Environmental Taxes Database: A User-Friendly Approach

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1. Introduction: General Information on Construction and Classification of the Environmental Taxes Database

Over the last decades, various economic policy instruments have played an increasing role in environmental policies and natural resources management of OECD countries. The range of instruments includes environmental taxes, fees and charges, tradable permits, deposit-refund systems and subsidies for environmental protection. In order to use these data in policy analyses, OECD has organized these into a database.

The data presented are obtained from the OECD database on instruments ~~used~~ for environmental policy and natural resources management which have been developed in co-operation between OECD and the European Environment Agency. This (Our?) database covers the 34 member countries of OECD i.e. Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States.

The classification of environmentally related tax rates by and large follows the general tax base category included in the original database of OECD, attached in a separate sheet. The "CO2 tax" is a specific tax base in the original database. However, we excluded it from the initial general bases and present it as a separate category because of its importance as an environmental policy instrument.

Tax rates are expressed in each country's national currency. Euro area member countries' rates are expressed in Euros. Data classification within each country follows

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the unit of measurement so as the rates to be comparable. In cases where it is possible to have more than one applicable tax rate for a single country, we provide not only all the relevant specifications but also the minimum, the maximum and the median of all available values.

In some cases tax rates vary across communities or across states within a country; e.g., (i.e.,) Australia, Belgium, Canada, Spain, Switzerland and USA. We provide information only for the commonly used tax rates across communities or states, or the federal tax rates if the country's political system is based on federalism.

Furthermore, we separately report on the basic tradable permits, their type and whether or not trading is allowed. If the type of permits system is a quota system the initial allocation method is also mentioned. Finally, we list all the abbreviations used in the database regarding the national currencies, units of measurements and chemical terms.

The main categories of environmentally relevant tax bases are the following:

Measured or estimated emissions to air
Tax on NOx emissions
Tax on sulphur
Tax on other emissions to air (measured or estimated)
Tax on CO2

Ozone depleting substances (e.g. CFC, HFC, PFC or halons)

Hazardous chemicals (certain chlorinated solvents, pesticides, antibiotics and growth promoters)

Measured or estimated effluents to water
Tax on effluents of oxydizeable matters (BOD6, COD7) (measured or estimated)
Water pollution tax

Waste management
Tax on waste (general)
Tax on waste (individual products e.g. packaging, beverage containers etc)

Energy products
Energy products used for transport purposes:

Unleaded petrol
Leaded petrol
Diesel
Other energy products for transport purposes (e.g. LPG8 or natural gas)

Energy products used for stationary purposes:
Light fuel oil
Heavy fuel oil

Natural gas
Coal
Coke
Other fuels for stationary use
Electricity consumption
Electricity production
Transport
Registration or use of motor vehicles, recurrent (e.g. yearly) taxes
Resources
Tax on water abstraction
Land tax (mainly mining and forestry activities)

In this particular report we describe the steps we have undertaken in order to make this dataset more user friendly and more amenable to future empirical work. We describe a reorganization of the data into categories which are somewhat different from the original OECD classification. We also describe how these are converted into units that are both comparable and common across countries (e.g. same currency as well as same unit, for instance € per kgr etc.). Our version of the data is provided in a set of spreadsheets, where the user is left with various options and is possible to re-organize the data for further analysis.

The rest of this note is organized as follows. Section 2 describes the choice of instruments, the dimensions along which these differ across countries, how we suggest to organize them and what modification are necessary to make these comparable across countries. Section 3 gives a brief overview of the data and the last section concludes.

2. The Original Dataset and Suggested Groupings

2.1 The Choice of the Instruments Included in the Dataset

The original source of our data is the OECD. In particular, we have employed the "Database on Instruments Used for Environmental Policy" (OECD-EP henceforth), which is freely available online.[1] The OECD-EP includes *inter alia* details on Taxes/Fees and Charges, Deposit-Refund Systems, Tradable Permits and Environmental Subsidies. In our presentation and organization of OECD-EP into a user-friendly format, we focus mostly on Taxes/Fees and Charges and on Tradable Permits. On the one hand, this choice reflects certain restrictions OECD-EP imposes by its own structure. On the other hand, it also reflects the fact that the more policy relevant instruments are taxes and tradable permits, let alone the fact that these are the most

[1] The original OECD data link is: http://www2.oecd.org/ecoinst/queries/. Our version of the database uses data we have last accessed on December 2014. Since then, it seems that some observations have been eliminated from the database. See our discussion below.

frequently used measures in the empirical and theoretical literature on environmental policy issues.

As far as the subsidies are concerned, OECD-EP contains detailed descriptions on the schemes employed in different countries. However, only in few of these cases it is possible to retrieve explicit data on the subsidies supplied.[2] Similarly, data on Deposit-Refund Systems are available on a product-by-product basis, which makes rather cumbersome the "aggregation" of this information for general issues we would like to address.[3] Moreover, since the data and information in OECD-EP is more complete for taxes, we focus mostly on these in our organization of the dataset below. Organizing different taxes in a simple way, makes the comparison of environmental tax instruments across countries easier, which is a fruitful way forward for research purposes and policy analysis.

The original data in OECD-EP is based on a classification system on a country-by-country basis, and contains all the different types of environmentally-related taxes implemented by each national authority, as well as their relevant rates. The countries for which data on environmental taxes and permits are available are the 34 OECD countries, presented in **Table 1**.[4]

Permits on the other hand, are classified according to an environmental domain (water pollution, air pollution, climate change, etc.) per country. The OECD-EP provides information on the type of permits used in each country, as well as whether trading is allowed or not. For example, some countries such as Denmark and France are using unconditional "grandfathered" emission quotas under a tradable permits scheme, while others such as Sweden have to auction for their quotas. Out of the 34 OECD countries studied here only 21 are using permit systems at this point of time.

[**Insert Table 1 about here**]

We should stress here that the number of available tax instruments seems to vary, not only across countries, but also depending on the date the original source of data is accessed. For instance, when we last accessed OECD-EP in December 2014, the source-database contained taxes for countries, e.g. Chile and Mexico, which as of May 2015, are not included. In order to provide an outcome that is as informative and as

[2] The database contains a description of the subsidy scheme (e.g. grant, tax break), without – in most cases – providing exact information about the amount of tax break, the amount of grant etc.

[3] For instance, most of these data focus on beverage container recycling.

[4] The OECD-EP database in principle reports data on non-OECD countries as well. However, each time we have accessed the original data, it did not return any information on taxes and tradable permits for these countries.

complete as possible, we include in our version of the database all values available during December 2014. Whenever necessary, the relevant "problematic" observations will be flagged accordingly so that the user is informed about this issue.

2.2 Original Organization and Heterogeneity of Instruments across Countries

A simple inspection of the OECD-EP reveals that it is not "user friendly" and easily amenable to further processing, so that taxes reported could be used in empirical research.[5] To start with, there is an extreme degree of heterogeneity of the tax instruments employed in different countries. Many national authorities use diverse taxes, aiming at correcting similar externalities. In principle, to help organizing the data, OECD-EP provides an organization of these tax rates into two different groupings. For instance, Czech Republic uses a natural gas tax, whereas Denmark imposes both a CO_2 tax on natural gas when it is used as fuel in stationary reciprocating engine plant and a natural town gas tax.

The *first* one is in an organization according to the "Environmental Domain". This sorts different instruments into eleven groups like air and water pollution, land and waste management and so on. Details on all the relevant categories are provided in **Table 2**. The *second* one is to use an organization of the taxes according to the tax base upon which they are levied. For instance, OECD-EP employs some 35 tax base categories, e.g. diesel, electricity consumption, natural gas, etc., which we report in **Table 3**. However the very number of the categories makes the data hard to work with, making the user wonder under which category the appropriate taxes fall.

[**Insert Tables 2 and 3 about here.**]

As we feel that organizing the data just by looking at the general tax base albeit informative, is quite "loose", we propose a different grouping below. The suggested organization of the data is, in our view, more straightforward in terms of interpretation of the general and more specific categories of taxes employed across different countries, and more pertinent to research purposes and policy analysis.

2.3 Suggested Organization of the Data

For illustrative purposes, in our classification we have divided environmental taxes into four main groups:

1. **Pollution taxes**

[5] Although the OECD-EP database provides an output in spread-sheet format, the tax rates figures, currency in which they are denominated and units upon which they are imposed are given together with a short description of the units in the same cell (for instance "XX€ per litre") making further processing cumbersome.

2. **Energy taxes**
3. **Transport taxes**
4. **Taxes on natural resources.**

Table 4 below provides a brief description of each group and its sub-groups.

[**Insert Table 4 about here.**]

2.3.1 Pollution Taxes

[**Talk a bit about pigouvian taxation here?**]

This group includes taxes on measured or estimated emissions to air, measured or estimated effluents to water, ozone depleting substances, hazardous chemicals and management of waste.

CO_2 taxes are one of the policy instruments available to governments in their efforts in reducing greenhouse gas emissions. In the original data provided by the OECD, a "tax on CO_2" is considered on a source-specific basis, regarding only the source from which CO_2 is produced (e.g. fuels, greenhouse gases etc.). As a result CO_2 taxes are levied and shown on several tax bases. However, for comparison and research purposes and due to the importance of this environmental policy instrument, we identify all the relevant taxes and report them as a separate category under pollution taxes.[6]

A CO_2 tax is assumed to be a *pollution tax* rather than an *energy tax* (see for instance Grossman (1999) for a discussion). Energy taxes, which are reported below as a separate category, increase the price of energy uniformly, regardless of the emissions produced by the energy source. An *ad valorem* energy tax which is levied according to the energy content of fuels or the value of energy products may not be consistent with the emitted amounts of greenhouse gases (see Fisher et al. (1996)).

Pollution Taxes: Sub-categories and Measurement Units

The first sub-group of pollution taxes is formed by the measured or estimated emissions to air. This includes taxes on NOx emissions, taxes on sulphur, taxes on other emissions to air (measured or estimated) and the taxes on CO_2. One issue we try to resolve below is the heterogeneity of measurement of the taxes. For instance, a closer look at the CO_2 taxes reveals that these are measures as national currency per tonne, national currency per litre, national currency per Nm^3 or per Sm^3, national currency per GJ, and even national currency per unit (e.g. for vehicles).

The other four sub-groups include taxes on ozone depleting substances (e.g. CFC, HFC, PFC or halons)[7]**;** taxes on hazardous chemicals (certain chlorinated

[6] In order to avoid duplication of tax instruments, we ***do not*** report CO_2 taxes in the general category under which they appear, but rather we present these separately as a new tax category.

[7] Halons may refer to haloalkane or halogenoalkane, a group of man-made chemical compounds that exist at gases or liquids consisting of alkanes with linked halogens. Moreover, the acronyms are described in detail **Table 5**. See below.

solvents, pesticides, antibiotics and growth promoters)**;** taxes on effluents to water (for instance taxes on effluents of oxydizeable matters (BOD6, COD7) as well as water pollution taxes); and taxes related to waste management (which might be general or even product-specific such as packaging, beverage containers etc.). Again a closer look at the data reveals a great degree of heterogeneity of measurement units across taxes and across countries which makes direct use of these data complicated.

2.3.2 Energy Taxes

We have classified in this group taxes on fuels. These fuels are used either for transport purposes or to produce other forms of energy (e.g. sub-group of *stationary applications*). The most important fuels for transport purposes are petrol and diesel. Fuels for stationary use include fuel oils, natural gas, coal, coke as well as electricity.

Energy Taxes: Sub-groups and Measurement Units

The first sub-group includes unleaded and leaded petrol, diesel and other energy products which are used for transport purposes (e.g. LPG8 or natural gas). The second sub-group contains light and heavy fuel oil, natural gas, coal and coke, other fuels for stationary use as well as electricity production and consumption. Again we are faced with the issue of diversity of measurement units: many of these items are subject to taxes measured as units of national currency per litre, and others (electricity) are expressed as national currency per MWh. We try to deal with these issues below.

2.3.3 Transport Taxes

This group of instruments includes mainly taxes related to the registration, ownership and use of motor vehicles. "One-off" taxes related to imports or sales of equipment are not included in our database; however they are available in OECD-EP.[8] Taxes on petrol, diesel and other transport fuels have been classified under ***Energy taxes*** as already discussed above. We should highlight here that these taxes are not imposed using as their measurement basis either weight or volume; rather they are fixed amounts to be paid for a given time period usually a year (e.g. € per year) – although there are other examples of monthly charges as well.

[8] We do report these separately, for the sake of completeness. However, given their original heterogeneity (some are reported as percentages, some as particular values etc.) we do not make any further conversions, as there is no straightforward way to make these comparable across countries.

2.3.4 Taxes on Natural Resources

Taxes on natural resources include a tax on water abstraction as well as a land tax based on the management of land, soil and forest resources. More specifically, the land tax includes taxes on extracted minerals such as phosphate, copper and silver, mining profits and rights, withdrawal of land from forestry, natural gravel and hydraulic structures. Land taxes from mining activities are commonly measured either by kg/tonne of extraction or per hectare. Land taxes from forestry are being used in Czech Republic and are calculated using a specific formula, which depends on the annual wood production and price per m^3. Rates differ according to the type of forests (i.e. economic forests, protected forests etc).

2.3.5 Organization of the Data: Some Further Remarks

We should stress here that in certain cases, tax rates vary across communities or across states/regions within the same country. For example, electricity consumption excise taxes differ significantly across USA states.[9] A similar lack of data homogeneity is observed in Australia, Belgium, Canada, Spain and Switzerland. In order to avoid further complications, in our 'user-friendly' database we include only the commonly used tax rates across communities or states, or the federal tax rates if the country's political system is based on federalism.

For completeness, in **Table 5** we also report all the abbreviations used in the database regarding the national currencies, units of measurements and chemical terms.

[**Insert Table 5 about here.**]

2.3.6 Tradable Permits

We separately report the basic tradable permits, their type and whether or not their trading is allowed. Whenever the type of permits system is a quota system, the initial allocation method is also given.

2.4 Required Data Adjustments for Comparability Purposes

Having organized the data in specific groups that are easily comparable across countries, we are still left with two major issues to resolve. First, taxes are expressed in units of national currency, which makes comparison across countries problematic. In principle, it is up to the final user of the data to convert these into a common currency. But in order to facilitate comparisons across countries and/or even across different groups of taxes, we propose to convert these using either PPP exchange rates or the

[9] For instance they differ for the states of Delaware, Columbia, Illinois, New Hampshire, Pennsylvania and Vermont.

USD exchange rates.[10] In some detail, the conversion to USD is based on average exchange rates between 2009 and 2013. To convert taxes into PPP adjusted exchange rates, we use either the 2005 or the 2011 conversion factors. We also provide a measure of taxes which is based on the average PPP exchange rates between 2009 and 2011.

The second is the heterogeneity of units of measurement (see for instance the taxes imposed on CO_2). We have made every effort possible to accommodate this making use of the following conventions. Whenever the tax base is liquids we convert taxes as USD (or PPP equivalent) per litre. Whenever the tax base depends on some measure of weight, we express these taxes as USD (or PPP equivalent) per kgr. All the conversions used, are described in Table 6.

[**Insert Table 6 about here.**]

3. Environmental Taxes in the OECD Economies: Some Descriptive Results

Having provided an overview of the reorganization and modification of the original data supplied by the OECD, we now turn to some (mostly descriptive) results on the environmental tax rates.

3.1 The Data to be used in Subsequent Analyses

To give the reader an overview of the environmental tax instruments in **Tables 7a** and **7b** we report the number of taxes levied in different countries in the sample. **Table 7a** reports the number of taxes related to emissions to air whereas **Table 7b** displays the number of instruments used regarding fuel taxes. Regarding the former type of instrument, we note that there is a degree of disparity: the number of instruments related to NOx is much smaller relative to the number of instruments regarding CO_2 emissions and other emissions to air. As far as taxes on fuels are concerned, their number seems more evenly spread across countries with some exceptions – for instance Belgium and Italy have some 17 different taxes imposed on natural gas, number much larger than that in other countries.

[**Insert Tables 7a and 7b about here.**]

In order to further facilitate use of the data in subsequent work, in our spreadsheets we also provide for each group of tax instruments the range of their values by country, as well as their mean values.

[10] Our exchange rate data, as well as data for aggregate trade flows we use below have been obtained from the World Bank's WDI database.

3.2 Figures and Correlations: Some Further Results

In order to inform the reader about the relation between the different tax instruments and international trade, in this small subsection we report simple correlations and cross-plots of the number of environmentally-related taxes and the volume of trade, imports and exports. That is we present cross-plots and calculate the correlations between the numbers of environmental taxes by country,[11] or the intensity of environmental taxes,[12] exports, overall volume of trade (exports plus imports of goods and services), volume of trade in services, and trade balances – all expressed as percentage of GDP.[13] **Figures 1** to **4** report these plots and **Table 8** contains the correlations.

[**Insert Figures 1 to 5 about here.**]

[**Insert Table 8 about here.**]

Looking at the figures there is no clear picture emerging: there seems to be no clear, strong relation between the number of environmentally related taxes and international trade. When the number of taxes does not include vehicle registration fees, the relation between this number and exports and overall trade to GDP is positive; while the relation between the number of taxes and overall trade in services and the trade balance is negative. When however the number of taxes is measured to include vehicle registration fees, the relation with measures of trade is more clearly negative. The feature which is clearer is the relation between the trade balance of each country in our sample and the number of environmental taxes: this relation is negative – albeit not extremely strong in quantitative terms.

A similar picture arises when we look at the relation between the intensity of environmentally related taxes and international trade: the relationship between them is very weak. While the link between exports and tax intensity as well as overall trade and tax intensity is negative, the intensity of environmental taxes is positively related to the trade balance. Again, the relation between tax intensity and trade flows is not strong quantitatively.

4. Conclusions

This notes provides a description of the steps we have undertaken in order to make the data available in OECD's "Database on Instruments Used for Environmental Policy" comparable across countries. In particular we have re-organized the data in categories

[11] We use two measures of this number. The first is simply the number of environmental taxes by country, and the second one also includes vehicle registration fees as extra categories.

[12] **This is proxied by the percentage of tax revenue to GDP, when the tax instrument is an environmental tax.**

[13] These are the average percentages to GDP over the period 2009-2013.

which attract more attention policy discussion (e.g. CO_2 emissions). Then we have converted these tax instruments into common currency and, whenever possible, into common units of weight or volume. The final output is provided in a set of spreadsheets that are easily usable in further work.

References

Groosman, B. (1999) "2500 Pollution Tax" **Bouckaert. B.** and **De Geest, G.** (eds) *Encyclopedia of Law and Economics*, Edward Elgar and the University of Ghent.

Fisher,B., Barret, S., Bohm, P. Kuroda, M., Mubazi, J., Shah, A. and R. Stavins (1996) "An Economic Assessment of Policy Instruments for Combating Climate Change" Chapter 11 in **Bruce, J., Lee, H**. and **Haites, E.** (eds.) *Climate Change 1995: Economic and Social Dimensions of Climate Change*, Cambridge University Press, 397-439.

Tables

Table 1a. Countries included in the Sample

Panel A: Countries which Levy Taxes			
Australia	Austria	Belgium	Canada
Chile	Czech Republic	Denmark	Estonia
Finland	France	Germany	Greece
Hungary	Iceland	Ireland	Israel
Italy	Japan	Korea	Luxembourg
Mexico	Netherlands	New Zealand	Norway
Poland	Portugal	Slovak Republic	Slovenia
Spain	Sweden	Switzerland	Turkey
United Kingdom	United States		
Panel B. Countries with Environmental Permits			
Australia	Belgium	Canada	Chile
Denmark	Estonia	France	Hungary
Iceland	Italy	Mexico	Netherlands
New Zealand	Norway	Poland	Slovenia
Spain	Sweden	Switzerland	United Kingdom
United States			

Notes: List of countries for which environmental taxes and/or fees are available in OECD's "Database on instruments used for environmental policy". Details are available at the webpage of the database: http://www2.oecd.org/ecoinst/queries/Default.aspx.

Table 2. Classification used in OECD-EP Database

Water Pollution	Waste Management
Air Pollution	Natural Resource
Climate Change	Noise
Land Contamination	Ozone Layer
Energy Efficiency	Land Management
Transport	

Notes: The table reports one of the possible groupings available in OECD's "Database on instruments used for environmental policy"

Table 3. General Tax Base in OECD-EP Database

1	Administrative tasks related to environmental policy	18	Measured or estimated effluents of oxydizeable matters (BOD, COD)
2	Air transport	19	Measured or estimated NOx emissions
3	Coal	20	Natural gas
4	Coke	21	Noise
5	Diesel	22	Non-point sources of water pollution - Artificial fertilisers
6	District heat consumption	23	Non-point sources of water pollution - Manure
7	Effluent collection and treatment, fixed annual taxes	24	Non-point sources of water pollution - Pesticides
8	Electricity consumption	25	Other energy products for transport purposes
9	Electricity production	26	Other fuels for stationary purposes
10	Hazardous chemicals	27	Other measured or estimated effluents to water
11	Heavy fuel oil	28	Other measured or estimated emissions to air
12	Leaded petrol	29	Other transport
13	Light fuel oil	30	Ozone depleting substances
14	Management of biodiversity and wildlife	31	Transport - Motor vehicles, one-off import or sales taxes
15	Management of fish stocks	32	Transport - Registration or use of motor vehicles, recurrent taxes
16	Management of land, soil and forest resources	33	Unleaded petrol
17	Management of water resources	34	Waste management - in general
		35	Waste management - individual products

Notes: The table reports the General Tax-base categories that the OECD's "Database on instruments used for environmental policy" employs in classifying the different tax instruments available across different national authorities.

Table 4. The Suggested Organization of the Database

I. Pollution Taxes			
1	**Measured or estimated emissions to air**	1	Tax on NOx emissions
		2	Tax on sulphur
		3	Tax on CO_2
		4	Tax on other emissions to air (measured or estimated)
2	**Ozone depleting substances**	1	Tax on ozone depleting substances
3	**Hazardous chemicals**	1	Tax on hazardous chemicals
4	**Measured or estimated effluents to water**	1	Tax on effluents of oxydizeable matters
		2	Water pollution tax
5	**Waste management**	1	Tax on waste (general)
		2	Tax on waste (individual products)
II. Energy Taxes			
1	**Fuels for Transport Purposes**	1	Tax on unleaded petrol
		2	Tax on leaded petrol
		3	Tax on diesel
		4	Tax on other energy products for transport purposes
2	**Fuels for Stationary Purposes**	1	Tax on light fuel oil
		2	Tax on heavy fuel oil
		3	Tax on natural gas
		4	Tax on coal
		5	Tax on coke
		6	Tax on other fuels for stationary use
		7	Tax on electricity consumption
		8	Tax on electricity production
III. Transport Taxes			
1	**Transport**		Registration or use of motor vehicles, recurrent taxes
IV. Taxes on Natural Resources			
1	**Natural resources**	1	Tax on water abstraction
		2	Land tax (mining, forestry)

Notes: The table reports our suggested organization of the OECD's "Database on instruments used for environmental policy" into more user-friendly categories.

Table 5. Units of Measurement

Panel A: Acronyms		Panel B: Original Measurement Units		Panel C: Currencies	
Acronym	**Definition**	**Abbreviation**	**Unit of measurement**	**Acronym**	**Currency**
BOD	Biochemical oxygen demand	cm^3 or ccm	cubic centimeter	AUD	Australian Dollar
CFC	Chlorofluorocarbons	GJ	gigajoule	GBP	British Pound
CNG	Compressed natural gas	kg	kilogram	CAD	Canadian Dollar
CO_2	Carbon dioxide	km	kilometer	CLP	Chilean Peso
COD	Chemical oxygen demand	kmol	kilomole	CZK	Czech Koruna
HCI	Hydrochloric acid	kW	kilowatt	DKK	Danish Krone
HFC	Hydrofluorocarbons	kWh	kilowatt hour	EUR	Euro
LPG	Liquefied petroleum gas	m^3	cubic meter	HUF	Hungarian Forint
NOx	Nitrogen oxides	mg	miligram	ISK	Iceland Krona
PC	Polycarbonate	MJ	megajoule	ILS	Israeli New Shekel
PE	Polyethylene	MWh	megawatt hour	JPY	Japanese Yen
PET	Polyethylene terephthalate	Nm^3	normal cubic meter	KRW	Korean Won
PFC	Perfluorocarbons	Sm^3	standard cubic meter	MXN	Mexican Peso
PP	Polypropylene			NZD	New Zealand Dollar
PS	Polystyrene			NOK	Norwegian Kroner
SF6	Sulfur hexafluoride			PLN	Polish Zloty
SO	Sulphur oxides			SKK	Slovak Koruna
SO_2	Sulphur dioxides			SEK	Swedish Krona
VOC	Volatile organic compounds			CHF	Swiss Franc
				TRY	Turkish New Lira
				USD	US Dollar

Table 6. Unit Conversion in OECD-EP Database

Original Unit	New Unit	Scaling Factor	Reference
Barrel	litre	158.987	http://www.eia.gov/cfapps/ipdbproject/docs/unitswithpetro.cfm
216 litre barrel	litre	216	
Day	year	0.0027	=1/365
Gallon	litre	3.7854	http://www.metric-conversions.org/volume/us-liquid-gallons-to-liters.htm
GJ	litre[14]	39.0778	http://www.sbr.gov.bc.ca/documents_library/shared_documents/Conversion_factors.pdf
GJ	litre[15]	26.137	http://www.sbr.gov.bc.ca/documents_library/shared_documents/Conversion_factors.pdf
GJ	kgr[16]	34.1208	https://www.unitjuggler.com/convert-energy-from-GJ-to-kgSKE.html
gram	kgr	0.001	=1/1000
hectolitre	litre	100	=100
m^3	litre	1000	=1000
MJ	litre	0.0391	1MJ=0.001GJ, and 1GJ=39.0778litres (Propane)
month	year	0.0833	=1/12
month-cc	year-cc	0.0833	=1/12
month-kW	year-kW	0.0833	=1/12

[14] This refers to taxes on CO_2 or and taxes on *other energy products for transport purposes*.
[15] This refers to taxes on *natural gas*.
[16] This refers to taxes on *Coal*, taxes on *other fuels for stationary purposes* or taxes on *electricity production*.

month-tonne	year-kgr	83.3333	=(1/12)*1000
MWh	kWh	1000	=1000
Nm^3	litre[17]	1054.92	http://www.gaslink.ie/energyconversion
Nm^3	(m^3)[18]	1.0549	http://www.gaslink.ie/energyconversion
pound	kgr	0.4536	
quarter	year	0.25	
Sm^3	litre	1000	http://www.sbr.gov.bc.ca/documents_library/shared_documents/Conversion_factors.pdf
tonne	kgr	1000	
tonne	litre[19]	1015	http://www.eurocbc.org/Standard%20Conversion%20Factors%20dti_converfactors.pdf
tonne	litre[20]	1177	http://www.accruegroupinc.com/oil-industry-conversions.html
tonne	litre[21]	1.108	https://www.energyinst.org/_uploads/documents/DSI06.pdf
tonne	(m^3)[22]	1360	http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy/using-the-review/Conversionfactors.html
week	year	0.0192	=1/52

[17] This refers to taxes on CO_2 or taxes on *other energy products for transport purposes* (taxes on *natural gas*).
[18] This refers to taxes on *natural gas*.
[19] This refers to a tax on *heavy fuel oil* (Estonia).
[20] This refers to taxes on *mineral oils* (Spain).
[21] This refers to taxes on *oil and lubricants* (in France and Italy) – the general tax-base being *tax on waste (individual products)*.
[22] This refers to a tax on *natural gas* (Japan).

Table 7a. Number of Taxes on Air Pollution

Country	Tax on NOx emissions	Taxes on CO_2	Taxes on other emissions to air
Australia	3		
Czech Republic	1		31
Denmark	2	17	
Estonia	1	2	13
Finland		33	1
France	2	9	15
Hungary	1		8
Italy	1		1
New Zealand			1
Norway	6	13	2
Slovak Republic	1		8
Slovenia		18	1
Sweden	1	12	
Switzerland		1	1
Total	***19***	***105***	***82***

Notes: The table shows the number of different environmental taxes across countries, which are levied on various forms of air pollution.

Table 7b. Number of Taxes on Fuel

Country	Tax on diesel	Tax on natural gas	Tax on other fuels for stationary purposes
Australia	2		
Austria	2	1	1
Belgium	4	17	9
Canada	1		
Chile	1	1	
Czech Republic	1	2	12
Denmark	2	3	9
Estonia	1	1	1
Finland	2	2	10
France	3	1	
Germany	2	1	7
Greece	1		2
Hungary	1	1	1
Iceland	1		
Ireland	4	2	11
Israel	1		
Italy	5	17	12
Japan	1	1	2
Korea	3	1	3
Mexico	1		
Netherlands	3	6	2
New Zealand		1	

Norway	2		
Poland	1		
Portugal	2	1	3
Slovak Republic	2	2	
Slovenia	4	4	2
Spain	2		2
Sweden	3		1
Switzerland	1	2	3
Turkey	2		
United Kingdom	4	3	2
United States	6		2
Total	***71***	***70***	***97***

Notes: The table shows the number of different environmental taxes across countries, which are levied on various forms of fuel.

Table 8. Correlations: Nr. of Tax Rates and Tax Intensity with Different Measures of International Trade

	Nr. of tax rates (1)	Nr. of tax rates (2)	Tax Intensity
Exports/GDP	0.0197	-0.0618	-0.0161
Imports/GDP	0.0442	-0.0645	-0.0246
Trade/GDP	0.0308	-0.0632	-0.0200
Trade in Services /GDP	-0.0436	-0.0363	-0.0327
Trade Balance/GDP	-0.0722	-0.0402	0.0161

Notes: The table reports the pairwise correlations between the number of environmental taxes imposed by each country and various measures of international trade. These include trade (exports + imports of both goods and services), trade in services (exports + imports of services alone), the trade balance etc. The Nr. of tax rates (1) is the overall number of environmental taxes a country imposes; Nr. of tax rates (2) is the overall number of environmental taxes ***inclusive*** of car registration fees. Tax intensity is measured by the percentage of tax revenue from environmental taxes to GDP (data obtained from Eurostat).

Figures

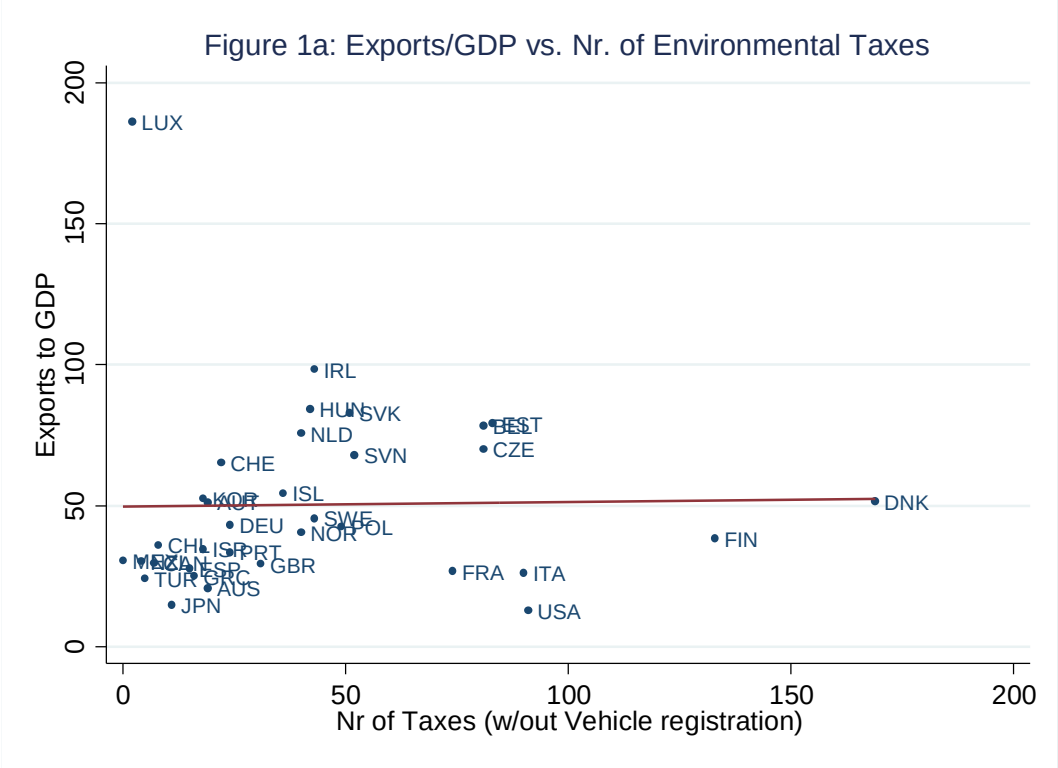


Figure 1a: Exports/GDP vs. Nr. of Environmental Taxes
Exports to GDP
0
50
100
150
200
Nr of Taxes (w/out Vehicle registration)
0
50
100
150
200
LUX
IRL
HUN
SVK
NLD
BEL
EST
CZE
SVN
CHE
ISL
KOR
AUT
DNK
DEU
SWE
POL
NOR
FIN
CHL
ISR
PRT
GBR
FRA
ITA
TUR
GRC
AUS
JPN
USA

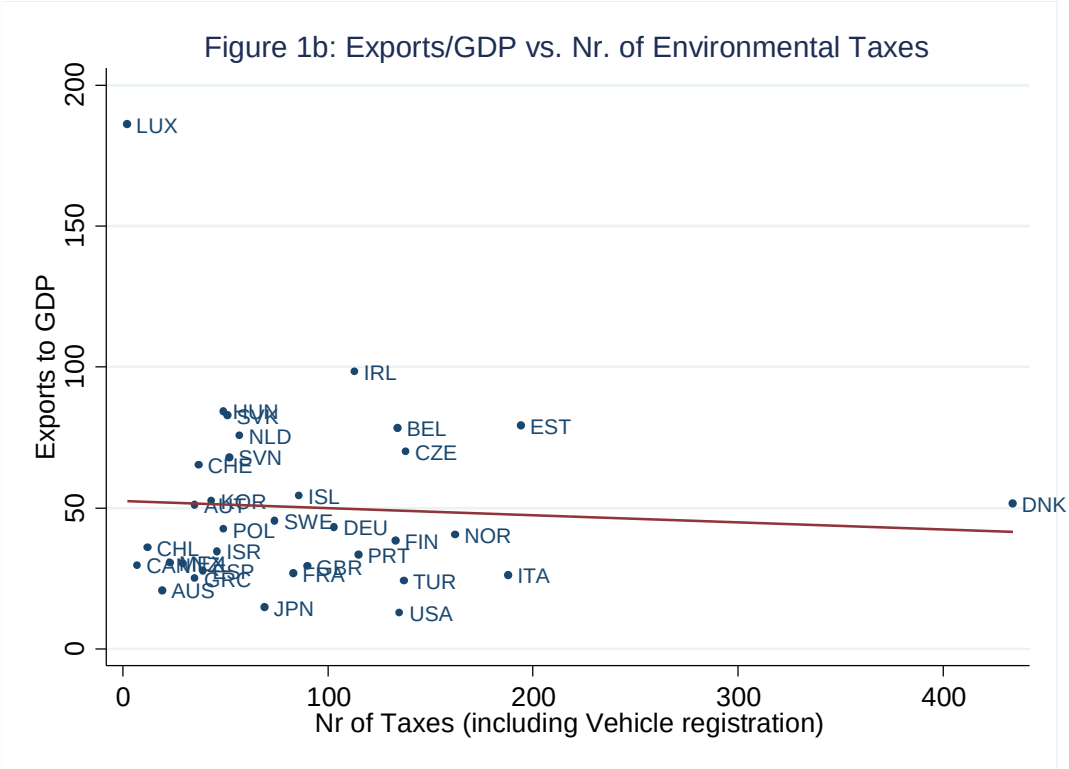


Figure 1b: Exports/GDP vs. Nr. of Environmental Taxes
Exports to GDP
0
50
100
150
200
Nr of Taxes (including Vehicle registration)
0
100
200
300
400
LUX
IRL
HUN
SVK
NLD
BEL
EST
CZE
SVN
CHE
ISL
KOR
AUT
DNK
SWE
DEU
POL
FIN
NOR
CHL
ISR
PRT
GBR
FRA
ITA
TUR
GRC
AUS
JPN
USA

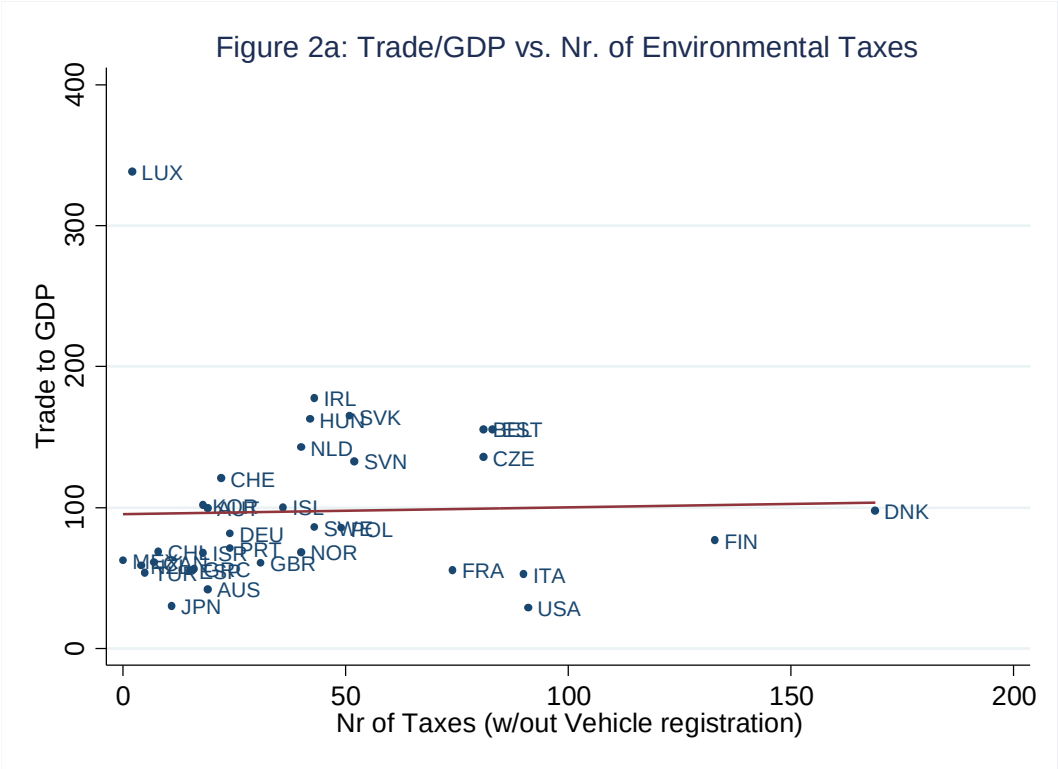


Figure 2a: Trade/GDP vs. Nr. of Environmental Taxes
Trade to GDP
0
100
200
300
400
Nr of Taxes (w/out Vehicle registration)
0
50
100
150
200
LUX
IRL
HUN
SVK
NLD
SVN
CZE
CHE
ISL
DNK
DEU
FIN
NOR
GBR
FRA
ITA
AUS
JPN
USA

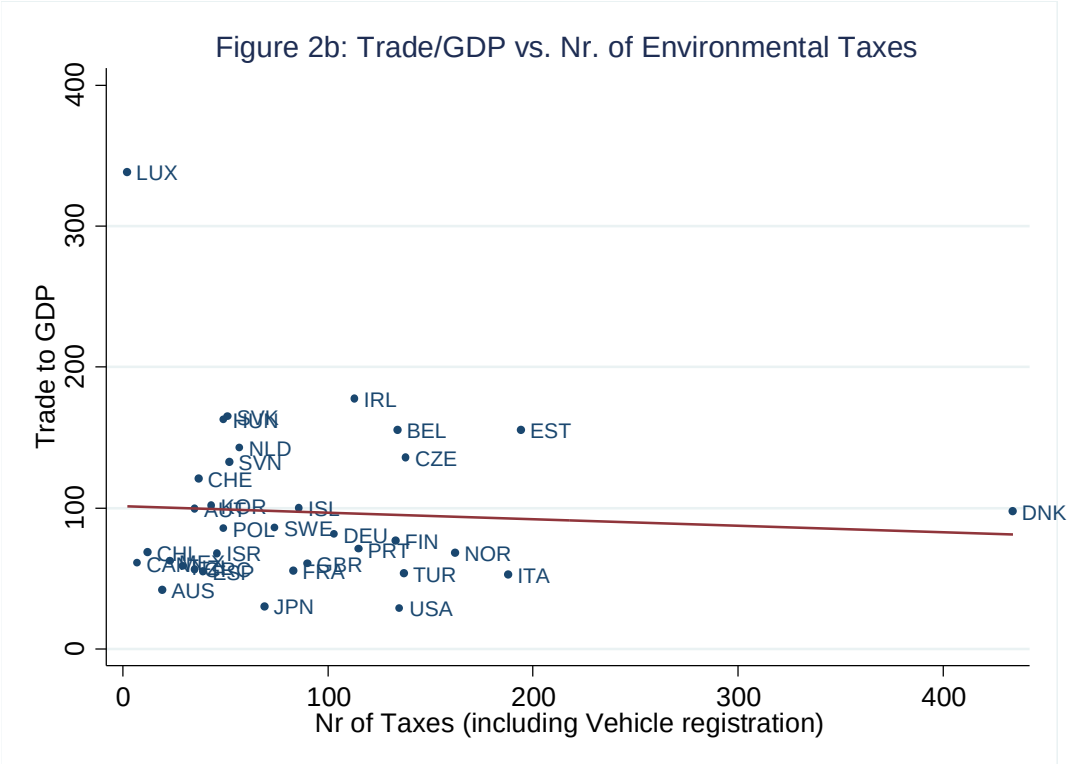


Figure 2b: Trade/GDP vs. Nr. of Environmental Taxes
Trade to GDP
0
100
200
300
400
Nr of Taxes (including Vehicle registration)
0
100
200
300
400
LUX
IRL
BEL
EST
NLD
CZE
SVN
CHE
ISL
DNK
POL
SWE
DEU
FIN
PRT
NOR
GBR
FRA
TUR
ITA
AUS
JPN
USA

Figure 3a: Services Trade/GDP vs. Nr. of Environmental Taxes

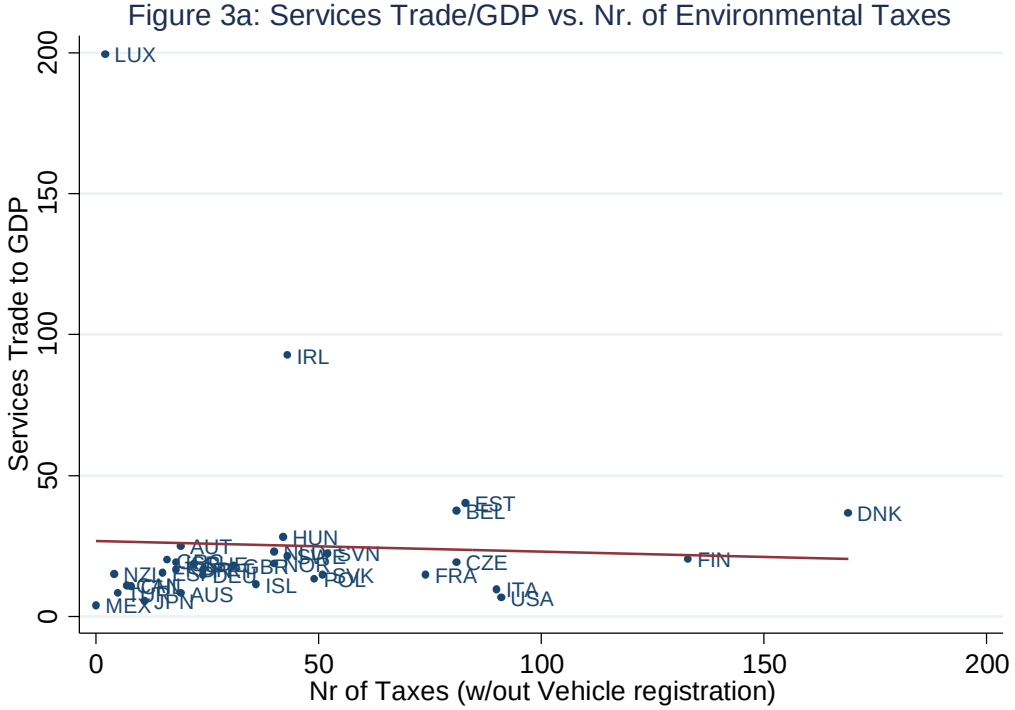


Figure 3b: Services Trade/GDP vs. Nr. of Environmental Taxes

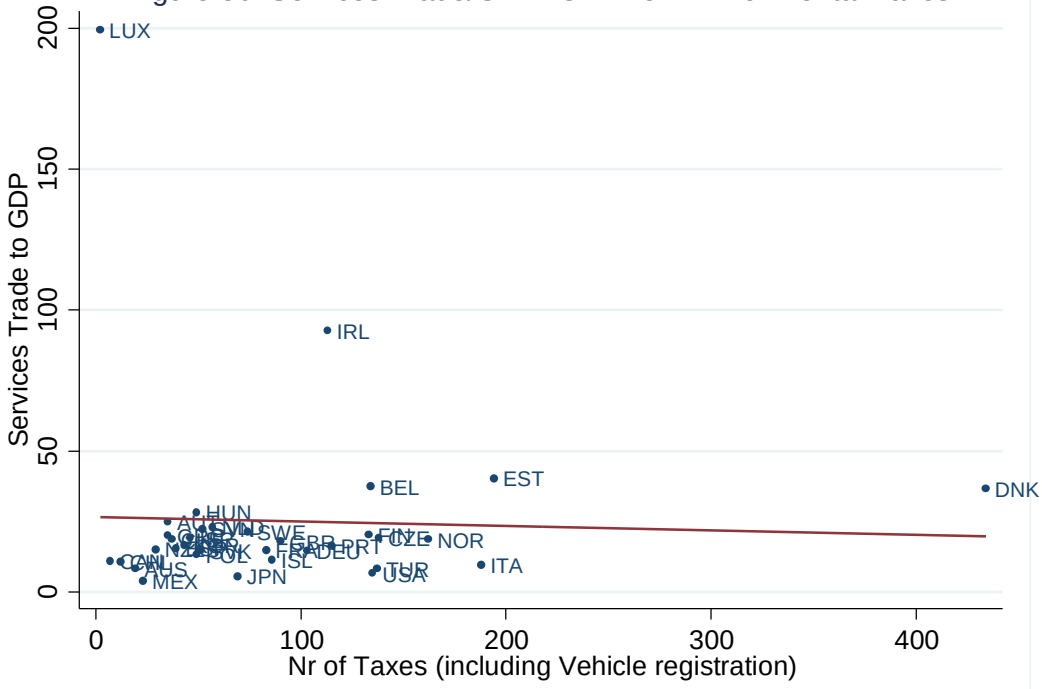


Figure 4a: Trade Balance/GDP vs. Nr. of Environmental Taxes

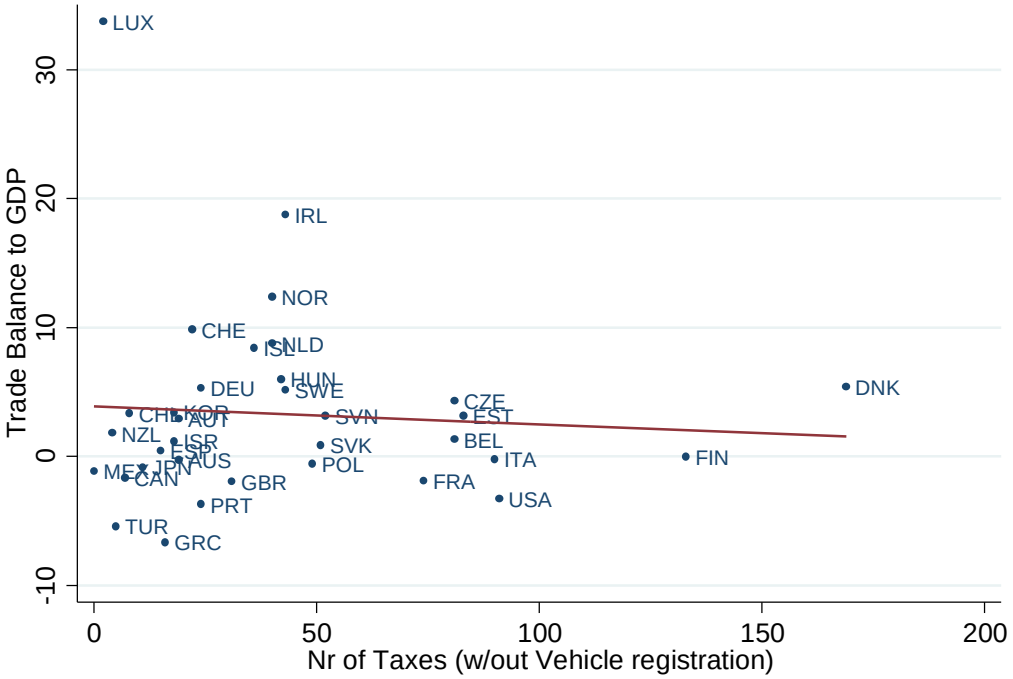


Figure 4b: Trade Balance/GDP vs. Nr. of Environmental Taxes

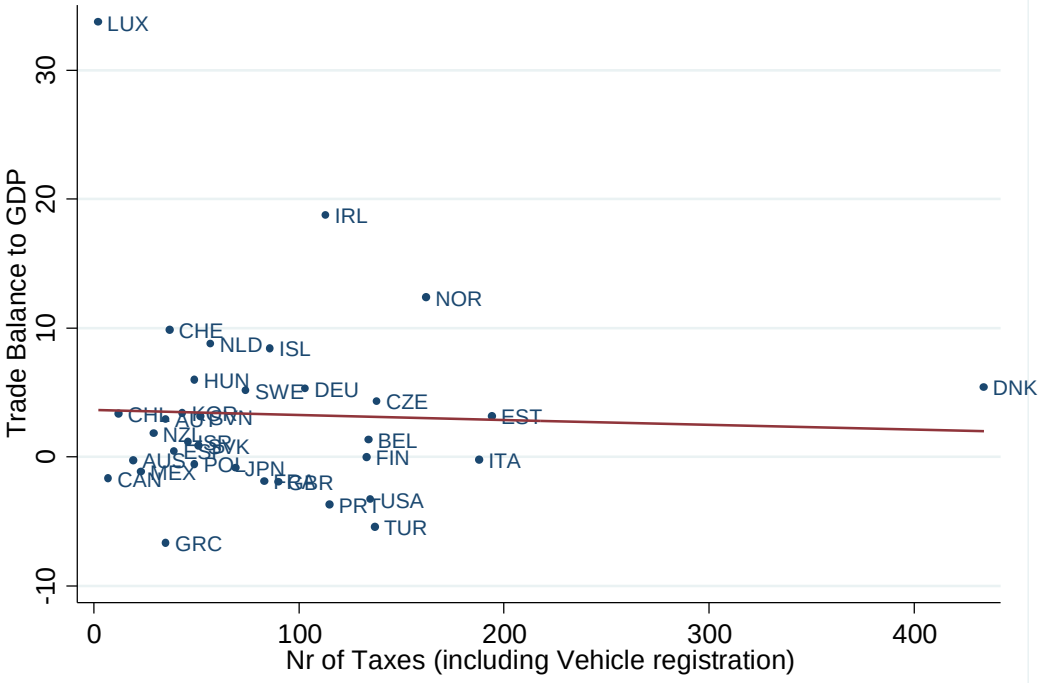


Figure 5a: Exports/GDP vs. Tax Revenue from Environmental Taxes

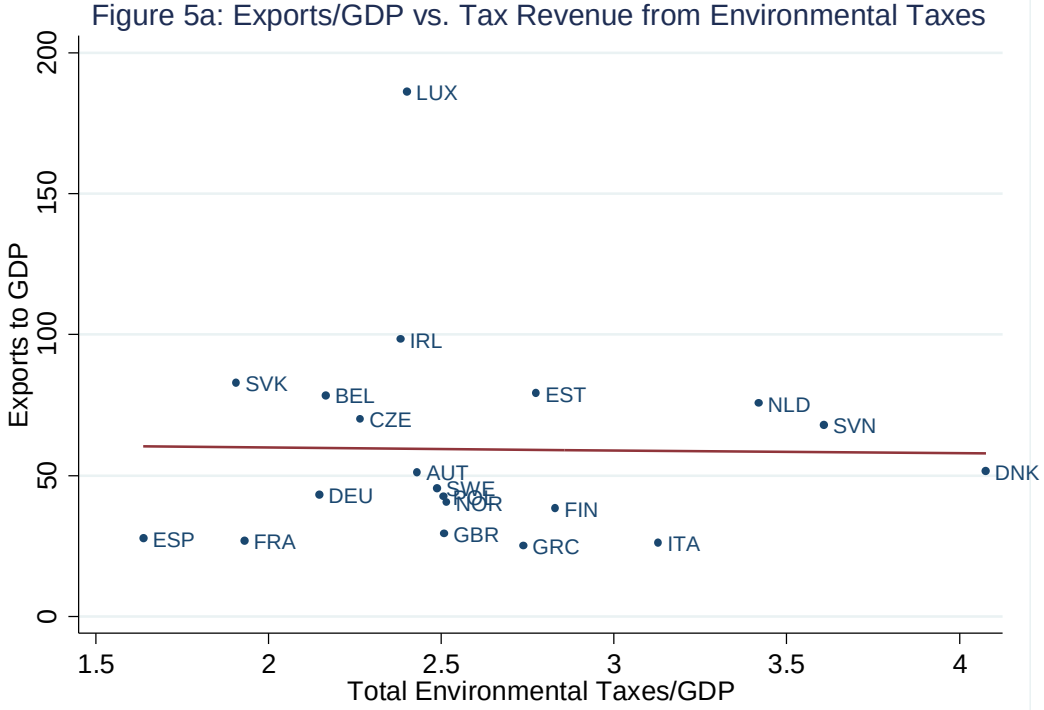
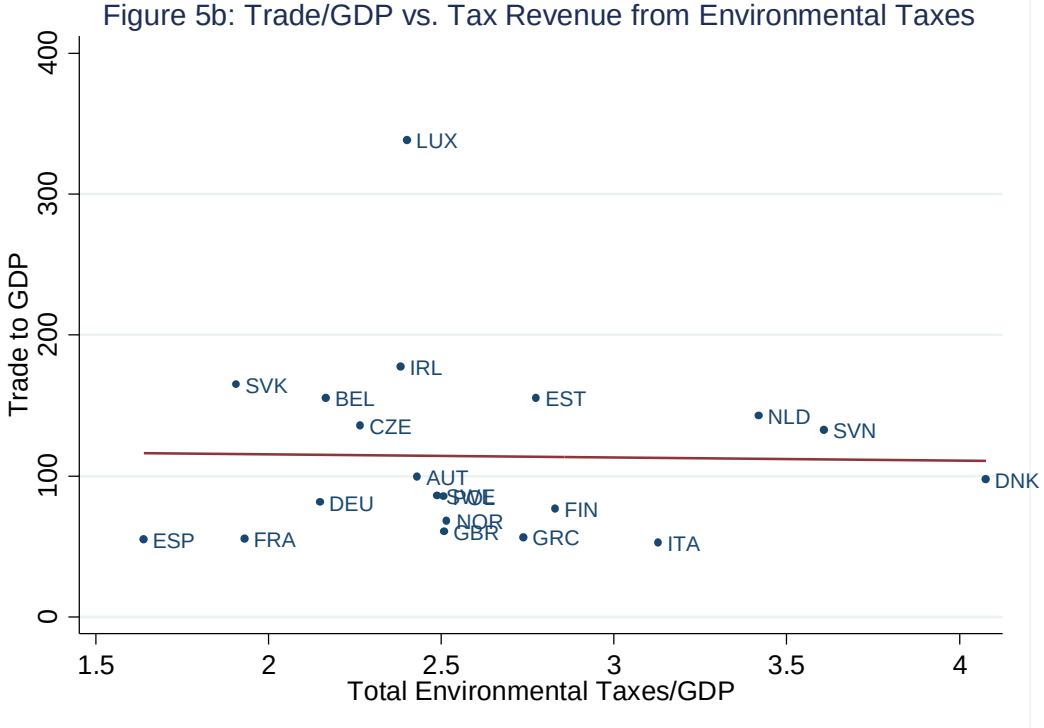


Figure 5b: Trade/GDP vs. Tax Revenue from Environmental Taxes



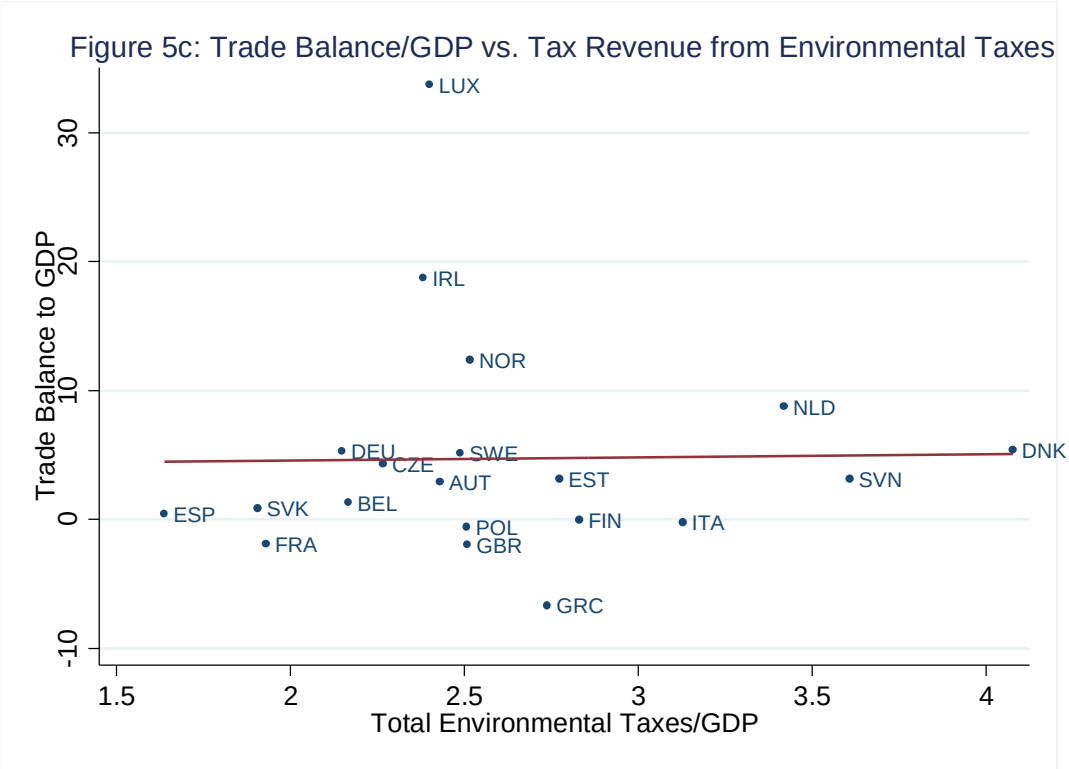


Figure 5c: Trade Balance/GDP vs. Tax Revenue from Environmental Taxes
Trade Balance to GDP
30
20
10
0
-10
1.5
2
2.5
3
3.5
4
Total Environmental Taxes/GDP
LUX
IRL
NOR
NLD
DNK
DEU
CZE
SWE
AUT
EST
SVN
BEL
ESP
SVK
FRA
POL
GBR
FIN
ITA
GRC