DRAFT PAPER NOT FOR CITATION OR QUOTATION

Improving the Representation of Public Procurement in the GTAP Framework

Table of contents

Abstract

In 2012, €352 billion of the €420 billion EU public procurement budget was open to member countries of the WTO Agreement on Government Procurement (GPA). This represents 85% openness for the EU, which contrasts with the value of other GPA members such as the USA, whose level of public procurement offered to foreign bidders was of approximately €178 billion of €556.25 billion (32%) and for Japan where the open procurement figures were about €27 billion of the €96.4 billion (28%). Given the large, and growing, size of these public expenditures, access by potential foreign suppliers has become increasingly important. Yet the analytical tools used to quantify the impact of restrictive public procurement decisions remain woefully underdeveloped. This paper reports on a project, being undertaken by the Center for Global Trade Analysis and collaborators, aimed at improving the representation of public procurement in the GTAP data base and modelling framework.

The Nature of the Challenge

Due to the fact that any public procurement agreements will involve multiple countries, purchasing a wide range of goods and services, supplied by many different regions, this question is best addressed in a multi-region, general equilibrium framework. Yet the scope for global CGE modelling of any new issue, such as public procurement, is inevitably limited by data. If current purchases cannot be separately identified in the data, then there is little hope of estimating the likely impact of liberalization. Currently most global CGE models rely, directly or indirectly on the GTAP Data Base (Narayanan, Aguiar and McDougall, 2012). Unfortunately, the current structure of GTAP poses serious limitations when it comes to analysing public procurement.

There are several key limitations which deserve special mention. First of all, it is likely that the current data base does not accurately capture the mix of domestic and imported goods which are purchased by governments. This is because the source IO tables usually have just one vector of imports, which the contributor distributes across uses following the domestic or total (domestic plus imports) allocation. Secondly, even when accurate information about the composition of imports is available, the GTAP Data Base does not provide specific information on which countries supply the current purchases. The absence of such sourcing information is problematic, as it holds the key to determining which countries will benefit from a liberalization of public procurement rules. Finally, since the GTAP Data Base fails to distinguish public from private investment, a large share of public procurement — namely that associated with infrastructure development — is not available for analysis.

Approach

In order to remedy these limitations, we are currently undertaking a project, funded by the EU Commission which is focused on both data and modelling extensions. In this paper, the extended data base is discussed to gain insight into the current state of play with public procurement at global scale. We then use it in conjunction with a modified model to test the implications of several liberalization scenarios.

Data Base: In terms of data, there are four important modifications to the GTAP data base. First, we improve the characterization of government consumption of domestic and imported products; second, we disaggregate public investment; third, we identify the sourcing of imports by exporting region; and fourth, we collect available estimates of the restrictiveness of current public procurement policies for key economies.

This involves building on the most recent, GTAP Data Base, as supplemented with the following list of currently available data:
1. Information pertinent to the domestic and import (by source) composition of public procurement drawn from statistical reports submitted to the World Trade Organization (WTO) pursuant to the Agreement on Government Procurement (GPA).
2. Newly available estimates of the sourcing of public sector purchases. Here we will rely on MRIO estimates based on allocations using the Broad Economic Categories (BEC) concordances (Walmsley et al., forthcoming).

3. Disaggregation of private and public investment using OECD data.

The GPA signatory countries are required to collect and provide statistics on the number and estimated value of contracts awarded by entity, as well as categories of products and services, differentiating between domestic and foreign providers. As the WTO website remarks, these requirements "have not worked well". In light of the fact that each country report is unique and will require individualized treatment, for this project, we will focus on the EU, Japan, and USA, which together comprise the vast majority of public procurement of the GPA signatory countries. The next sections discusses our processing of GPA data.

The WTO Government Procurement Agreement

The Government Procurement Agreement (GPA) is the main international agreement related to public procurement in the World Trade Organization (WTO). Forty three countries have signed the agreement (see Table 1). The agreement seeks to open government procurement to international tendering. The agreement, however, does not apply to all government purchases, each signatory country determines which government contracts the agreement applies (for contracts over a specified threshold) and which government offices are excluded, for example the purchases of the ministry of defense of a given country.

Table 1: Parties to the agreement of WTO-GPA

Country	Accession	Country	Accession
Armenia	2011	Liechtenstein	1997
Canada	1996	Netherlands -Aruba	1997
European Union (and its 28 member states)	Various, Croatia-2013	Norway	1996
Hong Kong, China	1997	Singapore	1997
Iceland	2001	Switzerland	1996
Israel	1996	Chinese Taipei	2009
Japan	1996	United States	1996
Korea	1997		

Source: WTO-GPA, http://www.wto.org/english/tratop_e/gproc_e/memobs_e.htm

For each country, the GPA data that is reported to the WTO distinguishes procuring entities of the central government, sub-central government and other entities such as utilities. This is recorded in Annexes 1-3 of Appendix 1 of the GPA. Procurement of goods and services by each government entity is also reported.[1] Japan is the only country which shows the origin of their imports for public procurement.

In order to fall under the scope of the GPA, countries must specify a threshold level for their public procurement contracts. The thresholds for the EU, US, and Japan are displayed in Table 2, for a

[1] This is true for the US for the year 1996. Other years simply reflect the total values of goods and services per office.

complete list please see Appendix Table A1. The contracts are classified into contracts for goods, services except construction services, and construction services.

Table 2. Thresholds in Annexes 1, 2 and 3 of Appendix 1 of the Government Procurement Agreement for EU, US, and Japan (expressed in SDR)

		European Union (and its member States)	Japan	United States
ANNEX 1	**Goods**	130,000	130,000	130,000
	Services except construction services	130,000	130,000	130,000
	Construction services	5,000,000	4,500,000[a]	5,000,000
ANNEX 2	**Goods**	200,000	200,000	355,000
	Services except construction services	200,000	200,000	355,000
	Construction services	5,000,000	15,000,000[b]	5,000,000
ANNEX 3	**Goods**	400,000	130,000	400,000
	Services except construction services	400,000	130,000	400,000
	Construction services	5,000,000	4,500,000 or 15,000,000[c]	5,000,000

[a] Architectural, engineering and other technical services covered by this Agreement: 450 thousand SDR

[b] Architectural, engineering and other technical services covered by this Agreement: 1500 thousand SDR

[c] Architectural, engineering and other technical services covered by this Agreement: 450 thousand SDR. Two values are specified for Japan because it has two categories of Japanese government entities.

Source: Extract from http://www.wto.org/english/tratop_e/gproc_e/thresh_e.htm

The next three sections will present the structure of data and give descriptive statistics on the overall data for the 27 member countries of the European Union, Japan and the United States of America, respectively.

Table 3 shows the structure of the EU statistical report submitted to the WTO in 2007. There are two types of excel files and Table 3 shows what each contains. The summary excel file is where we find aggregates and the file gives an overview of public procurement in the EU region. The second type of files are those available for each member state.

Table 3: Summary of type and nature of data from WTO-GPA for EU

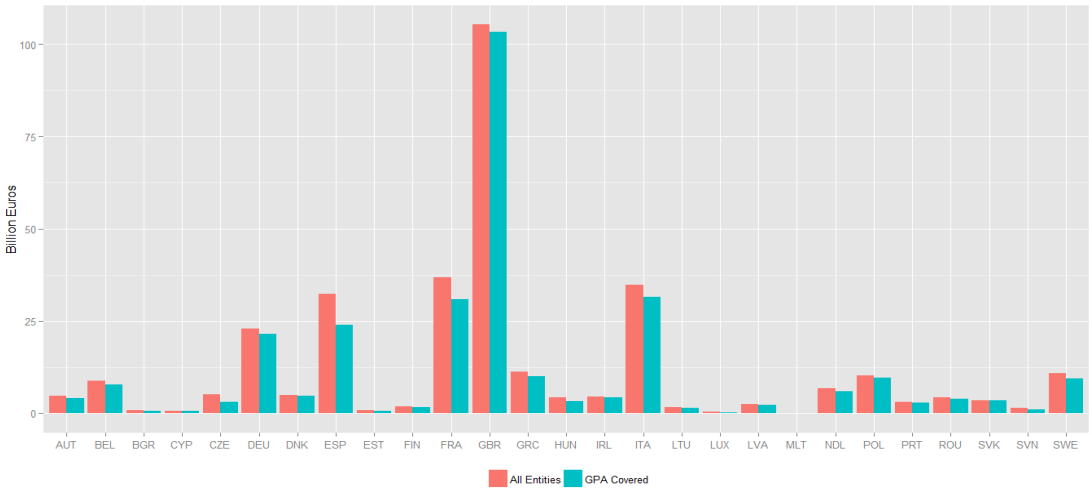
Type of statistic	Summary File	Member State files
Number of contracts	In thousands	In thousands
Value of contracts	Billions of Euros	In Thousands of Euros
Level of Annexes	Annex 1, Annex2, Annex 3	Annex 1, Annex2, Annex 3
Level of Government	Central, State, Local, Social Security Funds	Contracting Entity for Annex 1
		Bodies governed by public law and Regional, local authorities for Annex 2
		Utilities (both covered and uncovered[2] for Annex 3
Type of Contract	Goods, Services exc. Construction, Construction Services	Goods, Services exc. Construction, Construction Services
Type of Purchase	CPV (Common Procurement Vocabulary) for Annexes	Detailed by purchasing authority and each annex
Article XV (Only for entities covered by GPA)	Summary table by Annex type	Detailed by Annex level and product category
Values Above Threshold	Yes	Yes
Values below Threshold	As part of the Total procurement report	Not available
Cross Border Procurement	Maximum and Minimum estimates	Not available

Overall procurement pattern in the EU

In general, the EU procurement rules govern the way that public money is spent and the WTO-GPA can be considered as part of this general rule. In 2007, EU procurement that is governed by the WTO-GPA and that is above the agreed threshold was about 309.6 billion Euros. Figure 1 shows the distribution across the 27 member countries (along with the shares, right column). There is high concentration of value of contracts per country. In fact, three countries –Germany, France and the UK- account for nearly half of the value of total award values.

[2] Uncovered Utilities include railways, gas and other entities

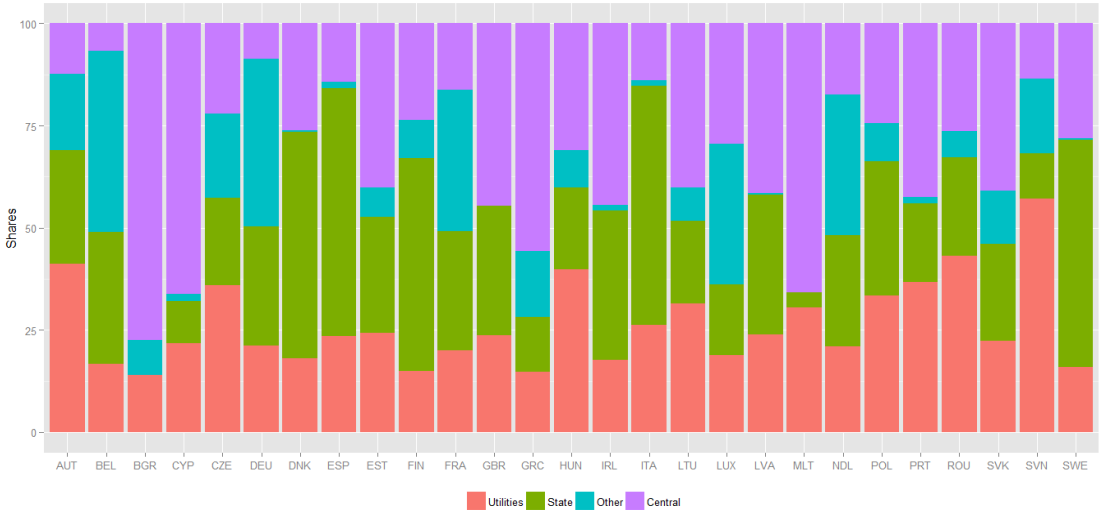
Figure 1: WTO-GPA procurement as share of total government procurement



Overall Country patterns and Government Use Types

Figure 2 illustrates the different share of EU regulated procurement that is accounted for by central, local, utility or other authorities across the member states. It is apparent that there is substantial variation among member countries regarding expenditure allocation. This seems to suggest that the degree of centralization varies enormously across member states and there is a significant amount of procurement carried out by government institutions providing specific public services which are neither central nor local government administrations (e.g., Belgium).

Figure 2: Breakdown of total value of contracts awarded by type of authority

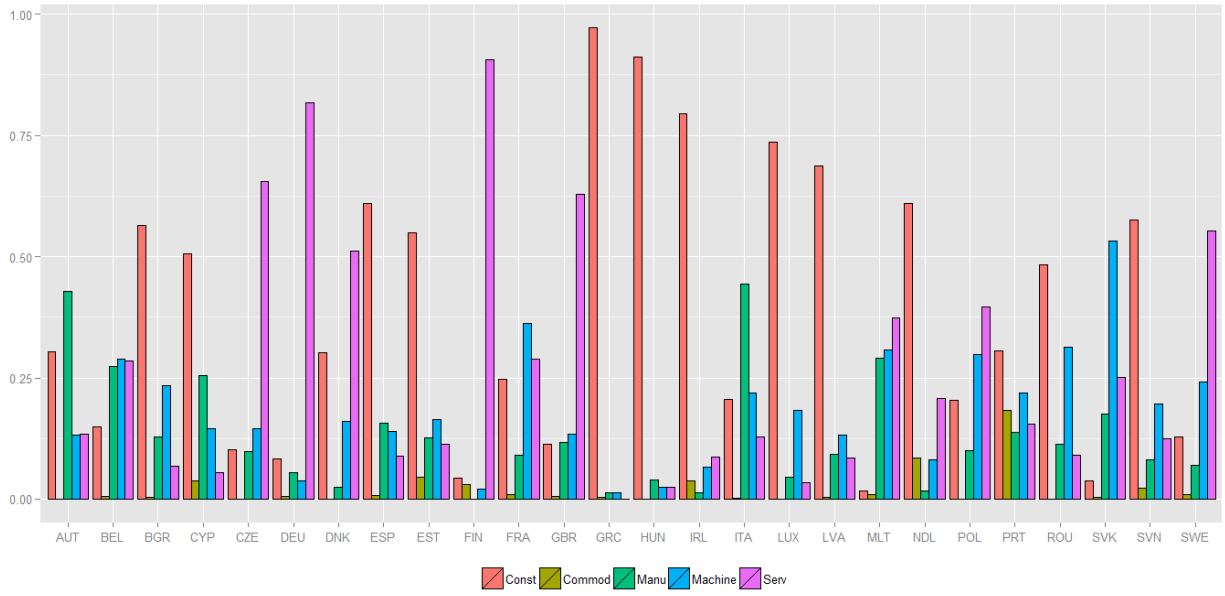


Sectoral Patterns

In this section we provide a brief overview of the procurement by product. We will work with five products/services: Construction, Commodities (including food), Manufacturing and equipment, and Services. The EU uses Common Procurement Vocabulary (CPV) classification system. All purchases are identified at very detailed 8 digit level[3]. However, the EU statistical report for 2007 aggregates these codes to two digit levels giving us 45 varieties. Table A2 in the Appendix lists the two digit CPV code and its mapping to the GTAP 57 products.

Figure 3 shows the breakdown of Annex 1 expenditure by the sectors identified above. While the overall picture is rather mixed, we note that construction and service sectors tend to dominate the overall picture. Spending on commodities, in general, has the lowest share across EU member countries.

Figure 3: Business sector patterns of procurement

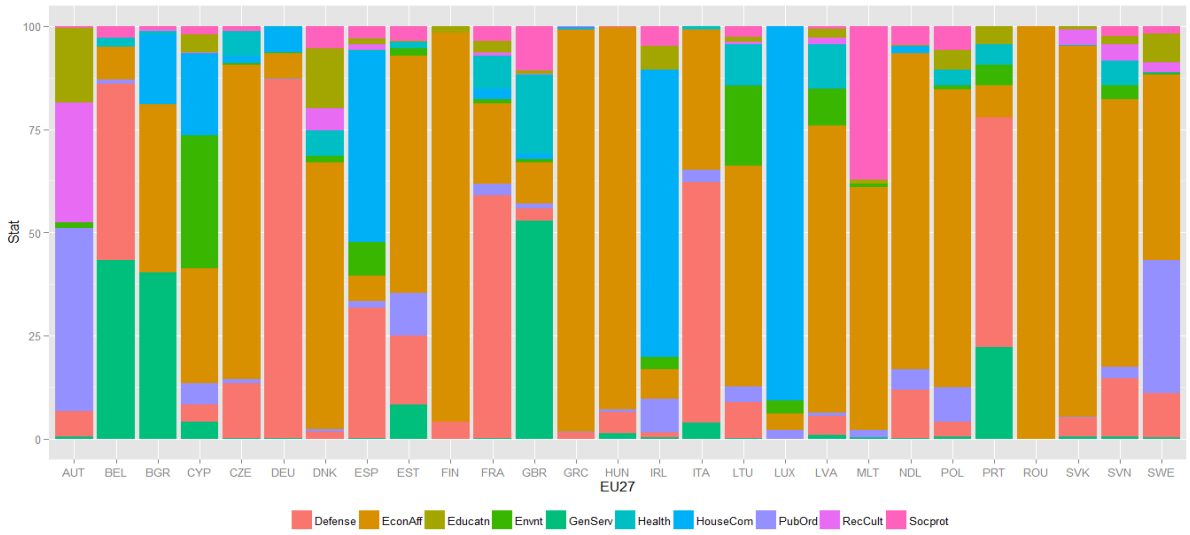


Procurement by Government Activities

We can also view purchases by activity of government (for example, health, defense, education). These divisions are based on the UN Classification of the Functions of Government (COFOG) scheme, which we have mapped to each country's government entities.[4] Figure 4 shows the contribution of these categories to total government procurement across the European Union.

[3] Official Journal of the European Union (15.3.2008): Commission Regulation (EC) No 213/2008
[4] Table A3 in the Appendix presents UN COFOG.

Figure 4: Share of government activity in total procurement



Japan in the WTO-GPA

Table 4 provides a summary of the data submitted to the WTO-GPA. This report is very detailed in terms of data coverage for Annex 1 and 2 categories. Unlike the European Union, Japanese data provides some data on nationality of winning tenderer. However, the data fails to discuss why Annex 3, Annex 4 and Annex 5 are missing from the report. As a result, it is not clear how utilities that are covered under the GPA are handled in the Japanese procurement procedure. We also note that the Japanese report uses the Central Product Classification (CPC) system. However, the report submitted to the WTO-GPA aggregates the CPC to two digit numbers and there are only 44 varieties of goods and services.

Table 4: Structure of Japanese public procurement data in WTO-GPA

Reported statistic	Annex 1	Annex2
Summary Table	Yes	Yes
Purchase by Product type (CPC based)	Yes	Yes
Procuring Entity	Yes	Yes
Type of Contract (Work, Supplies, Service)	No	No
Nationality of Tenderer	Yes	Yes
Values Above/ Below threshold	Above threshold	Above threshold
Article XV of WTO-GPA	Yes	Yes
Number of Contracts	Yes	Yes
Units	Special Drawing Rights (SDR)	Japanese Yen

Source: WTO-GPA, http://www.wto.org/english/tratop_e/gproc_e/gpstat_e.htm

Total procurement that falls under the GPA rule amounts to about 13 billion USD in 2007. This is about 34 % of total government procurement (sum of above and below threshold) during the year and amounts to just about 0.3 % of GDP.

Figure 5 shows the business pattern breakdown of procurement for Japan. It indicates that most of the procurement goes to the construction sector. This is a pattern that is very similar that of European Union and the US. Similarly, the service and manufacturing sectors are the main types of products that procuring entities acquire.

We can further look at the nationality of the winning tender and Figure 6 tells the story that much of the purchasing is done within Japan and there is little that is coming from companies located outside of Japan.

Figure 5: Summary of procurement by sector

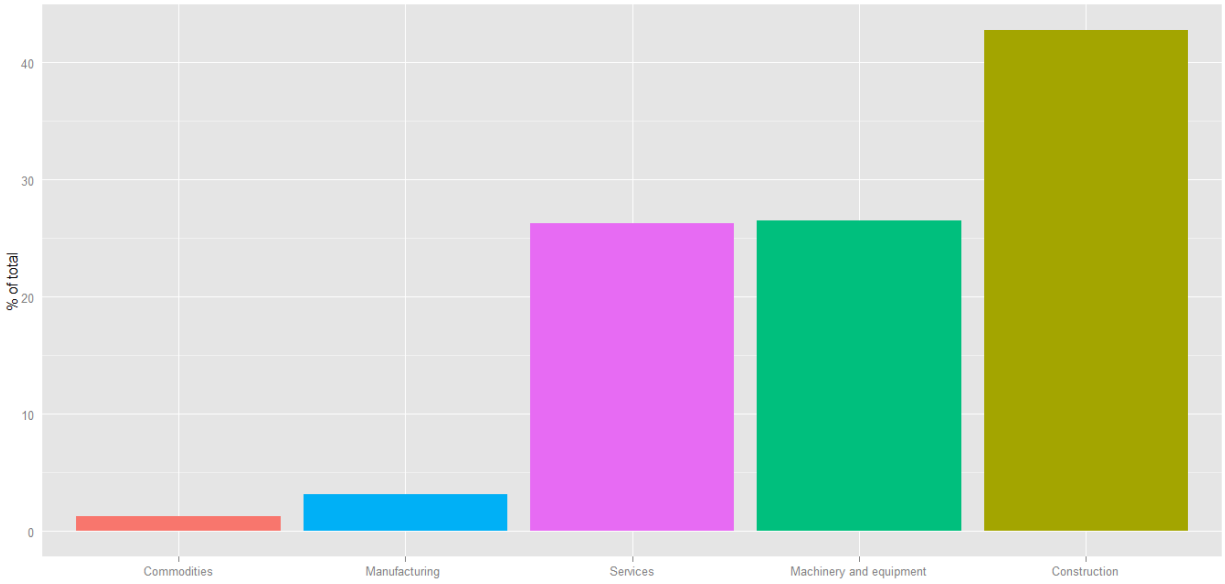
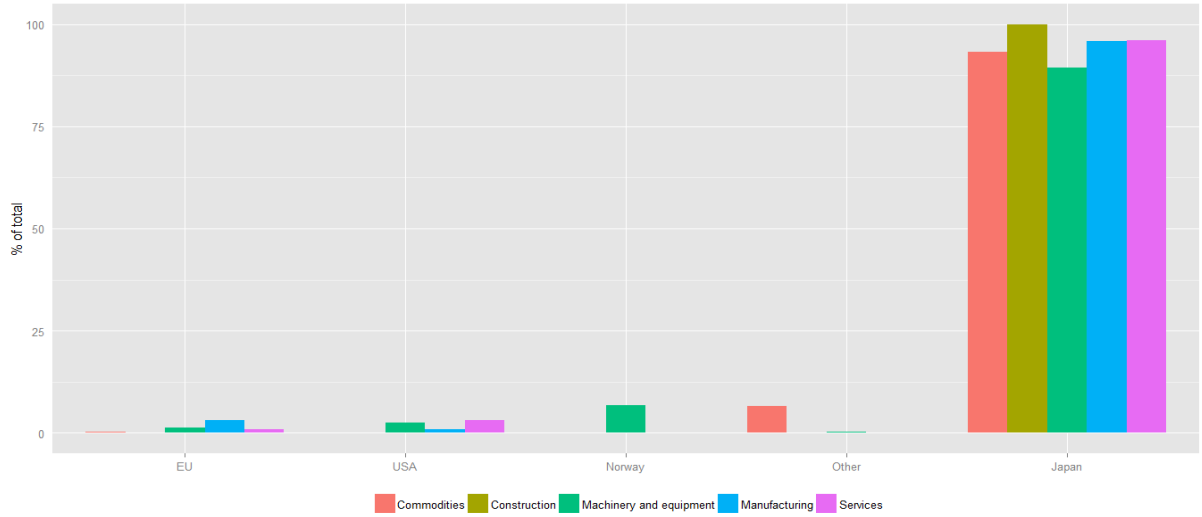


Figure 6: Summary of procurement by sector and nationality of tenderer



The United States of America in the WTO-GPA

This section discusses the data source and some salient features of government procurement of the United States of America that falls under the WTO-GPA rules. Table 5 provides a summary of the data submitted to the WTO-GPA. This report is the least detailed compared to those submitted by the European Union and Japan. Most of the data submitted to the WTO-GPA is at an aggregate level. The data also fails to discuss why Annex 4 and Annex 5 are missing from the report. Annex 3 data for utilities is provided for those companies that fall under the rules. However, the data is still at an aggregate level. We also note that the US report uses the Product and Service Classification (PSC) system. However, the report submitted to the WTO-GPA aggregates the PSC at the procuring agency level making it impossible to know how much an agency spent on a particular product category.

The Federal Procurement Data System is the source of data for Annex 1 expenditure while Annex 2 expenditure is obtained from the Government Division of the US Census Bureau. Data for Utilities (or Annex 3) comes either from various sources including the agencies themselves, the US Department of Energy or the Federal Data Procurement System.

Table 5: Structure of US public procurement data in WTO-GPA for 2007

Reported statistic	Annex 1	Annex2	Annex 3	Annex 4 and Annex 5
Summary Table	No	No	No	None
Purchase by Product type	No[5]	No	No	None
Procuring Entity	Yes	No[6]	Yes	None
Type of Contract (Work, Supplies, Service)	No	No	No	None
Nationality of Tenderer	No	No	None	None
Values Above and/or Below threshold	Above and below threshold	Total expenditure only	Total expenditure only	None
Article XV of WTO-GPA	Yes	No	No	None
Number of Contracts	Yes[7]	No	No	None
Units	Thousands of Dollars	Thousands of Dollars	Thousands of Dollars	None

Source: WTO-GPA, http://www.wto.org/english/tratop_e/gproc_e/gpstat_e.htm

GTAP MRIO

This section discusses the methods used to generate a multi-regional input-output (MRIO) database from the GTAP Data Base, in order to be able to identify agent purchases of foreign goods by country of origin.

In the standard GTAP database, imports, $VIMS(i,s,r)$, of good i are identified by source country s at the national level of country r. However, at the agent level, goods purchased are only identified as domestic or foreign. For example, the value of the purchase of good i by a representative firm of industry j in country r is denoted as $VIFM(i,j,r)$, at market prices. In an MRIO, the value of the purchase of good i by a representative firm of industry j in country r should additionally be distinguishable by the origin of purchase, country s.

In order to add the additional desired dimension of origin country to the firm's imports, we assume proportionality. In other words, the share of goods purchased from a particular foreign source is assumed constant across agents. From $VIMS(i,s,r)$ the shares of imported good i from source country s out of total imports of good i from all source countries to destination country r, at market prices. This can be denoted as:

$$MSHRM(i,s,r) = \frac{VIMS(i,s,r)}{\sum_{k \in REG} VIMS(i,k,r)}$$

Then, this share is applied to $VIFM(i,j,r)$ to generate $VIFMS(i,j,s,r)$:

[5] A list of Product and Service Classification (PSC) codes are given for each procuring entity for Annex 1 type expenditures. But is not possible to tell how much is spent by a procuring entity on each product.
[6] Data for Annex 2 is provided at the US State level using expenditure by function classification that is similar, but not identical, to the UNCOFOG system.
[7] Aggregate number of contracts for each procuring entity.

$$VIFMS(i,j,s,r) = MSHRM(i,s,r) * VIFM(i,j,r)$$

This is the value of intermediate goods i for use in industry j imported from source country s to destination country r, at market prices. These shares are also applied to $VIFA(i,j,r)$, firm purchases at agent prices. This method is also used to generate country source specific purchase values for private and government consumptions, at both market and agent prices.

In order to generate country source specific values of agent purchases at world prices, import shares by agent are computed, and subsequently applied to $VIWS(i,s,r)$. For the case of the firm, compute the share of imported good i used in production of good j out of total imports of good i from all source countries to destination country r, at market prices. This can be denoted as:

$$MSHRFM(i,j,r) = \frac{VIFM(i,j,r)}{\sum_{s \in REG} VIMS(i,s,r)}$$

Then I apply this to $VIWS(i,s,r)$,

$$VIFWS(i,j,s,r) = MSHRFM(i,j,r) * VIWS(i,s,r)$$

Generating $VIFWS(i,j,s,r)$, the value of foreign intermediate products i for use in industry j imported from source country s to destination country r, at world prices. By this method, the value of source specific purchases at world prices are also generated for the private and government consumptions.

These processes render the original GTAP database variables $VIFM(i,j,r)$, $VIFA(i,j,r)$, $VIGM(i,r)$, $VIGA(i,r)$, $VIPM(i,r)$, $VIPA(i,r)$, $VIMS(i,s,r)$, and $VIWS(i,s,r)$ superfluous. Instead, we now have the source specific purchases for each agent at world, market, and agent prices, as captured by $VIFWS(i,j,s,r)$, $VIFMS(i,j,s,r)$, $VIFAS(i,j,s,r)$, $VIGWS(i,s,r)$, $VIGMS(i,s,r)$, $VIGAS(i,s,r)$, $VIPWS(i,s,r)$, $VIPMS(i,s,r)$, and $VIPAS(i,s,r)$.

Public Investment

Apart from the OECD data, which was originally the only source of data that we proposed to use, we have collected data about public investment from the United Nations (UN) and EUROSTAT.

The OECD data presents Gross Fixed Capital Formation (GFCF) data for four years (1995, 1999, 2003, and 2007) distinguished by institutional sectors (General Government, Households and non-profit institutions serving households, and Corporations) for 30 countries. “For government this typically means investment in transport infrastructure and public buildings such as schools and hospitals. For households, this generally equates to dwellings.” (OECD, 2010).

The OECD also presents GFCF data by asset group. The six assets the OECD presents are: Dwellings (excluding land); Other buildings and structures (roads, bridges, airfields, damst, etc.); Transport equipment (ships railway, aircraft, etc.); Other machinery and equipment (office machinery and hardware, etc.); Cultivated assets (managed forests, livestock raised for milk production, etc.); and intellectual property type fixed assets (mineral exploration, software and databases and literary and artistic originals, etc.).

The integrated economic accounts data from the United Nations identifies data for the total economy and the five institutional sectors of the SNA system, i.e., the non-financial corporations, financial corporations, general government, households, and non-profit institutions serving households. For 2007, the UN offers data for 71 countries. From EUROSTAT, we can obtain GFCF data for the total economy, government, business, and household sectors for EU 27 countries.

In general, there is consistency among data sources in terms of the monetary value of public investment. Table 6 shows the 2007 public investment ratio to total investment for EU countries. We relied heavily EUROSTAT for public investment data for EU countries. UN estimates and EUROSTAT data for public investment are within 5% of discrepancy. Czech Republic and Greece being the exceptions. Apart from European countries, the order in which we rank these data sources is OECD and UN.

Table 6. 2007 Ratio of public investment to total investment for EU countries

	UNDATA	OECDDATA	EUDATA	EU/UN	EU/OECD
aut	0.050064	0.05	0.049941	-0.2%	0%
bel	0.07185	0.07	0.071857	0.0%	3%
che	0.090329	0.09	0.088227	-2.3%	-2%
cyp	0.136249	0	0.13677	0.4%	
cze	0.154427	0.19	0.165605	7.2%	-13%
deu	0.080267	0.08	0.079198	-1.3%	-1%
dnk	0.086374	0.08	0.086249	-0.1%	8%
esp	0.13176	0.12	0.131574	-0.1%	10%
est	0.148575	0	0.146537	-1.4%	
fin	0.114351	0.12	0.11437	0.0%	-5%
fra	0.155823	0.15	0.151956	-2.5%	1%
gbr	0.105217	0.1	0.104278	-0.9%	4%
grc	0.142726	0	0.160529	12.5%	
hun	0.168074	0.17	0.174011	3.5%	2%
irl	0.183477	0.16	0.178112	-2.9%	11%
ita	0.108352	0.11	0.109866	1.4%	0%
ltu	0.185582	0	0.183769	-1.0%	
lux	0.159004	0	0.158994	0.0%	
lva	0.166856	0	0.169037	1.3%	
nld	0.166049	0.17	0.165119	-0.6%	-3%
nor	0.139471	0.13	0.140193	0.5%	8%
pol	0.19319	0.19	0.193395	0.1%	2%
prt	0.121673	0.11	0.121073	-0.5%	10%
rou	0.187685	0	0.196945	4.9%	
svk	0.071391	0.07	0.071717	0.5%	2%
svn	0.152133	0	0.152408	0.2%	
swe	0.156666	0.16	0.15682	0.1%	-2%

Model and Scenarios

Model: In order to utilize the new data, we modify the standard GTAP model to incorporate several new features. First, the model incorporates public-private splits within the OSG (other government services) industry as well as the investment sector, based on the satellite data. Second, the model structure disaggregates public and private investment as distinct categories of final demand, each with its own commodity and source composition. Third, we incorporate sourcing by agent (i.e., for firms, private consumption, government consumption, private investment, and public investment), including source-specific commodity taxation on imports.

Scenarios: In order to illustrate the value of this new data base and modelling structure, we analyse two different scenarios in which public procurement rules are liberalized. In the first case, key non-EU countries adjust public procurement access to EU levels. In the second scenario, public procurement is fully liberalized across the board, in a broad range of countries, including the EU.

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Appendix

Table A1. Thresholds in Annexes 1, 2 and 3 of Appendix 1 of the Government Procurement Agreement (expressed in SDR)

COUNTRY	ANNEX 1			ANNEX 2			ANNEX 3		
	Goods	Services except construction services	Construction services	Goods	Services except construction services	Construction services	Goods	Services except construction services	Construction services
Armenia	130,000	130,000	5,000,000	200,000	200,00	5,000,000	400,000	400,000	5,000,000
Canada	130,000	130,000	5,000,000	355,000	355,000	5,000,000	355,000	355,000	5,000,000
European Union	130,000	130,000	5,000,000	200,000	200,000	5,000,000	400,000	400,000	5,000,000
Hong Kong, China	130,000	130,000	5,000,000	n.a	n.a	n.a	400,000	400,000	5,000,000
Iceland	130,000	130,000	5,000,000	200,000	200,000	5,000,000	400,000	400,000	5,000,000
Israel	130,000	130,000	5,000,000	250,000	250,000	5,000,000	355,000	355,000	5,000,000
Japan	130,000	130,000	4,500,000 a	200,000	200,000	15,000,000 b	130,000	130,000	4,500,000 or 15,000,000 c
Korea	130,000	130,000	5,000,000	200,000	200,000	15,000,000	450,000		15,000,000
Liechtenstein	130,000	130,000	5,000,000	200,000	200,000	5,000,000	400,000	400,000	5,000,000
Netherlands-Aruba	130,000	130,000	5,000,000	n.a.	n.a.	n.a.	400,000	400,000	5,000,000
Norway	130,000	130,000	5,000,000	200,000	200,000	5,000,000	400,000	400,000	5,000,000
Singapore	130,000	130,000	5,000,000	n.a	n.a	n.a	400,000	400,000	5,000,000
Switzerland	130,000	130,000	5,000,000	200,000	200,000	5,000,000	400,000	400,000	5,000,000
Chinese Taipei	130,000	130,000	5,000,000	200,000	200,000	5,000,000	400,000	400,000	5,000,000
United States	130,000	130,000	5,000,000	355,000	355,000	5,000,000	400,000	400,000	5,000,000

a Architectural services: 450,000, b Architectural services: 1,500,000, c Architectural services: 450,000. Two values are specified for Japan because it has two categories of Japanese government entities.

Source: http://www.wto.org/english/tratop_e/gproc_e/thresh_e.htm

Table A2. WTO-GPA commodity classification and GTAP57 mapping

CPV Code	Long Name	Mapping to GTAP sectors
01	Agricultural, horticultural, hunting and related products.	pdr, wht, gro, v_f, osd, c_b, pfb, ocr, ctl,oap, rmk, wol
02	Products of the forestry and logging industry.	frs
05	Fish, fishing products and other by-products of the fishing industry.	fsh
10	Coal, lignite, peat and other coal-related products.	coa
11	Crude petroleum, natural gas, oil and associated products.	oil, gas
12	Uranium and thorium ores.	omn
13	Metal ores.	nmm
14	Mining, quarrying and other associated products.	nmm
15	Food products and beverages.	ofd, pcr
16	Tobacco, tobacco goods and supplies.	b_t,
17	Textiles and textile articles.	tex
18	Clothing and footwear.	wap
19	Leather and leather products.	lum
20	Wood, wood products, cork products, basketware and wickerwork.	ppp
21	Various types of pulp, paper and paper products.	ppp
22	Various types of printed matter and articles for printing.	ppp
23	Petroleum products and fuels.	p_c
24	Chemicals, chemical products and man-made fibers.	crp
25	Rubber, plastic and film products.	crp
26	Non-metallic mineral products.	nfm, fmp, i_s
27	Basic metals and associated products.	nfm, fmp, i_s
28	Fabricated products and materials.	nfm, fmp, i_s
29	Machinery, equipment, appliances, apparatus and associated products.	ome
30	Office and computing machinery, equipment and supplies.	ome
31	Electrical machinery, apparatus, equipment and consumables.	ele
32	Radio, television, communication, telecommunication and related equipment and apparatus.	ele
33	Medical and laboratory devices, optical and precision devices, watches and clocks, pharmaceuticals and related medical consumables.	ome
34	Motor vehicles, trailers and vehicle parts.	mvh
35	Transport equipment.	ome
36	Manufactured goods, furniture, handicrafts, special-purpose products and associated consumables.	omf
37	Recovered secondary raw materials.	nfm, fmp, i_s
40	Electricity, gas, nuclear energy and fuels, steam, hot water and other sources of energy.	ele,gdt
41	Collected and purified water and water distribution.	wtr

CPV Code	Long Name	Mapping to GTAP sectors
45	Construction work.	cns
50	Repair, maintenance and installation services.	obs
60	Land transport services and transport via pipeline services.	otp, wtp
62	Air transport services.	atp
64	Postal and telecommunications services.	cmn
66	Insurance and pension funding services, except compulsory social security services and insurance-related services.	isr
67	Services auxiliary to financial intermediation.	ofi
70	Real estate services.	obs
72	Computer and related services.	obs
74	Architectural, construction, legal, accounting and business services.	obs
78	Printing, publishing and related services.	obs
90	Sewage- and refuse-disposal services, sanitation and environmental services.	obs

Source: EU Report and GTAP Data Base

Table A3: UN Classification of the Functions of Government

Level 1	What it includes
General public services	
	Executive and legislative organs, financial and fiscal affairs, external affairs
	Foreign economic aid
	General services
	Basic research
	R&D General public services
	General public services n.e.c.
	Public debt transactions
	Transfers of a general character between different levels of government
Defense	
	Military defense
	Civil defense
	Foreign military aid
	R&D Defense
	Defense n.e.c.
Public order and safety	
	Police services
	Fire-protection services
	Law courts
	Prisons
	R&D Public order and safety
	Public order and safety n.e.c.
Economic affairs	
	General economic, commercial and labor affairs
	Agriculture, forestry, fishing and hunting
	Fuel and energy
	Mining, manufacturing and construction
	Transport
	Communication
	Other industries
	R&D Economic affairs
	Economic affairs n.e.c.
Environmental protection	
	Waste management
	Waste water management
	Pollution abatement
	Protection of biodiversity and landscape

Level 1	What it includes
	R&D Environmental protection
	Environmental protection n.e.c.
Housing and community amenities	
	Housing development
	Community development
	Water supply
	Street lighting
	R&D Housing and community amenities
	Housing and community amenities n.e.c.
Health	
	Medical products, appliances and equipment
	Outpatient services
	Hospital services
	Public health services
	R&D Health
	Health n.e.c.
Recreation, culture and religion	
	Recreational and sporting services
	Cultural services
	Broadcasting and publishing services
	Religious and other community services
	R&D Recreation, culture and religion
	Recreation, culture and religion n.e.c.
Education	
	Pre-primary and primary education
	Secondary education
	Post-secondary non-tertiary education
	Tertiary education
	Education not definable by level
	Subsidiary services to education
	R&D Education
	Education n.e.c.
Social protection	
	Sickness and disability
	Old age
	Survivors
	Family and children
	Unemployment
	Housing

Level 1	What it includes
	Social exclusion n.e.c.
	R&D Social protection
	Social protection n.e.c.

Source: http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=4