

UNIVERSALISTIC RULES – PARTICULARISTIC IMPLEMENTATION: THE EU'S SINGLE MARKET FOR GOVERNMENT PURCHASES

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ABSTRACT. Open and fair access to government contracts has been a long-standing principle in many international trade agreements including the EU's single public procurement market. However only about 5% of procurement contracts are awarded to non-domestic suppliers. This is in strike contrast with overall trade openness among these countries which surpasses 50% of GDP. Our analysis contrasts international trade statistics with contract-level administrative data to investigate to what degree this gap results from government particularistic protectionism and what are its drivers. We find sizeable effect (between 21% and 44%) which can be attributed to public bodies using particularistic means to favour domestic firms. Taking the example of EU institutions, which have arguably much less reason to prefer domestic companies in whichever member state they are located, suggests that procurement openness could increase up to 10-times approximating member states' total openness.

INTRODUCTION

Open and fair access to government contracts has been a long-term principle in many international trade agreements including the World Trade Organisation's so-called plurilateral Agreement on Government Procurement (GPA) (https://www.wto.org/english/tratop_e/gproc_e/overview_e.htm). Among these agreements, the European Union (EU)'s single public procurement market (http://ec.europa.eu/growth/single-market/public-procurement/index_en.htm) is probably the most extensive with its long standing

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common regulatory and enforcement framework preceding the GPA and strong institutional backing both for punishing lack of rule transposition and incorrect implementation (e.g. European Court of Justice). Even in such a well-governed part of the world, qualitative evidence is ample demonstrating how universalistic rules of open and fair trade in government contracts are bent by national governments to favour companies' particularistic link (e.g. owned by political office holders or donors to electoral campaigns). If the suspected market entry restrictions are systematic, the resulting efficiency losses are likely to be considerable as public procurement amounts to roughly 13% of GDP in the EU (European Commission, 2016). Moreover, if the EU single market in public procurement fails to foster trade among EU and European Economic Area (EEA) members¹ due to particularistic motives, we can reasonably assume that other trade agreements will fail to do so even more.

In spite of such salient economic role of procurement markets in Europe and globally and long standing regulatory action, no systematic study exists which would assess the effect of any such trade agreement on procurement markets and the potential links to particularism. In order to address this gap in the literature, this paper sets out to

- 1) measure the degree of particularistic protectionism in public procurement in the EU and EEA;
- 2) explore its distribution across countries and time; and
- 3) identify its drivers in terms of tender-level corrupt practices to separate particularistic favouritism from its other reasons for the gap.

Particularistic protectionism in public procurement trade refers to the deliberate bending of universalistic rules of open and fair access to government contracts in order to benefit domestic companies with particularistic links established through friendship, kinship or the purchase of influence² (throughout this paper particularism and corruption are used interchangeably).

¹ <http://www.efta.int/eea/policy-areas/goods/competition-aid-procurement-ipr/procurement> (annex XVI)

² For a wide-ranging discussion of conceptualizing corruption as particularism or partiality see: (Mungiu-Pippidi, 2015; North, Wallis, & Weingast, 2009; Rothstein & Teorell, 2008)

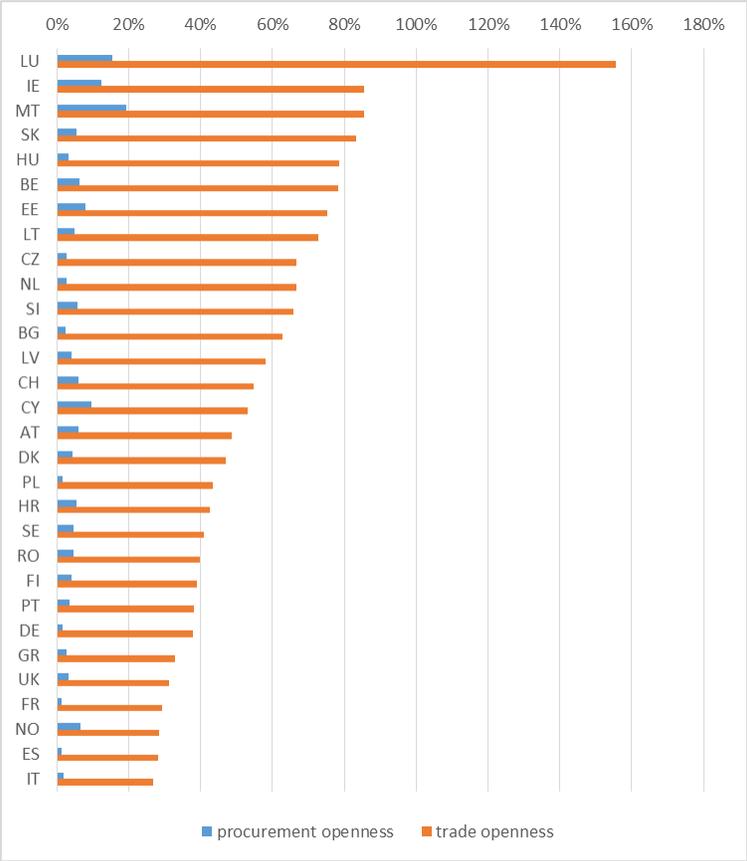
In subsequent sections a number of key contributions are made: first, we identify a large gap in the public procurement trade in Europe which persists in spite of the strong EU institutional framework. We estimate that at least 17% of total procurement spending happens on markets which are protected from foreign competition by corrupt means. Second, this gap is attributed mainly to national public authorities manipulating the way open and fair rules of public procurement are applied to particular tenders in order to favour their domestic firms. The degree and forms of such particularistic protectionism varies by country, but it is present all across the EU. Surprisingly, some well-governed countries such as Denmark and Finland appear to protect their procurement markets to a comparatively high degree; while some traditionally considered as more corrupt countries such Poland and Romania protect their procurement markets from foreign competition relatively less. Third, using organisations of the European Commission as a possibly least protectionist institution regardless of the country they reside in, we suggest that intra-EU public procurement trade could increase tenfold, that is from 5% currently to roughly 50%.

The puzzle

The subsequent analysis tries to explain two striking features of European public procurement trade: its absence and its lack of responsiveness to the EU institutional framework. First, while most if not all EU and EEA countries are highly open economies when it comes to private to private trade, they are extremely closed when it comes to government contracts (Figure 1). On average, member states' trade openness is roughly 10-times their procurement openness (56.6% and 5.9% respectively). Furthermore, trade and procurement openness are by far not following the same patterns for each country.

Second, while EU and EEA countries import more public procurement products from each other than from outside of the block: on average 0.08% higher share of procurement import from member states than non-member states for all possible importer-exporter country pairs in 2013 (significant at the 0.1% level). While this is a very small difference (around one-quarter standard deviation), when taking into account the total trade in each relation, it turns into practically zero and insignificant.

Figure 1. Contrasting trade openness with public procurement openness, EU+EEA, 2009-2014 averages



CONCEPTUAL FRAMEWORK

Protectionism in public procurement means that trade is missing, it could have taken place but it did not. Measuring how much procurement trade is missing requires a suitable benchmark. We establish it in two different ways, reflecting macro as well as micro perspectives: a) comparing procurement trade to total trade (i.e. predominantly business-to-business trade) and b) comparing individual member states' procurement markets to the most open member state's markets. The so-identified missing procurement

trade is attributed to particularism in public procurement as long as more corrupt countries have bigger such trade gap (macro view) and corruption risks in the tendering process accompany missing procurement trade (micro view). Each of these identification strategies are discussed briefly below.

Identifying particularistic public procurement from a macro perspective rests on three presumptions: First, within the EU and EEA, total trade is not or only marginally susceptible for government manipulation due to strict EU single market regulations, effective oversight, and the predominantly business-to-business nature of contracting. Second, within the EU and the EEA public procurement trade is susceptible for government manipulation (i.e. by central govt., municipalities, State-owned enterprises, etc.) as the implementation and monitoring of the Public Procurement Directives are largely controlled by member states and they are also the main buyers. Third, some public procurement sectors are inherently more open to trade than others as typically goods are more easily transported to other countries than services or construction works. These three arguments together suggest that public procurement trade openness is determined by total trade openness and procurement spending structure. By implication,

H₁: Public procurement openness' deviation from total trade openness and public procurement spending structure is likely to be due to particularistic protectionism.

However, the deviation of public procurement openness from what total trade openness and public procurement spending structure predicts can not only be due to particularism, but also the associated higher administrative costs of contracting a foreign supplier such as obtaining translations, working across greater distances. Furthermore, governments as buyers may have such specific requirements which make it hard for foreign companies to successfully bid even in the absence of particularistic motivations. Hence, the counter-hypothesis:

H₂: Public procurement openness' deviation from total trade openness and public procurement spending structure is likely to be due to administrative costs and product specificity.

Identifying particularistic public procurement from a micro perspective follows a similar logic to that of the macro approach while

also complementing it by offering more precise theoretical backing for identifying product specificities and particularistic motifs. The macro view evoked the average relationship between procurement trade, total trade, and procurement spending structure, the micro view, instead, hypothesizes that at least one member state for each product market approximates the optimal openness, hence can serve as a benchmark. Then member state markets' deviations from this benchmark, if also associated with micro-level corruption risks, can be attributed to particularistic protectionism. Deviations are defined along the two cardinal dimensions: difference in the given market's openness from the benchmark and the difference in contract-level corruption risks compared to the benchmark for each product market (i.e. comparisons are made between member states on the level of product markets). These two dimensions allow for identifying 4 market-types³ (Table 1). Two types represent the two extremes of the most interest to us - universalistic procurement trade and particularistic protectionism:

1. Member state **markets open to procurement trade** are characterised by no to very little deviation from the benchmark both in terms of procurement trade openness and corruption risks. This is where procurement trade takes place as we would expect in a corruption-free world.
2. **Particularistic protectionism** is identified in member state markets where the deviation from the benchmark is high both in terms of procurement trade openness and corruption risks. These are the markets where not only a lot more trade could have taken place, but they are also ripe with signals of corruption which are typically used to restrict market access of non-connected firms. The remaining two types represent mixed combinations of openness and corruption risks:
3. **Product specificity** characterises those member state markets where there is a high degree of missing procurement trade compared to the benchmark while micro-level corruption risks are only low. In these member state markets, it is possible that predominantly country-specific products are purchased, hence the high degree of missing foreign suppliers compared to the

³ Markets where no member state has any foreign suppliers are most likely closed to procurement trade by nature, hence they are excluded from the analysis.

benchmark. The lack of micro-level corruption risks suggest that it is not government manipulation of the procurement process which is causing the trade gap.

4. **Particularistic trade** characterises those member state markets where there is a low degree of missing procurement trade compared to the benchmark while micro-level corruption risks are high. These member state markets are close to being as open as the benchmark, but they are of considerably higher corruption risks which suggests that there are mixed dynamics going on in them: on the one hand foreign companies are granted access, on the other hand they are most likely accommodated to a high corruption risk environment.

Table 1. Typology of markets according to openness to trade and corruption risks

		Corruption risk difference	
		Low	High
Market trade openness difference	Low	Open trade	Particularistic trade
	High	Product specificity	Particularistic protectionism

Countries generally characterised by universalistic rule implementation in public procurement are expected to refrain from particularistic protectionism according to the above market-level definition more compared to countries characterised by particularism generally. Hence, we can combine the above market-level theory with general expectations of how governance regimes work, to hypothesize:

H₃: High corruption risk countries are more prone to spending on markets characterised by micro-level particularistic protectionism.

DATA AND METHODS, INCLUDING INDICATORS

Data and indicators

The analysis makes use of country-level statistics as well as contract-level administrative data serving the macro and micro analysis. On the country-level, international trade as well as

corruption-perceptions data are drawn from the World Bank Databank⁴. On the contract-level, public procurement data derives from public procurement announcements in 2009-2015 in the EU and EEA. Announcements appear in Tenders Electronic Daily (TED), the online version of the 'Supplement to the Official Journal of the EU', dedicated to European public procurement (DG GROWTH, 2015). The data represent a complete database of all public procurement procedures conducted under the EU Public Procurement Directive in the EU and EEA regardless of the funding source (e.g. national, EU funded). The database was released by the European Commission - DG GROWTH⁵ which also has conducted some data quality checks and enhancements. TED contains variables appearing in 1) calls for tenders, and 2) contract award notices. All the countries' public procurement legislation is within the framework of the EU Public Procurement Directives, hence the national datasets are therefore directly comparable (European Commission, 2014). The source TED database contains over 3 million contracts, while contracts below mandatory reporting thresholds⁶ were dropped. This database directly reflects the policy goal of opening up domestic public procurement markets. The database used in this analysis, including corruption risk indicators can be downloaded from <http://digiwhist.eu/resources/data/>.

Unfortunately, some data errors necessitate data corrections and careful use of some variables. The distribution of price data is suspect, with some outliers ranging from zero to values surpassing countries full GDP, which might potentially cause flaws within the result. We thus more typically use counts rather than value sums of tenders. If sums are used, these follow from prices Winsorised⁷ at 99.5th percentile, that is with prices effectively capped by value of 23.3 mil. EUR. Moreover, country identifiers were subject to corrections such as re-labelling French dependent territories Réunion and Martinique as parts of France.

Key indicators used in the analysis were the following:

⁴ <http://data.worldbank.org/>

⁵ Source data can be downloaded from: <https://open-data.europa.eu/en/data/dataset/ted-csv>

⁶ <http://www.ojec.com/thresholds.aspx>

⁷

- *Procurement openness* is calculated from procurement data for its part where country of both contracting authority and supplier is identified. For those, the openness is simply calculated as share of tenders with non-domestic suppliers on the total count of tenders.
- *Total trade openness* is calculated from World Bank macro-data taking the indicator Imports of goods and services (% of GDP) directly.
- *Procurement spending structure* is measured using the TED database, by classifying main sectors⁸ into low, medium, and high openness procurement sectors according to their Europe-wide average procurement openness score. In order to get 3 groups with equal number of sectors, we applied two thresholds: 1.75% and 4.5%.
- *Corruption-perceptions* indicator is also drawn from World Bank data, where indicator Control of Corruption: Estimate is directly used.
- *Contract-level corruption risks* are calculated using the TED database taking the so-called Corruption Risk Index as the best proxy available at such a micro level (Fazekas & Kocsis, 2015).

Methodology

Two types of analysis have been carried out: country-level panel regressions and market-level hierarchical clustering. Both are introduced briefly without extensive discussion of the technical details.

In the country-panel analysis, the following regression equation was estimated (using fixed as well as random effect specifications):

$$\begin{aligned} \text{Procurement openness}_{i,t} & \\ &= \alpha_i + \beta_1 \text{Trade openness}_{i,t} \\ &+ \beta_2 \text{Procurement spending structure}_{i,t} + \varepsilon_{i,t} \end{aligned}$$

The country and period-specific residual $\varepsilon_{i,t}$ represents the amount of procurement trade which is unexplained by total trade openness and procurement spending structure. In as much as it is

⁸ Sectors are defined using 2-digit CPV categories, see: <http://simap.ted.europa.eu/en/web/simap/cpv>

correlated with corruption perceptions and objective corruption proxies it is identified as the estimate of particularistic protectionism.

For the market-level hierarchical analysis, markets were identified by three categorical variables characterising each market: i) product market (3-digit CPV code), ii) border region (nuts 2 region bordering with another member state or not); and iii) contract size (above or below product market average). This approach lead to 1634 different markets, some of which are present (i.e. actually spending taking place) in all member states some are only in a handful of them. Most open member state markets were simply identified by selecting the member state with highest procurement openness in each of the 1634 markets. Hierarchical clustering was carried out using two dimensions: member state market's deviation from the benchmark in terms of procurement openness and Corruption Risk Index (average linkage, Euclidian distance measure). Member state markets identified as ridden with particularistic protectionism are then verified using country-level corruption indicators reflecting our expectation that more corrupt countries would spend more using particularistic protectionist markets.

RESULTS

PARTICULARISTIC PROTECTIONISM ON THE COUNTRY-LEVEL

Following the macro-level theoretical expectations and the regression specification outlined above, 5 different fixed-effects panel regression models are reported in Table 2 (Hausman tests indicate that fixed effects regressions fit the data structure better than random-effect). As expected, increasing the spending share on highly open procurement markets increases procurement openness: 1% higher spending results in 0.2% increase. The effect of trade openness on procurement openness is largely insignificant which is due to strong path-dependence of each country (i.e. low time-series variance of trade openness). Nevertheless, strongly correlated with trade openness, total log GDP is a significant predictor in line with expectations: increasing the size of the economy by 1% roughly decreases procurement openness by 5% in model 5.

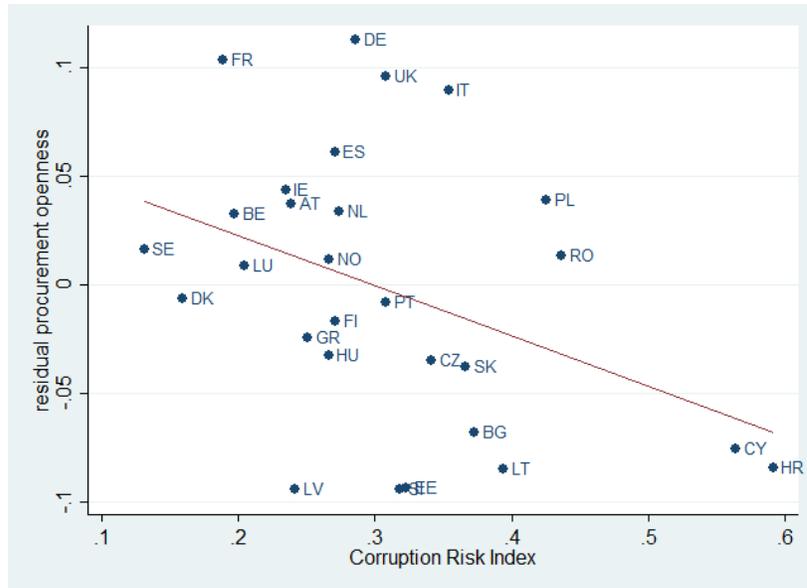
Table 2. Fixed-effects panel regressions explaining procurement openness, 2009-2014, EU+EEA

	Procurement openness				
	(1)	(2)	(3)	(4)	(5)
trade openness	-0.0101 (0.659)		-0.0217 (0.288)	0.000628 (0.979)	0.00131 (0.957)
spending share of med. open procurement markets		0.0877** (0.002)	0.0663* (0.016)	0.0746** (0.007)	0.0743** (0.007)
spending share of highly open procurement markets		0.179*** (0.000)	0.196*** (0.000)	0.207*** (0.000)	0.204*** (0.000)
log GDP (PPP, constant 2011 USD)					-0.0564 (0.090)
log GDP per capita (PPP, constant 2011 USD)				-0.0574 (0.064)	
N	173	176	173	173	173
N_g	30	30	30	30	30
r2_o	0.396	0.0734	0.00198	0.0320	0.410

Notes: p -values in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

In order to shed some light on whether H_1 or H_2 is supported by the data, i.e. the missing procurement trade is due to particularism or other reasons such as administrative costs, we correlated the residual from model 5 above with the country-level corruption indicators, the variant using the Corruption Risk Index is depicted in Figure 2. Partial support to our preferred interpretation in line with H_1 , all measures of corruption correlate with the residual to the magnitude of 0.39-0.44. Figure 2 already reveals interesting insights regarding the structure of suspected particularistic protectionism: on the one hand a number of countries lie under the 0 horizontal line representing the EU+EEA average, most notably two well-governed countries: Denmark and Finland seem to be considerably less open than their structural characteristics, i.e. total trade openness, and procurement spending structure, would predict. On the other hand, some countries are far above the red regression line representing the average relationship between residual procurement openness and

Figure 2. Country-level residual procurement openness (higher values indicate above prediction openness) and Corruption Risk Index, 2009-2014, EU+EEA



overall corruption in the country. For example, Poland and Romania, two high risk countries, appear to be purport considerably more procurement trade than their corruption level would suggest.

Even though we could gather some supportive evidence, the market-level analysis should corroborate the finding that there is considerable particularistic protectionism going on in Europe in spite of the extensive regulations and monitoring efforts against it.

Particularistic protectionism on the market-level

In this section we turn to micro-level identification of particularistic protectionism by directly clustering member state markets as outlined in section 3.2 according to their deviation from the best performing benchmark in terms of market openness and corruption risks. The theoretical expectation of four clusters is supported by the data (for details of optimal cluster numbers see Appendix A). While the exact boundaries of clusters are ambiguous to some degree, the overall typology fits the data well.

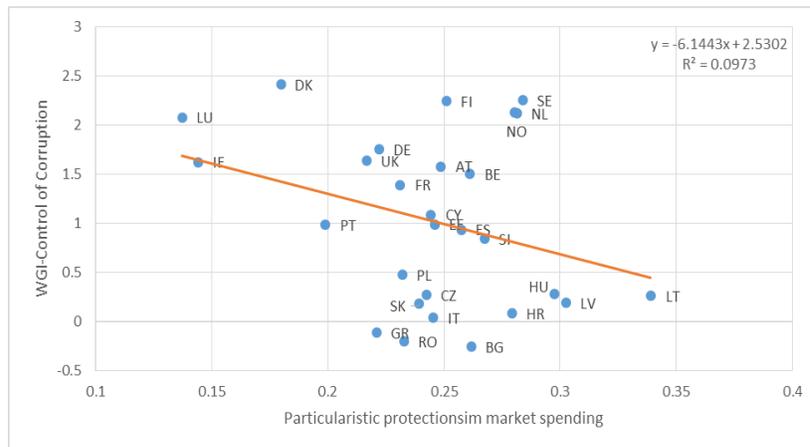
Quite in line with the initial puzzle of large amount of missing procurement trade (Figure 1), the open trade cluster is small in size and represents the exception rather than the rule, whereas the particularistic protectionism cluster encompasses a substantial portion of all spending analysed (17%) (Table 3). The fact that the particularistic trade cluster captures the overwhelming majority of procurement spending across Europe suggests that trade is far from promoting integrity uniformly, rather it often has to accommodate to the receiving country's corruption environment.

Table 3. Key characteristics of the identified clusters

	Billion EUR total spend	Spending share	N _{markets}	Missing procurement trade	Corruption risk (CRI) difference
Particularistic trade	1,620.0	79%	5,530	-0.83	0.02
Particularistic protectionism	350.0	17%	1,975	-0.05	-0.01
Product specificity	66.0	3%	652	0.89	-0.11
Open trade	4.7	0%	58	-0.40	-0.62
Total	2,040.0	100%	8,215	-0.50	0.00

In order to further verify the validity of these findings, the share of spending on markets characterised by particularistic protectionism is correlated with country-level corruption indicators expecting that more corrupt countries would spend such markets. The test is confirmatory with linear correlation coefficients of the magnitude 0.21-0.39 depending on the corruption measure used. Nevertheless, there are a number of surprising outliers, most notably, Denmark, Finland, Norway, the Netherlands, and Sweden (Figure 3). Removing these countries would make correlations jump to above 0.5 signalling a much stronger relationship. Comparing these results with the macro-analysis identifies a common set of outlier countries: Denmark and Finland on the more particularistic than expected and Romania and Poland on the less particularistic than expected end of the scale.

Figure 3. Spending on markets characterised by particularistic protectionism and WGI-Control of Corruption scores, 2009-2014



Patterns of particularistic protectionism

While the above results are only preliminary and need further investigation, they warrant some exploratory analysis across countries and over time. First, taking the residual procurement openness, that is procurement trade not explained by total trade openness and procurement spending structure, reveals that while most countries have been consistent in 2009-2014, some changed their performance. Some countries like Ireland or Sweden have managed to deteriorate their performance making them increasingly closed; while others went in the opposite direction improving their performance such as Norway or Slovenia (FIGURE 4).

Second, further reinforcing the earlier findings, well-governed Nordic countries most notably Norway, Sweden, and Finland as well as Denmark appear to use particularistic means to protect their markets much more than widely held corruption perceptions would suggest (

FIGURE 5). Contrary to claims that it is due to the small markets these countries have, other similarly small countries such as Ireland or Portugal fare much better.

FIGURE 4
Residual procurement openness over time in EU and EEA countries, 2009-2014

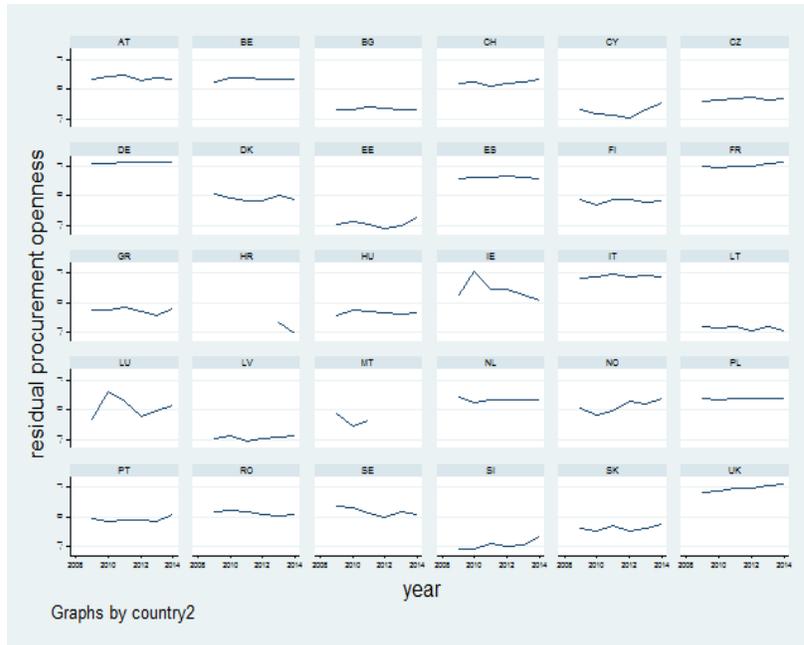
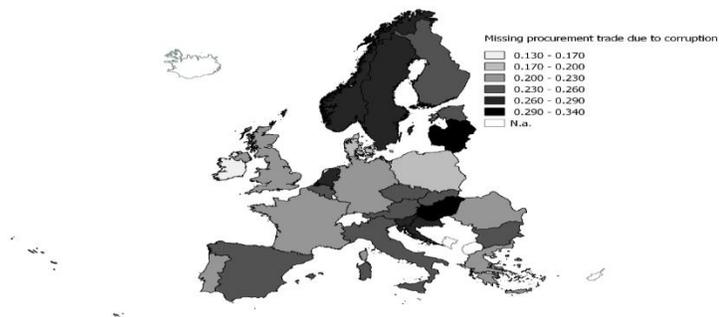


FIGURE 5
Map of Europe according to national share of spending on markets characterised by particularistic protectionism



CONCLUSIONS AND POLICY CONSEQUENCES

The analysis has established that there is a considerable amount of missing public procurement trade which could have taken place, but for various reasons didn't. Much of this gap can be attributed to public bodies using particularistic means to favour domestic firms both when looking at it from a country-level or a market-level perspective. Using contract-level data, we estimate that about 17% of public procurement spending is made on markets characterised by particularistic protectionism. While most countries resorting to particularistic means are among the least-well governed countries in Europe at least according to perception survey, there are a number of surprising outliers: Denmark and Finland and to a lesser degree Norway and Sweden appear to close their domestic markets to foreign competition considerably more than their corruption levels would suggest. Conversely, Romania and Poland close their domestic markets much less than expected based on their corruption levels.

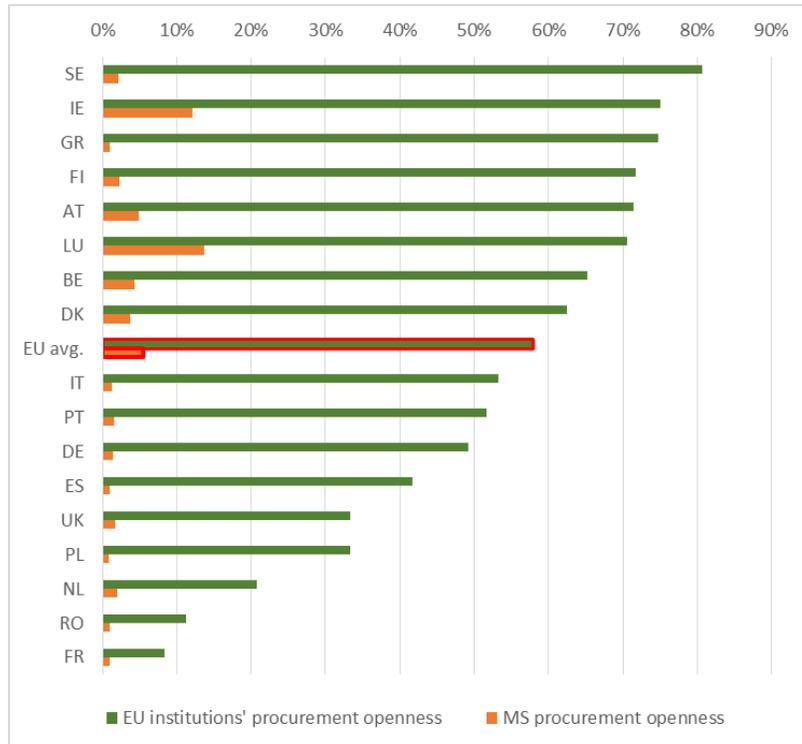
The benchmarks used so far are likely to underestimate the overall amount of particularistic protectionism as it is quite possible that even the most universalistic public sector would apply some degree of domestic preference maybe even achieved through particularistic means. However, EU institutions are not bound to a national economy to the same degree as domestic public institutions are, hence they may provide a pointer as to how much public procurement trade could take place in the absence of domestic preferences.

The comparison between member state procurement openness and EU institutions' procurement openness in those member states reveal a striking picture, EU institutions are about 10-times more open than their host countries with only moderate relationship between member state openness and EU institutions openness (linear correlation coefficient=0.47) (

Figure 6). Interestingly, EU institutions in the Netherlands, Romania, and France are the only ones which are rather close to their national counterparts rather than other EU institutions. Nevertheless, the comparison with EU institutions suggests that increasing openness and fairness of international trade in government contracts is feasible potentially increasing intra-EU and EEA procurement trade up to 10-times.

While combining a macro and micro analysis with different benchmarks and different data sources provide a robust analytical framework for identifying particularistic protectionism, there are three sets of limitations to our approach. First, there is no guarantee that either the European average or the European best performer benchmarks truly approximate optimal procurement openness. It cannot be rejected that even the most open country is applying a degree of particularistic protectionism. In addition, governments typically procure final goods, while most of trade takes place in raw and intermediary goods making the total trade openness benchmark potentially problematic. Second, some of the key variables are almost certainly prone to measurement error. Proxying corruption with contract-level red flags such as single bidding most likely underestimate corruption risks as many complex strategies of evading detection go undetected. This would lead to over-estimating the prevalence of markets characterised by product specificity. Moreover, procurement openness is defined as cross-border procurement contracts; however, many companies may find it beneficial to establish foreign subsidiaries for doing procurement trade given the ease of setting up companies across the EU and EEA. While this can certainly lead to an underestimation of procurement trade, the policy goal enshrined in the Public Procurement Directives is to increase cross-border procurement rather than encourage companies to establish foreign subsidiaries. Third, it is also conceivable that governments have truly unique requirements when they procure making the comparison with private-to-private trade misleading. Taken together the biases could go upwards or downwards, leaving us with no clear conclusion other than the need for further work.

Figure 6. Procurement openness of member states and the EU institutions residing them, member states with EU institutions awarding at least 50 contracts in 2009-2014



Policy recommendations

This preliminary analysis has provided ample evidence that particularistic protectionism is substantial and persistent in high as well as low integrity countries of Europe in spite of extensive regulations against it. Hence, policy reform should tackle particularism more effectively within the existing framework:

- Monitor the implementation of the Public Procurement Directives on the tender-level rather than proofing regulations and the institutional setup. Big Data analytical tools offer real time

intelligence on the risk of corruption and anticompetitive behaviour which can be made part of everyday policy making⁹.

- Improve member states' remedies systems and give greater powers to the Court of Justice of the European Union as it has been effective in striking down anti-competitive practices by member state authorities (Fazekas & Gamir, 2015).

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⁹ For an overview of available tools see: <http://digiwhist.eu/resources/research-and-policy-papers/>

APPENDIX A – IDENTIFYING THE OPTIMAL CLUSTERS**Table 4. Calinski/Harabasz pseudo-F measure of optimal cluster numbers**

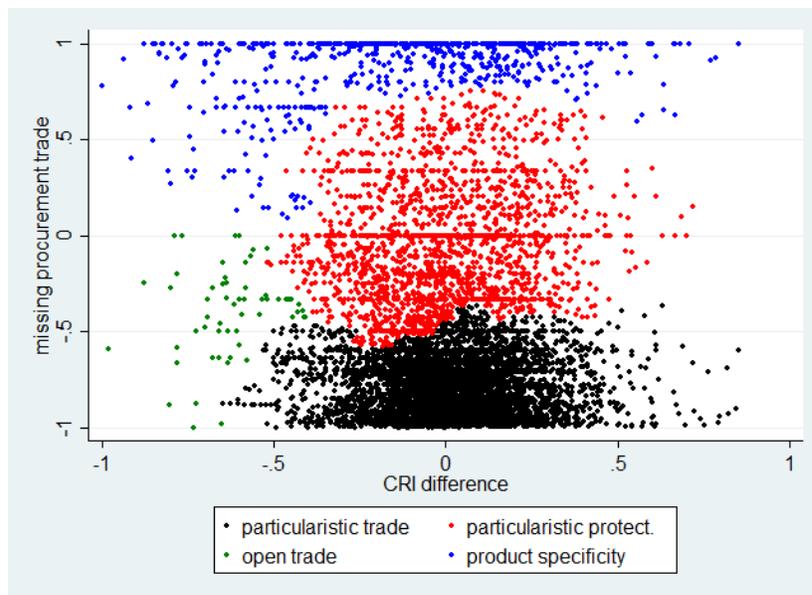
Number of clusters	Calinski/Harabasz pseudo-F
2	6878.03
3	12726.8
4	8798.04
5	7378.79
6	6137.32
7	5237.16
8	5471.67
9	4936.79
10	4396.97
11	5199.94
12	5257.52
13	5014.21
14	4629.75
15	4309.09

Table 5. Duda/Hart measures of optimal cluster numbers

Number of clusters	Duda/Hart	
	$J_e(2)/J_e(1)$	pseudo T-squared
1	0.5442	6878.03
2	0.4066	11033.35
3	0.951	304.37
4	0.4847	690.97
5	0.9489	316.74
6	0.4077	241.14
7	0.5617	1284.52
8	0.6256	288.45

9	0.527	29.62
10	0.7075	2408.06
11	0.5529	912.11
12	0.6542	272.73
13	0.8725	4.24
14	0.6004	25.29
15	0.4148	177.73

Figure 7. Distribution of markets according to cluster forming dimensions and cluster membership, markets with more than 5 contracts awarded in 2009-2014



Note: missing openness is rescaled to $[-1;+1]$ interval in order to make it fully commensurate with CRI differences.