

Determinants of direct cross-border public procurement in EU Member States ⁽¹⁾

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Abstract: The aim of this paper is to analyse the determinants of direct cross-border public procurement in the EU Member States. For this purpose, we use a unique dataset based on obligatory data published on TED (Tenders Electronic Daily) which covers public procurement contract award notices for the period 2008-2012 and consists of more than 30 variables. Among others, results of the econometric estimation suggest that the probability of awarding a contract cross-border depends positively on the value of the contract awarded and negatively on the number of offers. Among awarding country characteristics, GDP per capita and euro-area membership are found to positively impact the probability of a cross-border award, while population and the share of government expenditure in total GDP have a negative influence. Barriers to trade (a proxy of tariff and non-tariff barriers) are shown to have a significant negative impact on cross-border awards while investment freedom (a proxy of openness to FDI) is found to have a positive effect on the probability of a cross-border win.

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1. Introduction

Public Procurement is gaining importance on the trade negotiation agenda, both under the aegis of the WTO and at the bilateral level. This reflects the economic importance of public procurement markets in terms of GDP and trade flows as well as the fact that up to date a relatively small part of these markets has been committed internationally both at bilateral or multilateral level.

In spite of its importance, cross-border public procurement is one of the areas in which the international policy agenda is facing substantial challenges due to lack of data availability and analysis. In fact there is a generalised sense that the analytical tools required to better inform policymakers and negotiators are severely hampered by serious data shortcomings and lack of comparable statistics ⁽³⁾. As a consequence, economic assessment of the explanatory factors of cross-border procurement is scarce.

The goal of this paper is to identify the determinants of direct cross-border public procurement in EU member states. ⁽⁴⁾ For this purpose, the paper uses a unique dataset based on mandatory contract awards notices data published in Tenders Electronic Daily (TED) ⁽⁵⁾. The dataset consists of more than 30 variables and covers a time period of 5 years (2008-2012). Using state of the art econometric techniques, the paper analyses the effect of various determinants on the probability of a public tender to be awarded directly cross-border to a foreign company.

The novelty of the paper is twofold. First, the multivariate logit model estimated here accounts for the influence of variables related to the trade and business environment of the awarding country on the probability of a direct cross-border public procurement award in EU Member States. Second, the dataset underlying the econometric analysis is unique (consists of panel data for 5 years, 2008-2012) and is used for the first time for the purposes of this paper.

The rest of the paper is organized as follows: Section 2 describes public procurement patterns using descriptive statistics in terms of number and value of contract awards, legal framework, type of contract, level of procurement and procedures as well as sectoral and regional split. Section 3 provides a literature overview, the specificities of the econometric model and data used. Section 4 presents and discusses the results of the econometric estimations and finally, Section 5 provides conclusions and policy implications.

⁽³⁾ For an in-depth debate on the data challenges in the field of public procurement see Kutlina-Dimitrova, Z. and Lakatos, C. (2014) forthcoming.

⁽⁴⁾ The paper does not assess the level of openness of EU public procurement markets as due to data limitations only data on direct cross-border procurement is available.

⁽⁵⁾ Tenders Electronic Daily, Supplement to the Official Journal of the European Union.

2. Public Procurement in the EU

The descriptive statistics presented in this section are based on the TED award dataset ⁽⁶⁾. This dataset consists of contract awards data and thus implicitly includes all contract notices for which there was an award decision. Public authorities are obliged to publish their tender invitations on TED for all contracts exceeding EU public procurement thresholds (see Table 1). In many cases, however, contract awards below the threshold are also reported on TED. One of the reasons for this is that authorities are in general not prevented from announcing the tender on TED even if the tender's value is below the threshold. Another reason is the fact that tenders are often awarded to the most economically advantageous bidder i.e. even though the initial contract value is above or at the threshold the final award value might be well below the threshold. In this context, Table 1 provides an overview of EU public procurement thresholds at government levels and type of purchases.

Table 1: EU public procurement thresholds in EUR

Thresholds	Central government entities	Sub-Central entities	Utilities
Supplies	134,000	207,000	414,000
Services	134,000	207,000	414,000
Works	5,186,000	5,186,000	5,186,000

Source: EEC (2013)

The highest threshold lies currently at nearly EUR 5.2 million and applies to works. In this case there is no difference across government levels and utilities. The threshold for supplies and services stands at EUR 134,000 at central government and increases to EUR 207,000 at sub-central and to EUR 414,000 for the utilities provider level.

In terms of cross-border procurement the TED database provides information regarding both the country in which the contract is awarded and the contractor's country i.e. the residence country of the company who won the award. This type of cross-border procurement is a direct one as opposed to indirect cross-border procurement where an award winner is an affiliate of a foreign company residing in the country which launches the tender. This paper analyses the determinants of direct cross-border procurement only ⁽⁷⁾. The dataset covers intra-EU and extra-EU public procurement. Hence the econometric analysis and the descriptive statistics presented in this paper analyse total cross-border government purchases.

⁽⁶⁾ The raw dataset was processed so as to remove extreme values and exclude a large part of reporting errors due to non-compliance see also 3.3.

⁽⁷⁾ A study on public procurement in the EU estimates the share of indirect cross-border procurement at 11.4% in terms of number of awards and 13.4% in terms of value in addition to the share of direct cross-border public procurement. For a detailed assessment of the magnitude and determinants of indirect cross-border procurement in the EU see RAMBOLL/HTW Huhr (2011).

2.1 General overview

The TED dataset analysed in this paper points to a growing number of contract awards in the period 2008-2011, a trend applying to the number of direct cross-border public procurement contracts as well (Table 2). Note, however, that the number of cross-border awards increased less strongly than the number of domestic awards which affected the share of cross-border purchases in the total. This share decreased from 1.6% in 2008 to 1.3% in 2012. In the cleaned dataset, overall there were 17,007 cross-border awards out of the 1.223 million observations retained in the final dataset. This represents an average share of 1.4% of direct cross-border procurement awards for the five years considered.

With respect to the value of the contracts awarded, there has been a decline in 2011 and 2012 (Table 2). The total values of contracts awarded directly cross-border however were the highest in 2010 and 2011. Consequently the share of cross-border public procurement in value terms reached its peak in 2011 at 4.1%. The final total value of contracts awarded is slightly above €910 billion and 3.7% of this value represents direct cross-border awards. The fact that this share is higher than the share in the total number of awards points to a possible effect of the value of the contract on the propensity of a cross-border win.

Table 2: EU public procurement covered in the dataset by number of awards and award value

Number of awards				Award value (€ millions)		
Year	Total	Direct cross-border	Share	Total	Direct cross-border	Share
2008	179,174	2,924	1.6%	167,440	5,678	3.4%
2009	235,066	3,071	1.3%	180,446	6,293	3.5%
2010	253,997	3,498	1.4%	200,120	7,697	3.8%
2011	275,549	3,793	1.4%	182,507	7,567	4.1%
2012	279,945	3,721	1.3%	179,496	6,347	3.5%
Total	1,223,731	17,007	1.4%	910,008	33,583	3.7%

Source: TED, own calculations

Public procurement purchases in the EU are covered by the so called Classical and Utilities Directives ⁽⁸⁾. The former covers works, supplies and services contracts and the latter regulates procurement in the sectors energy, transport, water and postal services. In the time period 2008-2012, there were about 230,000 awards yearly covered by the Classical Directive (Table 3). This corresponds to a share of 94%. In the same period, almost 3,000 awards were awarded directly cross-border representing a share of 1.2% per year. The share of direct cross-border awards covered by the Utilities Directive is found to be significantly

⁽⁸⁾ For the Classical Directive see Directive 2004/18/EC for the Utilities Directive 2004/17/EC.

higher 3.9%. The same holds true if cross-border awards are compared to domestic awards on the base of the contract value. The share of cross-border awards is more than 60% higher under the Utilities Directive compared to the classical Directive. This finding points to a possible impact of the type directive on the propensity for a contract to be awarded directly cross-border.

In the TED database purchases are structured with respect to services, supplies or works. Table 3 provides an overview of the yearly number of awards and their value for both cross-border and domestic purchases according to these three categories. The share of cross-border awards is found to be the highest (1.7%) for supplies; an average of nearly 2,250 supplies contracts was awarded directly cross-border per year. Works are less predominantly awarded directly to foreign companies; their cross-border share is the lowest accounting for only 0.8%. Comparing the distribution of government purchases in award value terms leads to the same conclusion. The share of cross-border awards of supplies contracts is almost 150% higher than the one for services and 80% more than the one for works. This finding suggests that the type of procurement purchases might be a determinant of the propensity of a cross-border win.

Table 3: EU public procurement covered in the dataset by type of directive/purchase (2008-2012)

Number of awards per year				Award value (€ millions) per year		
<i>Regulation</i>	Total	Cross-border	Share	Total	Cross-border	Share
Classical Directive	229,931	2,829	1.2%	150,031	4,323	2.9%
Utilities Directive	14,815	572	3.9%	31,971	2,394	7.5%
<i>Purchases</i>						
Services	83,805	919	1.1%	64,051	1,540	2.4%
Supplies	130,779	2,246	1.7%	48,090	2,863	6.0%
Works	30,162	236	0.8%	69,860	2,314	3.3%

Source: TED, own calculations

Table 4 provides a breakdown of the number and value of procurement contracts by different types of awarding authorities. Most procurement contracts (domestic and cross-border), slightly over 72,500 per year, were awarded by 'bodies governed by public law'. This corresponds to a share of 30% of all authorities awarding public contracts published on TED. The highest share of cross-border contracts (3.9%), however, is found to be awarded by 'special purpose authorities' (utilities entities) engaged in the provision of utilities. Water, transport, energy and telecommunication utility providers award contracts to foreign companies above the average of all other types of government authorities.

Table 4: EU public procurement covered in the dataset by type of awarding authority (2008-2012)

Level of procurement	Number of awards per year			Award value (€ millions) per year		
	Total	Cross-border	Share	Total	Cross-border	Share
Central government	25,181	556	2.2%	25,127	1,611	6.4%
Local authorities	56,373	354	0.6%	45,529	596	1.3%
Utilities entities	14,815	572	3.9%	31,971	2,394	7.5%
Public law body	72,537	988	1.4%	36,329	914	2.5%
Other	62,278	763	1.2%	32,837	1,030	3.1%
National or federal agency	4,388	80	1.8%	3,547	84	2.4%
Regional or local agency	5,470	49	0.9%	4,854	56	1.2%
Not specified	3,704	39	1.1%	1,808	32	1.8%

Source: TED, own calculations

The same finding applies to the value of contracts awarded cross-border. Special purpose authorities engaged in the provision of utilities awarded contracts to foreign companies worth almost €2.4 billion per year representing the highest cross-border share of 7.5%. Comparing the contracts awarded to a foreign company in terms of number of awards and award value, the high share of cross-border contracts awarded at central government level is also noticeable. Central governments awarded yearly contracts worth €1.6 billion to foreign companies.

Table 5 provides an overview of the EU public procurement by type of procurement procedure. Overall, open procedures are found to be the most prominent in the EU, accounting for 85% of the number of contracts awarded and 63% of their value. Restricted procedures are the second most common type with a significantly lower share of 4% in terms of number and 16% in terms of contract value. Looking at cross-border procurement only, the significance of open procedures is smaller to the advantage of the so called negotiated procedures without a call for competition. Their share is the highest in terms of number (4.9%) and award value (8.7%). Negotiated procedures without a call for competition account for about 12% of both the value and number of total cross-border awards.

Furthermore, as shown in Table 5, compared to the average in EU Member States of 1.4%, other types of procedures such as the ones awarded through competitive dialogue, negotiated with competition and accelerated negotiated procedures are found to be significantly above the average in terms of number of contracts awarded to foreigners. In terms of value, the same patterns are revealed.

Table 5: EU public procurement covered in the dataset by type of procedure (2008-2012)

<i>Procurement procedure</i>	Number of awards per year			Award value (€ millions) per year		
	Total	Cross-border	Share	Total	Cross-border	Share
Accelerated negotiated procedure	602	17	2.8%	629	34	5.4%
Accelerated restricted procedure	1,957	48	2.5%	2,399	124	5.2%
Award without publication	6,067	69	1.1%	1,990	50	2.5%
Competitive dialogue	411	17	4.0%	5,289	115	2.2%
Negotiated procedure with competition	8,429	286	3.4%	19,106	1,275	6.7%
Negotiated procedure without competition	8,400	415	4.9%	8,544	743	8.7%
Open procedure	207,651	2,327	1.1%	114,155	3,343	2.9%
Restricted procedure	10,272	203	2.0%	29,100	977	3.4%

Source: TED, own calculations

2.2 Regional and sectoral overview

In a next step, we focus on a more disaggregated regional and sectoral overview of EU public procurement. Table 6 reveals interesting patterns about the distribution of EU public procurement by the country of the awarding authority and the share of cross-border awards in terms of number and value of awards. On the one hand, when considering the total number of awards, Poland (31%), France (25%) and Germany (6%) account for the majority of contracts awarded by EU member states. On the other hand, the share of different member states in the total value of public procurement contracts shows a less concentrated picture with France (19%), Poland (13%), Italy (12%) and the United Kingdom (12%) in top of contracting authorities.

In addition, we find that there is significant variation in terms of the share of cross-border awards across different EU Member States. While the EU average cross-border share in terms of number of awards is around 1.4%, this share is significantly higher for Luxembourg (17%), Malta (16%) and Ireland (14%). Finally, in value terms, the share of cross-border contracts is highest for smaller member states like Malta (41%), Cyprus (17%) and Luxemburg (16%), compared to an average of 3.7% for the EU as a whole. These descriptive statistics at the Member State level could be a first indication of the fact that variables such as population might be inversely correlated with the propensity of a country to award public procurement contracts to foreigners.

In a next step, we explore the distribution of EU public procurement contracts by sector considering also the cross-border award share (see Table 7). Overall, the data shows that services sectors account for about 46% of the number of contracts awarded and for more

than 72% of the value. A more detailed level analysis further reveals that in terms of number of contracts awarded sectors such as 'Medical equipment and pharmaceuticals' (29%) and 'Construction works' (12%) account for the majority of public procurement contracts in the EU. In terms of the share in the total value, these are the same two sectors that appear to be the most prominent, as 'Construction works' represents 36%, followed by 'Medical equipment and pharmaceuticals' with 5.4% of the total value of the contracts.

Table 6: EU public procurement covered in the dataset by awarding country (2008-2012)

Country	Number of awards per year			Award value (€ millions) per year		
	Total	Cross-border	Share	Total	Cross-border	Share
Austria	1,935	103	5%	3,071	148	5%
Belgium	3,063	167	5%	4,451	213	5%
Bulgaria	5,259	48	1%	2,044	226	11%
Cyprus	787	52	7%	476	80	17%
Czech Republic	5,436	104	2%	6,654	258	4%
Germany	14,573	179	1%	11,522	257	2%
Denmark	1,461	52	4%	3,208	126	4%
Estonia	1,404	83	6%	1,389	172	12%
Spain	10,863	117	1%	15,166	176	1%
Finland	1,628	42	3%	2,146	80	4%
France	60,107	447	1%	34,769	512	1%
Greece	2,602	41	2%	2,249	91	4%
Hungary	5,248	91	2%	5,019	174	3%
Ireland	408	59	14%	416	32	8%
Italy	12,407	153	1%	21,471	450	2%
Lithuania	4,626	106	2%	1,289	131	10%
Luxembourg	234	39	17%	324	53	16%
Latvia	5,958	139	2%	1,527	193	13%
Malta	144	23	16%	171	71	41%
Netherlands	1,609	41	3%	4,143	127	3%
Poland	74,728	650	1%	22,843	1,031	5%
Portugal	1,030	26	3%	1,860	157	8%
Romania	12,269	244	2%	7,727	965	12%
Sweden	1,272	55	4%	2,657	115	4%
Slovenia	4,369	87	2%	1,130	65	6%
Slovakia	1,903	77	4%	2,479	251	10%
United Kingdom	9,424	177	2%	21,799	563	3%
Total	244,746	3,401	1%	182,002	6,717	4%

Source: TED, own calculations

Interestingly, descriptive statistics show that, overall, the cross-border award share is higher in manufacturing sectors, both in terms of number of contracts and in value terms. As depicted in Table 7, in terms of number of contracts, the foreign share is higher in sectors such as 'Services related to the oil and gas industry' (15%) and 'Laboratory, optical and

precision equipment’ (8%) compared to an average of 1.4% for all sectors. Furthermore, when considering the value of contracts, we find high share of cross-border awards in sectors such as ‘Industrial machinery’ (22%), ‘Security, fire-fighting, police and defence equipment’ (18%), ‘Electrical machinery, apparatus and equipment’ (17%) compared to an overall sectoral average of 3.7%.

Table 7: EU public procurement covered in the dataset by sector (2008-2012)

Sector	Number of awards per year			Award value (€ millions) per year		
	Total	Cross-border	Share	Total	Cross-border	Share
Agricultural, farming, fishing, forestry and related products	1,014	22	2%	439	10	2%
Petroleum products, fuel, electricity and other sources of energy	4,421	34	1%	8,105	199	2%
Mining, basic metals and related products	633	11	2%	309	12	4%
Food, beverages, tobacco and related products	9,800	29	0%	5,134	26	0%
Agricultural machinery	444	13	3%	68	5	7%
Clothing, footwear, luggage articles and accessories	1,701	53	3%	549	41	7%
Leather and textile fabrics, plastic and rubber materials	455	12	3%	172	14	8%
Printed matter and related products	1,523	73	5%	671	87	13%
Chemical products	4,502	42	1%	1,139	21	2%
Office and computing machinery and equipment	5,811	42	1%	3,883	72	2%
Electrical machinery, apparatus and equipment	2,219	136	6%	2,025	352	17%
Radio, television, communication equipment	1,841	57	3%	1,929	68	4%
Medical equipment, pharmaceuticals and personal care	70,423	585	1%	9,741	168	2%
Transport equipment and auxiliary products	7,696	273	4%	6,549	890	14%
Security, fire-fighting,	1,034	60	6%	880	160	18%

police and defence equipment						
Musical instruments, sport goods, games, toys, handicraft	407	13	3%	81	7	9%
Laboratory, optical and precision equipment (excl. glasses)	4,480	365	8%	1,220	158	13%
Furniture (incl. office furniture)	4,931	87	2%	1,327	60	5%
Collected and purified water	72	1	1%	110	2	2%
Industrial machinery	2,420	172	7%	1,689	375	22%
Machinery for mining, quarrying, construction equipment	898	28	3%	514	44	9%
Construction structures and materials; auxiliary products	3,843	76	2%	2,795	157	6%
Construction work	29,398	212	1%	66,423	2,076	3%
Software package and information systems	1,765	76	4%	1,458	93	6%
Repair and maintenance services	6,948	78	1%	7,034	184	3%
Installation services (except software)	232	8	4%	204	26	13%
Hotel, restaurant and retail trade services	1,708	5	0%	2,080	4	0%
Transport services (excl. Waste transport)	6,829	32	0%	5,267	93	2%
Supporting and auxiliary transport services; travel agencies	695	6	1%	804	7	1%
Postal and telecommunications services	1,789	9	1%	1,707	19	1%
Public utilities	599	2	0%	1,561	13	1%
Financial and insurance services	5,716	61	1%	6,505	235	4%
Real estate services	437	7	2%	911	26	3%
Architectural, construction, engineering and inspection	10,476	201	2%	6,648	332	5%
IT services: consulting, software development,	4,004	126	3%	5,345	203	4%

Internet and						
Research and development services and related	828	34	4%	462	31	7%
Administration, defence and social security services	476	18	4%	769	21	3%
Services related to the oil and gas industry	161	24	15%	477	64	13%
Agricultural, forestry, horticultural services	8,724	9	0%	1,753	1	0%
Business services: law, marketing, consulting	6,982	168	2%	5,429	160	3%
Education and training services	6,569	29	0%	1,601	15	1%
Health and social work services	6,598	9	0%	5,222	58	1%
Sewage-, refuse-, cleaning-, and environmental services	11,185	48	0%	9,240	90	1%
Recreational, cultural and sporting services	864	40	5%	527	25	5%
Other community, social and personal services	1,189	19	2%	1,246	15	1%
Total	244,736	3,401	1%	182,001	6,717	4%

Source: TED, own calculations

Finally, we consider the distribution of cross-border procurement by contracting country. As expected, intra-EU cross-border public procurement contracts dominate the sample considered here as they account for about 83% of both the value and number of contracts awarded to foreigners. Among EU Member States, cross-border contracts awarded to Germany, United Kingdom and Italy are the most important in terms of number of awards while Germany, Italy and Spain are the most prevalent in terms of contract value. In terms of extra-EU cross-border procurement flows, the data reveals that countries like the US, Switzerland, Norway and Canada are among the most important foreign contractors both in terms of value and number of contracts awarded.

3. Determinants of direct cross-border public procurement in the EU

3.1 Literature overview

Reviewing the economic literature on the possible determinants of cross-border EU public procurement, we find two studies that provide insights. Both of these use TED data for analysing government procurement markets in the EU. Ramboll/HTW Huhr (2011) assess the determinants of cross-border procurement by estimating a binary logit-model on the probability for a contract to be awarded directly cross-border. Their estimations are based on a sample containing data from 2007 to 2009. The study estimates the effect of the contracts specifics (type of Directive, supplies vs. works and services), the award giving country specificities (population, euro-area membership, new versus old member states, etc.) and the buy/sell side (procurement level, type of procedure, contract value, number of bids, etc.) on the propensity of a cross-border win.

Ramboll/HTW Huhr (2011) results suggest a positive impact of awards under the Utilities Directives as opposed to the Classical Directive and of services and supplies versus works contracts on the probability for a contract to be awarded directly cross-border. Similarly, euro-area membership and sharing a common language are factors which impact significantly on the propensity of a cross-border win. In addition, the value of the contract awarded, the type of procedure (negotiated versus the open procedure) as well as European Community funding increase the probability of awarding a contract cross-border. Finally, factors which impact negatively the cross-border wins are population, level of procurement (in this case local government) and number of bids. Ramboll/HTW Huhr (2011) do not find significant time series effects in their multivariate logistic regressions.

The 2011 study from PwC, London Economics and Ecorys assesses inter alia the effect of selected factors on the probability of a cross-border win by estimating a marginal probit model using the TED dataset that covers the period 2006-2010. This study assesses the impact of type of procedure, level of government, centralisation of procurement, wealth, size, old versus new EU membership of the contract awarding country, the sectoral impacts and the type of contract awarded on the propensity of a cross-border win. The econometric specifications include time fixed effects for the period 2006-2010.

The results of the multivariate regression point to a positive impact of the type of procedure (negotiated versus restricted), EC-funded procurement and of supplies versus services contracts on the incidence of a cross-border win. Centralisation of procurement and economic power of the contract awarding country (measured on the base of the GDP per capita) also constitute a higher propensity of a foreign contract award. At the same time, the size of the country (population), the level of government consumption and the level of procurement (local) impact negatively on the probability of a contract to be awarded directly cross-border. PwC, London Economics and Ecorys (2011) also estimate the incidence of a cross-border win depending on the sector for which the cross-border contract is awarded

and report the highest incidence of a cross-border win for the ‘Machinery and equipment’ and ‘Manufactured goods’ sectors. The study does not find any significant time effects.

3.2 Econometric specification

The econometric analysis presented in this paper is based on a multivariate logit model ⁽⁹⁾ that estimates the impact of a set of selected explanatory variables on the probability of awarding public procurement contracts directly cross-border. The response variable is number of awards. Four specifications were estimated using a multivariate binary logit in a bottom-up approach meant to test the explanatory power of the model and the stability of the coefficients with respect to changes in the specifications.

The final specification is of the following general (logit) form:

$$\pi_{irt} = \Lambda(\alpha + \beta X_{irt} + \gamma Y_{rt} + \mu FE) = \frac{1}{1 + e^{-(\alpha + \beta X_{irt} + \gamma Y_{rt} + \mu FE)}} \quad (1)$$

where

- $\pi_{irt} = 1$ if procurement contract i , in country r is awarded cross-border at time t .
- $\pi_{irt} = 0$ if procurement contract i , in country r is awarded domestically at time t .
- X_{irt} is a matrix of explanatory variables that represent contract characteristics such as *contract value* and *number of offers* for contract i at time t in country i .
- Y_{rt} is a matrix of independent variables that control for awarding country characteristics such as *GDP per capita*, *population*, *trade to GDP ratio*, *government expenditure to GDP ratio*, *barriers to trade*, *investment freedom* and *business freedom* in awarding country r at time t .
- FE is a matrix of dummy variables that account for time fixed effects, sectoral fixed effects, type of procedure, awarding authority, contract type, euro-area fixed effects, etc.

Expressing the model in terms of odds ⁽¹⁰⁾:

$$\frac{\pi_{irt}}{1 - \pi_{irt}} = e^{(\alpha + \beta X_{irt} + \gamma Y_{rt} + \mu FE)} = e^{\alpha} (e^{\beta})^{X_{irt}} (e^{\gamma})^{Y_{rt}} (e^{\mu})^{FE} \quad (2)$$

or, equivalently:

$$\log_e \frac{\pi_{irt}}{1 - \pi_{irt}} = \alpha + \beta X_{irt} + \gamma Y_{rt} + \mu FE + \varepsilon_{irt} \quad (3)$$

⁽⁹⁾ In this paper the authors estimated both: a binary logit and a probit model. Note however that results of a probit model are by nature similar to the results of a logit model. The logit model however performed better in terms of likelihood and goodness of fit statistics. For this reason the results section reports the logit model specifications.

⁽¹⁰⁾ Thus, e^{β} and e^{γ} represents the multiplicative effect on the odds of increasing X_{irt} , Y_{rt} by 1, holding the other independent variables constant. The multiplicative effect of e^{μ} of the dummy variable set and FE has to be considered in respect to the corresponding omitted dummy variable.

3.3 Description of the data

Our main data source for the econometric analysis is Tenders Electronic Daily (TED), a unique dataset compiled based on mandatory contract awards notices in EU Member States for the period 2008-2012. The raw dataset was processed so as to remove extreme values and exclude a large part of reporting errors due to non-compliance. As a result, we removed observations without any information on the value of the award (around 30% of the contracts) as well as observations with a total award value below €1000 and above €200 million. The cleaned dataset consists of approximately 1.1 million observations.

The TED dataset is further complemented with macroeconomic data from the World Development Indicators of the World Bank and economic freedom indicators from the Heritage Foundation. Table 8 below provides an overview of the summary statistics for the continuous variables used in the econometric estimations. The variable ‘barriers to trade’ is a proxy for the protectiveness of a country in terms of tariff and especially non-tariff barriers whereas the investment freedom measures the openness of a country to foreign investments. The business freedom variable reflects the efficiency of government regulating product and factor markets.

Table 8: Summary statistics

	Source	Mean	St. Dev.	Min	Max
Contract value (€ mil)	Tender Electronics Daily	0.76	4.91	0.00	200
Number of offers	Tender Electronics Daily	6.23	16.71	1	1357
GDP per capita (\$)	World Development Indicators	25304	14288	6453	112029
Population (millions)	World Development Indicators	40.85	23.30	0.41	82.11
Trade to GDP ratio	World Development Indicators	86.17	31.81	48.02	333.53
Govt. exp to GDP ratio	World Development Indicators	19.67	4.23	6.31	29.79
Barriers to trade	Heritage Foundation	86.76	2.03	82.80	87.80
Investment freedom	Heritage Foundation	75.45	8.46	55.00	95.00
Business freedom	Heritage Foundation	77.10	7.41	62.40	98.10

4. Results

Table 9 provides an overview of the results of the econometric analysis. The approach followed is a bottom-up one starting with specification (1) containing key predictors of the probability of a direct cross-border win. This type of approach also tests the sensitivity of the results to the exact econometric specification i.e. whether the significance and/or the magnitude of the coefficients depend on adding additional independent variables in the regressions. Each of the specifications is based on a sample covering more than one million observations.

All predictors included in specification (1) impact highly significantly (the variables are significant at one tenth of a percent level) the response variable. The value of the contract

awarded has a positive influence on the probability of a cross-border win implying that high value contracts are more likely to be awarded to a foreign company. The magnitude of the results will be discussed further on in this paper where the marginal effects of the variables and the odds ratios will be presented. This is necessary as logistic regression coefficients cannot be interpreted as standard OLS type of coefficients given that the impact of the coefficient on the response variable varies with the value of the explanatory variables.

In addition, the results of specification (1) point to a negative influence of the number of offers received on the probability of a cross-border win. If the number of offers received can be regarded as a proxy for the competition pressure in public procurement contracts than this result suggests that government authorities are more likely to purchase goods and services from foreign companies when there is less competition from domestic providers in respect to a particular good or services. This result also suggests that, everything else equal, the propensity to award public procurement contract to a domestic company is higher.

Specification (1) also provides interesting insights about the influence of time effects on the probability of a direct cross-border win. To the contrary of the results of Ramboll/HTW Huhr (2011) and PwC, London Economics and Ecorys (2011) this paper identifies a change in the relationship between the predictors and the response variable within the time period considered 2008-2012. In specification (1) all the years are highly significant with a negative sign indicating that compared to 2008 (the omitted variable) it is less likely to award a contract to a foreign company. The model may pick up the influence of the economic crisis on the propensity of a cross-border award. More specifically, the crisis might have changed the pattern of governments procuring indirectly cross-border through affiliates instead of a direct procurement. This result however applies to the number of cross-border awards only and not to the award value and loses explanatory power as more variables are added to the model as in specifications (2)-(4).

The differences in the results of the time effects on the response variable are most likely due to the sample completeness. The results in this paper cover a full 5 year period 2008-2012 whereas the sample of Ramboll/HTW Huhr (2011) and PwC, London Economics and Ecorys (2011) cover only three years 2007-2009 and four years 2007-2010, respectively. Another possible explanation apart from the different model specification is the bias caused by having the year 2007 in the data as reporting requirements on TED have changed as of 2008.

Specification (2) in Table 9 expands the model by adding macro dimensions measuring the impact of the awarding country's wealth (GDP per capita), size (population), openness (trade to GDP ratio), and euro-area membership on the probability of a cross-border win. In addition a dummy gauging the effect of the procurement level is added. The omitted variable is contracts awarded by local governments.

Table 9: Results of the econometric analysis

Multivariate binary logit model on the probability of a direct cross-border award				
Predictors	(1)	(2)	(3)	(4)
Contract value in million €	0.0196***	0.0180***	0.0169***	0.0159***
log of number offers	-0.289***	-0.351***	-0.386***	-0.316***
2009	-0.170***	0.0342	-0.0271	-0.0339
2010	-0.167***	0.0737**	-0.00463	0.00523
2011	-0.188***	-0.0797**	-0.127***	-0.0865**
2012	-0.246***	-0.111***	-0.190***	-0.145***
GDP per capita (thousands €)		0.0335***	0.0154***	0.0172***
Population (millions)		-0.0202***	-0.0188***	-0.0195***
Trade to GDP ratio		-0.0000798	0.000346	0.000120
Govt expend to GDP ratio		-0.0430***	-0.0335***	-0.0313***
Central government		0.783***	0.825***	0.773***
Utilities providers		1.272***	1.360***	1.176***
Public law body		0.860***	0.914***	0.897***
Other		0.759***	0.869***	0.843***
National/federal agency		0.753***	0.585***	0.560***
Regional/local agency		0.214**	0.204**	0.197**
Not specified		0.610***	0.832***	0.818***
Euro vs. non-euro Member		0.135***	0.191***	0.172***
Barriers to trade			-0.0833***	-0.0753***
Business freedom			0.00939***	0.00814***
Investment freedom			0.0430***	0.0369***
Accelerated negotiated				0.440***
Accelerated restricted				0.590***
Award without pub				0.271***
Competitive dialogue				0.792***
Negotiated with comp.				0.411***
Negotiated without comp.				0.908***
Restricted				0.238***
Constant	-3.401***	-3.469***	-0.0483	-0.358
Nr. Observations	1099456	1099456	1099456	1099456
Pseudo R ²	0.0952	0.1356	0.1417	0.1476
Sectoral fixed effects ⁽¹⁾	yes	yes	yes	yes
* p<0.05, **p<0.01, *** p<0.001				

Source: Own calculations, binary logit model.

Results of column 2 suggest a positive and significant influence of the awarding country's wealth and openness on the propensity of a cross-border win. In addition, we find that government authorities in euro-area countries are more likely to award a contract to a

⁽¹⁾ Detailed results for the sectoral fixed effects are presented in Table A1 in the Annex.

foreign company. The effect of the level of public procurement is also very interesting and highly significant. It indicates that compared to awarding a contract at the local government level all other public procurement authorities are more likely to award a contract to a foreign company. The predictors' coefficients reveal that utilities providers have the highest propensity to award a contract to a foreign company (Table 9).

Specification (3) in Table 9 expands the econometric model by adding the influence of the tree types of openness/freedom indicators as described in Section 3.3. All the three indicators are highly significant predictors of the probability of a cross-border win. Also the influence of these indicators is tested for the first time according to the knowledge of the authors in this context. Barriers to trade measure the protectiveness of the domestic economy in terms of tariff and non-tariff barriers and appear with the expected sign in the model specifications (3). The result suggests that the more protective the country the less likely it is for a domestic authority to award a contract to a foreign company. Although intuitive, the result has important policy implications. The investment and business freedom variables affect as expected positively the probability of a cross-border win.

Finally, specification (4) in Table 9 provides an overview of the final and most complete model built to identify the determinants of a direct cross-border public procurement in EU Member States. In comparison with specification (3) the impact of the 'type of procedure' is added to the previous model. The omitted dummy variable is the open procedure which means that results for the other procedures are to be considered in comparison to a procurement contract awarded under the open procedure. All types of procedures are highly significant predictors of the probability of a public procurement contract to be awarded directly cross-border. The positive sign of the seven procedure dummies analysed reveals that a contract has a lowest probability to be awarded cross-border under the open procedure. Recalling from Section 2.1, this is the type of procedure most commonly used in 85% of the cases. The highest probability of a cross-border win is estimated for the negotiated procedures without a call for competition followed by contracts awarded through a competitive dialog.

Marginal effects and odds ratios

In order to get a better idea of the relative magnitude of the impact that each of the explanatory variables has on the odds of a cross-border award, as a next step we focus on odds ratios and marginal effects ⁽¹²⁾. Results presented in Table 10 are limited to specification (4), the final and most comprehensive one.

Regarding contract characteristics, results show that for the average of the sample the odds ratio of a cross-border win grows by 1.6% as the value of a contract increases by one million

⁽¹²⁾ Odds ratios measure the probability of the event divided by the probability of the non-event for the average (contract) of the sample, while marginal effects depict the change in probability of the event at the margin of the dependent variable average.

euros. We also note that while the marginal effect for the same variable is positive and highly significant it is smaller than 0.000.

Table 10: Marginal effects and odds ratios

<i>Explanatory variables specification (4)</i>	Odds ratios		Marginal effects	
	estimate	p-value	estimate	p-value
Contract value in million €	1.016	0.000	0.000	0.000
log of number offers	0.729	0.000	-0.002	0.000
2009	0.967	0.234	0.000	0.229
2010	1.005	0.850	0.000	0.850
2011	0.917	0.001	-0.001	0.001
2012	0.865	0.000	-0.001	0.000
GDP per capita (thousands €)	1.017	0.000	0.000	0.000
Population (millions)	0.981	0.000	0.000	0.000
Trade to GDP ratio	1.000	0.692	0.000	0.692
Govt expend to GDP ratio	0.969	0.000	0.000	0.000
Central government	2.167	0.000	0.008	0.000
Utilities providers	3.241	0.000	0.015	0.000
Public law body	2.452	0.000	0.008	0.000
Other	2.323	0.000	0.008	0.000
National/federal agency	1.750	0.000	0.005	0.000
Regional/local agency	1.218	0.006	0.002	0.011
Not specified	2.266	0.000	0.009	0.000
Euro vs. non-euro Member	1.187	0.000	0.001	0.000
Barriers to trade	0.927	0.000	-0.001	0.000
Business freedom	1.008	0.000	0.000	0.000
Investment freedom	1.038	0.000	0.000	0.000
Accelerated negotiated	1.553	0.000	0.004	0.002
Accelerated restricted	1.804	0.000	0.006	0.000
Award without pub	1.311	0.000	0.002	0.000
Competitive dialogue	2.208	0.000	0.009	0.000
Negotiated with comp.	1.509	0.000	0.004	0.000
Negotiated without comp.	2.479	0.000	0.010	0.000
Restricted	1.268	0.000	0.002	0.000

Source: Own calculations, binary logit model.

As pointed out previously, the number of offers has a negative impact on the probability of a cross-border award, finding that is underlined by the odds ratios and marginal effects. Thus, results show that the odds to award to a foreign contractor decreases by 27.1% with the log of number of offers.

The next category of explanatory variables pertains to characteristics of the awarding country. First, increasing GDP per capita of the awarding country by 1000€ will increase the odds ratio of a cross-border award by 1.7%. The marginal effect of GDP per capita is found to be statistically significant but does not have an impact on the dependent variable at the three digit level. Second, trade to GDP ratio, a proxy aimed to represent the degree of openness of the awarding country is found to be positive but results are not statistically significant at the 5% level.

Surprisingly, our results also show that the population and the share of government expenditure in total GDP of the awarding country have negative impacts on the probability for a contract to be awarded to a foreigner. More specifically, we find that increasing the share of government expenditure in total GDP by one unit decreases the odds of a cross-border win by 3.1% and an increase in the population by 1 million leads to a decrease of 1.9%.

Among the three economic freedom indicators included in our econometric specification, it is barriers to trade (a composite measure of tariff and non-tariff barriers in the awarding country) that have the most significant impact on the odds ratio of a cross-border win. Our results show that for the average of the sample, increasing this index by one unit decreases the odds of a cross-border award by 7.3%. Not surprisingly, investment freedom and business freedom are found to positively impact the probability of a cross-border win. Thus, an improvement in the investment freedom of the awarding country, a proxy for the openness to foreign investment flows, increases the odds of a cross-border award by 3.8%. Finally, improving the index business freedom (an overall indicator of the efficiency of government regulation of business) leads to an increase in the odds of a cross-border win by 0.8%.

As a next step, we turn to the impact on the dependent variable of different dummy variables included in our main regression (4).

First, regarding yearly fixed effects, results show that relative to 2008 the odds to award a contract to foreign contractor decreased in 2011 by 8.3% and 2012 by 13.5%. The fact that results are insignificant for 2009 and 2010 however makes it difficult to conclude without ambiguity on the effect of time on the response variable.

Second, the type of awarding authority plays a crucial role in determining the probability of a cross-border award. Of all types of awarding authorities, it is local governments that are found to have the lowest propensity to award contracts to cross-border providers. Utilities providers are found to be on the other end of the spectrum with the highest propensities, i.e. 224% higher than local governments.

Third, overall and for the average of the sample, EU Member states that are part of the euro-area are found to have higher odds to award procurement contracts cross-border, by 18.7%. Given that GDP per capita discussed previously already controls for the level of development of the awarding country, this finding could be pointing towards the fact that monetary

integration of the euro-area states positively influences the probability of awarding contracts cross-border.

Finally, our analysis concludes with the impact of the type of procedure on the probability of a cross-border win. The omitted variable here is open procedures, and our results show of all types, these are the types of contract that exhibit the lowest propensities to be awarded to foreign contractors. Given however that open procedures are usually the ones with the highest number of offers and the number of offers is found to have a strong negative impact on the probability of a cross-border award, this result is not unexpected. Table 9 shows also that contracts awarded through a competitive dialogue (121%) and those negotiated without competition (148%) have the highest odds to be awarded cross-border in comparison to the open procedures.

5. Conclusions and policy implications

Given the lack of empirical work examining issues pertaining to public procurement, this paper aims to fill in an important gap in the literature on the determinants of cross-border public procurement. The novelty of the paper is twofold: first, the multivariate logit model estimated here accounts for the influence of variables related to trade, foreign investment and business environment of the awarding country on the probability of a direct cross-border procurement award in EU Member States. The impact of these variables has not been tested so far to the knowledge of the authors. Second, the dataset underlying the econometric analysis is unique (consists of panel data for 5 years, 2008-2012) and has been used for the first time for the purposes of this paper.

Descriptive statistics presented in the first part of the paper reveal a dearth of information about patterns of public procurement by countries and sectors, with a special focus on contracts awarded cross-border. Among others, results of the econometric estimations suggest that the odds of awarding a contract cross-border grow by 1.6% as the value of a contract increases by one million euros. Furthermore, the odds to award to a foreign contractor decreases by 27.1% with the log of number of offers. Among awarding country characteristics, GDP per capita and euro-area membership are found to positively impact the probability of a cross-border award, while population and the share of government expenditure in total GDP has a negative influence.

Barriers to trade (a proxy of tariff and non-tariff barriers) are shown to have a significant negative impact on cross-border awards. Other results also show that of all types of awarding authorities, it is local governments that are found to have the lowest propensity to award contracts to cross-border providers. Utilities providers are found to be on the other end of the spectrum with the highest propensities. Finally, contracts awarded through an open procedure exhibit the lowest propensities to be awarded to foreign contractors. On the other hand, contracts negotiated without competition and with competitive dialogue have the highest probabilities to be awarded cross-border.

In terms of policy implications brought along by the findings in this paper, we note the importance of barriers to trade, foreign investment and business freedom indicators as factors that have a significant influence on the propensity of countries to award public procurement contracts cross-border. Of the three indexes considered here that describe the trading, business and investment environment of the awarding country it is barriers to trade that have been found to have the most significant weight in influencing the probability of a cross-border win. More specifically, our results suggest that, *ceteris paribus*, a decrease in the index that proxies tariff and non-tariff barriers by a unit will lead to a 7.3% increase in the odds ratio of a cross-border win. Furthermore, an improvement in the investment and business indicator by a unit will be translated in the improvement of the odds of a cross-border win by 3.8% and 0.8%, respectively. These findings suggest that apart from policy measures that have a direct influence on access to domestic procurement markets, there is important policy space for countries to indirectly improve the international contestability of their public procurement markets by reducing barriers to trade or by taking measures that improve the business and investment environment.

Finally, it is important to emphasize that the lack of data availability on public procurement in general and cross-border public procurement in particular remains a significant impediment in providing sound and reliable quantitative analysis on this topic for countries that do not collect/publish such information. Recent efforts by different international organizations and the European Commission are aimed to promote the collection, publication and use of detailed TED-type data that would allow policy makers and researchers to better understand barriers to public procurement markets with a direct implication for the national and multinational policy making process.

References

Directive 2004/17/EC of the European Parliament and of the Council of 31 March 2004 coordinating the procurement procedures of entities operating in the water, energy, transport and postal services sectors.

Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts.

EEC (2013), COMMISSION Regulation (EU) No 1336/2013 of 13 December 2013 amending Directives 2004/17/EC, 2004/18/EC and 2009/81/EC of the European Parliament and of the Council in respect of the application thresholds for the procedures for the awards of contract, Brussels: European Commission.

Kutlina-Dimitrova, Z. and Lakatos, C. (2014), Status-quo and data challenges in analysing cross-border public procurement, forthcoming.

PwC, London Economics and Ecorys (2011), Public Procurement in Europe: Cost and effectiveness, study prepared for the European Commission.

RAMBOLL/HTW Huhr (2011), Cross-border procurement above EU thresholds, final report for the European Commission, DG Internal Market and Services, Copenhagen.

TED (2013), Tenders Electronic Daily, Supplement to the Official Journal of the European Union, accessible at <http://ted.europa.eu/TED/browse/browseByBO.do>.

Annex

Table A1: Sectoral fixed effects

	Coefficient		Odds ratios	
	estimate	p-value	estimate	p-value
<i>Specification (4) – omitted dummy Agriculture</i>				
Petroleum products, fuel, electricity and other sources of energy	-1.448***	0.000	0.235	0.000
Mining, basic metals and related products	-0.394*	0.023	0.674	0.023
Food, beverages, tobacco and related products	-2.074***	0.000	0.126	0.000
Agricultural machinery	0.193	0.242	1.213	0.242
Clothing, footwear, luggage articles and accessories	0.243*	0.045	1.276	0.045
Leather and textile fabrics, plastic and rubber materials	0.125	0.482	1.133	0.482
Printed matter and related products	0.961***	0.000	2.614	0.000
Chemical products	-0.744***	0.000	0.475	0.000
Office and computing machinery, equipment and supplies	-1.092***	0.000	0.336	0.000
Electrical machinery, apparatus, equipment and	0.760***	0.000	2.139	0.000
Radio, television, communication, telecommunication and	0.0652	0.587	1.067	0.587
Medical equipment, pharmaceuticals and personal care	-0.815***	0.000	0.443	0.000
Transport equipment and auxiliary products to transportation	0.316**	0.003	1.371	0.003
Security, fire-fighting, police and defence equipment	0.767***	0.000	2.153	0.000
Musical instruments, sport goods, games, toys, handicraft,	0.350*	0.041	1.418	0.041
Laboratory, optical and precision equipment (excl. glasses)	1.105***	0.000	3.018	0.000
Furniture (incl. office furniture), furnishings, domestic	-0.0769	0.500	0.926	0.500
Collected and purified water	-1.114	0.059	0.328	0.059
Industrial machinery	0.937***	0.000	2.551	0.000
Machinery for mining, quarrying, construction equipment	0.290*	0.033	1.336	0.033
Construction structures and materials; auxiliary products to	-0.247*	0.033	0.781	0.033
Construction work	-1.084***	0.000	0.338	0.000
Software package and information systems	0.283*	0.015	1.327	0.015
Repair and maintenance services	-0.918***	0.000	0.399	0.000

Installation services (except software)	0.0542	0.783	1.056	0.783
Hotel, restaurant and retail trade services	-1.997***	0.000	0.136	0.000
Transport services (excl. waste transport)	-1.405***	0.000	0.245	0.000
Supporting and auxiliary transport services; travel agencies	-1.156***	0.000	0.315	0.000
Postal and telecommunications services	-1.549***	0.000	0.213	0.000
Public utilities	-2.025***	0.000	0.132	0.000
Financial and insurance services	-0.766***	0.000	0.465	0.000
Real estate services	-0.382	0.069	0.683	0.069
Architectural, construction, engineering and inspection	-0.215*	0.046	0.807	0.046
IT services: consulting, software development, Internet and	-0.261*	0.019	0.770	0.019
Research and development services and related	0.0824	0.535	1.086	0.535
Administration, defence and social security services	0.229	0.145	1.257	0.145
Services related to the oil and gas industry	1.454***	0.000	4.279	0.000
Agricultural, forestry, horticultural, aqua-cultural services	-3.175***	0.000	0.042	0.000
Business services: law, marketing, consulting, recruitment	-0.0492	0.651	0.952	0.651
Education and training services	-1.587***	0.000	0.205	0.000
Health and social work services	-2.826***	0.000	0.059	0.000
Sewage-, refuse-, cleaning-, and environmental services	-1.573***	0.000	0.207	0.000
Recreational, cultural and sporting services	0.686***	0.000	1.985	0.000
Other community, social and personal services	-0.517***	0.001	0.596	0.001

Source: Own calculations, multivariate binary logit model.