Cox hazard model; Kaplan-Meier survival functions
Probit model

Potential Candidates

- firm characteristics
 - product range
 - initial purchase size
- market structure
 - number of suppliers
- customer/supplier characteristics
 - gravity variables?
- (product characteristics)
 - homogeneous/differentiated
 - contract intensity (Nunn, QJE 2007)

Exports (annual)

	Firm- service- country	Firm-country	Service-country
Duration (ln)	-0.226**	-0.229**	-0.567**
Initial exports (ln)	-0.151**	-0.148**	-0.082**
No. services w/i a category (ln)	-0.023*		
No. total services (ln)	-0.079**	-0.539**	-0.350**
No. countries (ln)	-0.303**	-0.250**	-0.599**
Importer dummy	0.078**		
No. firms exp'g same cat. (ln)	-0.045**		
No. firms exp'g same srvce (ln)	-0.094**		
GDP (ln)	-0.013**	0.109**	-0.037*
Distance (ln)	0.017**	-0.116**	0.069**
Common language	-0.089**	0.039**	-0.451#
Colonial relationship	-0.045**	-0.059**	-0.119
No. firms exp'g to same ctry		-0.364**	
Observations	447,228	328,009	11,207
Number of relationships	192,935	127,317	3,280
Log-Likelihood	-254,041	-177,684	-5,265

Imports (annual)

	Firm- service- country	Firm-country	Service-country
Duration (ln)	-0.206**	-0.220**	-0.369**
Initial imports (ln)	-0.138**	-0.117**	-0.110**
No. services w/i a category (ln)	-0.010*		
No. total services (ln)	-0.114**	-0.581**	
No. countries (ln)	-0.309**	-0.275**	-0.625**
Importer dummy	0.012**		
No. firms imp'g same cat. (ln)	0.001		
No. firms imp'g same srvce (ln)	-0.070**		
GDP (ln)	-0.026**	0.001	-0.135*
Distance (ln)	0.003#	-0.033**	0.185**
Common language	-0.050**	-0.010	-0.603#
Colonial relationship	-0.077**	-0.067**	-0.199*
No. firms imp'g to same ctry		-0.130**	
Observations	1,292,211	780,776	15,977
Number of relationships	646,388	337,352	4,674
Log-Likelihood	-790,322	-465,745	-8,230

Exports (annual/quarterly)

	Firm- service- country	Firm- service- country
Duration (ln)	-0.226**	-0.370**
Initial exports (ln)	-0.151**	-0.129**
No. services w/i a category (ln)	-0.023*	-0.048**
No. total services (ln)	-0.079**	-0.052**
No. countries (ln)	-0.303**	-0.260**
Importer dummy	0.078**	-0.053**
No. firms exp'g same cat. (ln)	-0.045**	-0.056**
No. firms exp'g same srvce (ln)	-0.094**	-0.152**
GDP (ln)	-0.013**	-0.012**
Distance (ln)	0.017**	0.036**
Common language	-0.089**	-0.066**
Colonial relationship	-0.045**	-0.009
No. firms exp'g to same ctry		
Observations	447,228	1,154,834
Number of relationships	192,935	216,097
Log-Likelihood	-254,041	-594,401

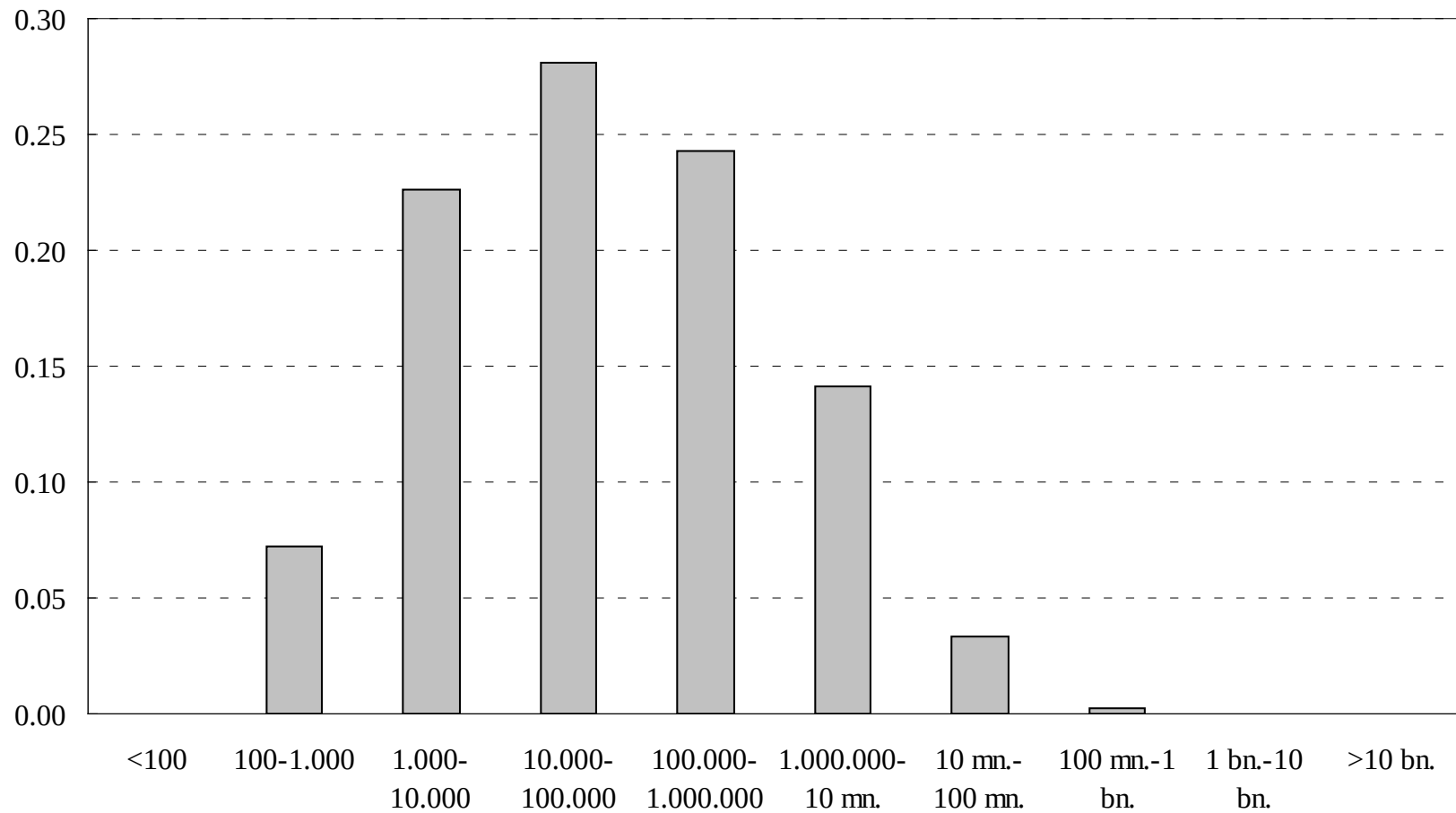
Imports (annual/quarterly)

	Firm- service- country	Firm- service- country
Duration (ln)	-0.206**	-0.362**
Initial imports (ln)	-0.138**	-0.100**
No. services w/i a category (ln)	-0.010*	0.026**
No. total services (ln)	-0.114**	-0.132**
No. countries (ln)	-0.309**	-0.296**
Importer dummy	0.012**	-0.036**
No. firms imp'g same cat. (ln)	0.001	-0.053**
No. firms imp'g same srvce (ln)	-0.070**	-0.065**
GDP (ln)	-0.026**	-0.000
Distance (ln)	0.003#	0.013**
Common language	-0.050**	0.017**
Colonial relationship	-0.077**	-0.124**
No. firms imp'g to same ctry		
Observations	1,292,211	2,940,982
Number of relationships	646,388	723,380
Log-Likelihood	-790,322	-1,611,507

Summary

- international trade relations are surprisingly dynamic
- variety of characteristics affect duration of trade:
country features, firm features, market structure
- set of stylized facts provide basis for modelling

Size distribution of trade spells



Trade duration



Do Country Characteristics Matter?

