

These are solutions to the second Problem Set for the Public Finance course. Once we grade your answers, you will see your points in the section ‘Study group roster’ in the SIS. The maximum number of points you could obtain from this assignment is 10. In case you have questions about your grade or these solutions, do not hesitate to contact Tereza Palanská at tereza.palanska@fsv.cuni.cz.

Problem 1 (6 points)

In this exercise, you will work with empirical data on public procurement. Download data on public procurement from OpenTender: [here](#) is the link to the download page. On the website, scroll down and choose one European country of your interest (and state clearly which country you chose). Use the link in the right column of the table to download data in JSON (upper table) or .csv format (bottom table). Only work with data for the year 2019. Use your favorite software.

- a) How many tenders did your chosen country administer in 2019?
- b) Create a three-column table that has different types of public procurement procedures in the first column and reports (i) percentage shares for each procedure type in terms of the number of tenders; and (ii) percentage shares for each procedure type in terms of the value of tenders. (Hint: Variables that you will need for these statistics are called `tender_proceduretype` and `tender_finalprice_eur`.)
- c) Create a horizontal bar graph showing the percentage share of tenders (in terms of their count) administered by different types of buyers. Based on this graph, can you tell how much your chosen country is decentralized in terms of procurement expenditures? (Hint: The relevant variable is called `buyer_buyertype`.)
- d) One simple way to find out which public procurement procedures are most efficient in finding the right (i.e., the cheapest) supplier is by looking at the difference between the estimated price of the tender and the final price of the tender. Calculate the average difference (in EUR) between these two measures for each procedure. Which procedure achieves the best outcomes on this metric? (Hint: The relevant variables are called `tender_estimatedprice_eur` and `tender_finalprice_eur`.)

Solution

I choose Denmark.

- a) There were 6,669 public procurement tenders in 2019 in Denmark.
- b) Table 1 shows the percentage shares for each procedure type in terms of the number of tenders and in terms of the value of tenders.

Procedure type	Share of tenders (by count)	Share of tenders (by value)
COMPETITIVE_DIALOG	0.12%	0.57%
INOVATION_PARTNERSHIP	0.01%	0.00%
NEGOTIATED_WITHOUT_PUBLICATION	0.18%	0.40%
NEGOTIATED_WITH_PUBLICATION	11.59%	3.08%
OPEN	66.53%	81.73%
RESTRICTED	13.21%	10.49%
unknown	8.35%	3.72%

Table 1: Percentage shares for each procedure type in terms of numbers of tenders and in terms of the value of tenders

- c) Figure 1 shows the percentage shares of tenders (in terms of their value) administered by different types of buyers. We observe that from this point of view, Denmark is a relatively decentralized country, because around 35% of tenders are administered by regional authorities.

A government is considered to take a decentralised approach to public procurement when contracting regional contracting authorities are responsible for conducting public procurement. Conversely, in a centralised approach, the national government carries out most procurement activities and then distributes the purchased goods and services to lower levels of government.

- d) Table 2 shows the average difference between estimated and final price for each type of public procurement procedure in Denmark in 2019. We observe that the best outcome on this metric (i.e., the highest average difference between the estimated price and the final price) is for the open procedure—on average, the final price of the tender was more than 2.6 million EUR lower than the estimated price. The worst-performing procedure on this metric is competitive dialog—for tenders that used this procedure, the final price was, on average, more than 69 million EUR higher than the estimated price.

Procedure type	Average difference between estimated and final price
COMPETITIVE_DIALOG	-69,300,000
NEGOTIATED_WITH_PUBLICATION	273,934
OPEN	2,682,111
RESTRICTED	-3,860,429

Table 2: Average difference between estimated price and final price for each procedure

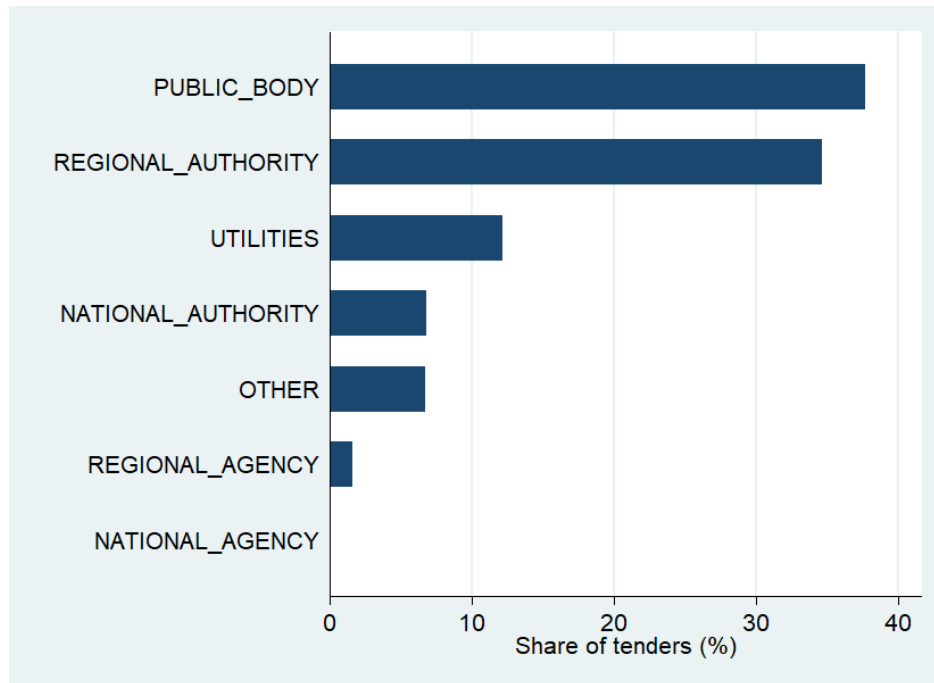


Figure 1: Percentage share of tenders (in terms of their value) administered by different types of buyers

Stata code:

```
*Public Finance 2020 IES CUNI - Problem Set 2, Problem 1

global PS2 "C:\Users\miros\Desktop\Dropbox\Teaching\Public Finance\Problem Sets\2020\Problem Set 2"

*Import data for year 2019 for my chosen country, Denmark.
insheet using "$PS2\data-dk-2019.csv", delimiter(";") clear
save "$PS2\data-dk-2019.dta", replace

*a)
tab tender_year

*b)
*Second column of table
egen no_of_tenders=count(tender_year)
bys tender_proceduretype: egen no_of_tenders_proceduretype=count(tender_year)
gen share_by_count=no_of_tenders_proceduretype/no_of_tenders
*Third column of table
egen tot_price=sum(tender_finalprice_eur)
bys tender_proceduretype: egen tot_price_proceduretype=sum(tender_finalprice_eur)
gen share_by_value=tot_price_proceduretype/tot_price
duplicates drop tender_proceduretype, force
```

```

br tender_proceduretype share_by_count share_by_value

*c)
use "$PS2\data-dk-2019.dta", clear
egen no_of_tenders=count(tender_year)
bys buyer_buyertype: egen no_of_buyertype=count(tender_year)
gen share_buyertype=100*(no_of_buyertype/no_of_tenders)
label variable share_buyertype "Share of tenders (%)"
duplicates drop buyer_buyertype, force
graph hbar (asis) share_buyertype, over(buyer_buyertype, sort(share_buyertype) desc)
graph export "$PS2\PS2_fig1.png", replace

*d)
use "$PS2\data-dk-2019.dta", clear
gen diff=tender_estimatedprice_eur-tender_finalprice_eur
bys tender_proceduretype: egen avg_diff=mean(diff)
duplicates drop tender_proceduretype, force
br tender_proceduretype avg_diff if avg_diff!=.

```

Problem 2 (4 points)

Externalities are all around us. Think of an externality associated with the **consumption** of a good whose name starts with the same letter as your last name.¹

- Write the name of the good and explain which externalities can arise when it is consumed. Classify whether the externality is positive or negative and specify on whom the externality falls.
- Suppose that the demand for this good in the market is given by the equation $P_D = 5 - \frac{M}{2} * Q$, where P_D is the price per demanded unit of the good, M is the number of the month in which you were born, and Q is the total quantity of the good consumed in the market. Also suppose that the supply of this good is given by the equation $P_S = N * Q$, where P_S is the price per supplied unit of the good and N is the number of characters in your first name.² The marginal effect of the externality, i.e. the externality associated with the consumption of an additional unit of the good, is given by $MEE = 1.5Q$.

Illustrate the market for this good with a supply/demand graph. In this graph, draw and label curves for demand, supply, marginal effect of externality, private marginal cost, social marginal cost, private marginal benefit, and social marginal benefit. Indicate the area that represents deadweight loss of this externality. Make sure to label both axes.

- How large is the difference between the socially optimal consumed quantity and the equilibrium consumed quantity in case of no correction for the externality? (i.e., how many units of the good are over- (or under-) consumed?)

¹If you can't think of one, use the first letter of your first name or your hometown.

²As an example, if you were born in May and your name is Martin, set $M = 5$ and $N = 6$.

- d) How large is the deadweight loss of this externality (in terms of money)?

Solution

- a) My letter is P and I choose plane rides. The externality that I exert on other people when I take a plane ride is environmental: the plane generates greenhouse gases. It is a negative consumption externality that falls on every person on the planet through the negative effects of climate change.
- b) Suppose I was born in May and my name is Martin. Then, $P_D = 5 - 2.5Q$ and $P_S = 6Q$. Our externality is a negative one and arises during the consumption of each individual plane ride. Therefore, the social marginal benefit curve can be derived as the private marginal benefit curve (i.e., demand curve, denoted by D) minus the value of the externality (MEE), or $SMB = D - MEE = 5 - 2.5Q - 1.5Q = 5 - 4Q$. This means that the social benefit of the consumption of an additional plane ride is smaller than the private benefit. Figure 2 depicts the situation in the market for plane rides.

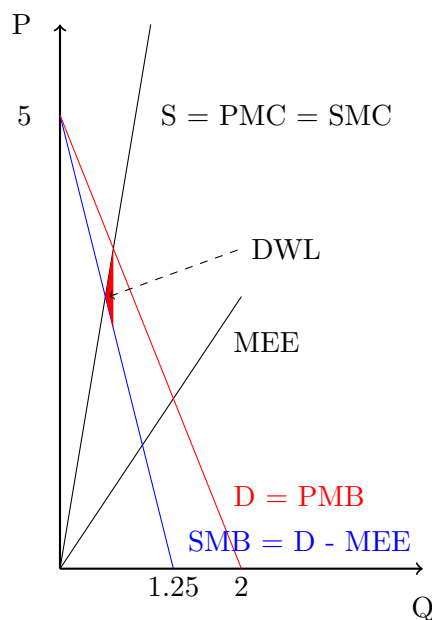


Figure 2: Market for plane rides which generate a negative consumption externality

- c) Since there is a negative consumption externality in the market for plane rides, there will be overconsumption. The socially optimal consumed quantity can be calculated by solving for Q in the equation $SMC = SMB$. In our case, this is $6Q = 5 - 4Q$, which gives $Q^* = 0.5$. The equilibrium consumed quantity in case of no correction for the

externality can be calculated by solving for Q in the equation $PMC = PMB$. In our case, this is $6Q = 5 - 2.5Q$, which gives $Q^E = 0.588$.

The difference between Q^E and Q^* is overconsumption: $Q^E - Q^* = 0.588 - 0.5 = 0.088$.

- d) The deadweight loss is represented by the red triangle in Figure 2. The base of this triangle is of size $3.528 - 2.648 = 0.88$, and the height of the triangle is of size 0.088. The area of this triangle is thus $((3.528 - 2.648) * 0.088)/2 = 0.03872$. The monetary value of the DWL is thus approximately \$0.039.