**Measuring the Effect of Consumption Tax on Inequality**

Progress Report

Alessandro Bordoli

**July 2016**

Table of Contents

1 Introduction 1

2 Literature Review 1

3 Data 6

4 Methodology 14

4.1 Dataset Prep 14

4.2 Selection of OECD Variables 14

4.3 Implicit Tax Rate 15

4.4 Consumption/Income Relationship 19

5 Conclusion 22

6 Appendices 22

Appendix A: Literature Review 22

Appendix B: OECD Selection of Variables 44

Appendix C: OECD Selection of Variables 0

# 1 Introduction

This work, which was completed in June and July 2016, was specifically focused on consumption taxes, and the results will be used as part of a larger study measuring the effects of different fiscal systems on inequality. The work should be interesting for researchers and policymakers in this area for several reasons:

* Most international studies of this scope leave out consumption taxes entirely or fail to make an attempt to accurately measure them. This will be one of the first such studies to do so.
* Consumption taxes make up a substantial share of total government tax revenues. They are therefore important to study if one wants to understand how fiscal systems function.
* Countries have significant differences in the types and levels of consumption taxes collected.
* Economic theory suggests consumption taxes are *regressive.* It is therefore important to include them in studies measuring inequality to provide policymakers with an accurate portrayal of how specific tax and transfer mixes can affect inequality in a country.

There are, however, several challenges for studying consumption taxes. This work focused on overcoming some of those challenges. The specific objectives of this study were as follows:

* Overcome problems present in expenditure data at the micro-level in the LIS database, which is the main database used for the overall study.
  + The main problem was that consumption expenditures were consistently higher than income figures. This is a common problem cited in the literature. Accurate measures to reconcile data between income surveys and household budget surveys are in great need. This work hopes to play some role in providing a solution to this problem.
* Obtain an accurate measure of implicit consumption tax rates using methodologies previously developed.
* Characterize the relationship between consumption and income and generate an average propensity to consume to measure this relationship.

# 2 Literature Review

A wide literature review was conducted, with the main results presented in Appendix A of this report. While the initial focus was differentiating between papers that utilized implicit consumption tax rates vs. statutory ones, this isn’t necessarily the most important divide in the literature. Instead, the main problem cited is how to match data from budget surveys and income surveys. It is widely acknowledged that no perfect solution currently exists to fix this. However, the overall consensus is that ignoring consumption taxes greatly distorts results, and measures should be taken to include them in papers. The literature can still be divided along some lines.

* Papers that generate implicit tax rates using tax revenue data vs. those that create representative household budgets and apply statutory tax rates
* Papers that focus on one country (often countries that have extensive household budget data) vs. international papers (which most often ignore consumption taxes altogether

For this study the most important papers were as follows:

* Savage and Callan (2015) – analyze three different approaches to measuring consumption taxes for one country (Ireland)
* Decoster et al. (2007, 2010, 2011) – developed the main methodology used in EUROMOD and has a large following in the literature
  + Figari and Paulus (2010)
* Sierminska and Garner (2002) – take LIS data and augment it with data from U.S. Consumption Expenditure Survey
* Garfinkel and Smeeding (2006) – use LIS and OECD data – very close to our own methodology
* Warren (2008) – overall summary of papers that study consumption taxes and inequality
* Carey and Tchilinguirian (2000) – most recent paper on how to calculate implicit tax rates (compared to Mendoza et al. (1994))

This work lays the groundwork for identification of major strands in the literature that can be used to construct a full literature review.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Implicit** | **Statutory (Estimated)** | **Statutory (Imputed)** |
| **Recommendation** | These rates adopt greatly simplifying assumptions but are much easier to use and can be calculated for (almost) all countries. | This is probably the most accurate but the most difficult to do as well. | This is the compromise measure. It allows a higher measure of accuracy and is probably necessary to conduct for our study given that we want to combine data from budget and income surveys. |
| **Advantages (+)** | 1. Consistent with concept of tax at agg level and representative agent assumption (Carey and Tchilinguirian 2000) 2. Greatly simplifies the calculation process | * High accuracy since it | * Allows you to use highest quality income data and combine this with expenditure data from HBS (Savage and Callan 2015) * Imputation allows for simulation of policy changes and their effects (Savage and Callan 2015) |
| **Disadvantages (-)** | * Requires author to adopt a number of limiting assumptions that may not be realistic (Carey and Tchilinguirian 2000) * If tax shifting occurs these rates will not take account of it (Carey and Tchilinguirian 2000) * No good way to take into indirect taxes on investment goods (VAT-exempt in most cases) (Carey and Tchilinguirian 2000) * AETRs are backward looking, average rates that are not optimal for many analyses (Carey and Tchilinguirian 2000) * Will be especially bad proxy for expected marginal rates when tax policy has recently changed | * Due to complexity of tax credits, assumptions, and deductions in most countries, not clear that these rates are what affect macro variables (Carey and Tchilinguirian  2000) * Lack of data that measures both income and expenditure side at appropriate level * Quality of data on income will most likely be of lower quality than in income surveys (Savage and Callan 2015) | * Always second-best substitute for actual data. Imputed variables should be at sufficient level of aggregation to hide differences that are not controlled for (Sutherland et al. 2013) |
| **Necessary Assumptions** | * Initial impact = final incidence |  | * Explicit method - functional form of expenditure must be assumed to use Engel curves (Savage and Callan 2015) |
| **Methodology** | Mendoza et al. (1994)  or  Carey and Tchilinguirian (2000)  \*The second equation has increased cross-country comparability. Refer to [Preliminary Data Analysis](evernote:///view/2147483647/s302/2284d476-e31c-4667-b663-9e794dc7ebf9/2284d476-e31c-4667-b663-9e794dc7ebf9/) for more details. |  | * Expenditure is estimated using expenditure survey. * Coefficients from estimation phase used to impute expenditure into income survey. |
| **References** | * [Carey and Tchilinguirian (2000)](http://www.keepeek.com/Digital-Asset-Management/oecd/economics/average-effective-tax-rates-on-capital-labour-and-consumption_247874530426#page1) * [Alm and El-Ganainy](http://link.springer.com.gate3.inist.fr/article/10.1007/s10797-012-9217-0) * Prasad and Deng (2009) | * Figari and Paulus (2012) | * [Savage and Callan (2015)](http://ftp.iza.org/dp8897.pdf) * Sutherland et al. (2013) * Decoster et al. (2007, 2010) |

# 3 Data

Data was taken from two main sources for this work: OECD and Eurostat. This follows the previous literature that has studied this subject. The aim was to find the most accurate country-level data possible to combine with the microdata in LIS. The following provides a guide for where the main variables were located:

**Dataset I: Consumption Expenditure by Quintile**

*Variable 1: Mean consumption expenditure by income quintile*

|  |  |
| --- | --- |
| Variable Source | [Eurostat](http://ec.europa.eu/eurostat/web/household-budget-surveys/database)   1. Living conditions and welfare (livcon)    1. Consumption expenditure of private households (hbs)       1. Mean consumption expenditure of private households (hbs\_exp)          1. ***Mean consumption expenditure by income quintile (in PPS) (hbs\_exp\_t133)*** |
| Time Coverage | 1988, 1994, 1999, 2005, 2010 |
| Unit of Measure | Currency = Euro/PPS; Structure = per 1000; PPS = Avg. EU (Reference Year 2010)  \*[Information on PPS by Eurostat](http://ec.europa.eu/eurostat/cache/metadata/EN/prc_ppp_esms.htm) |
| Instructions | * Need to add the different quantiles you want to look at (in this case all five) into the table) * Convert table to country-year observations.   1. Bring the QUANTILE down to the columns.   2. Drag the TIME on top of GEO to get country-year observations. * To manually copy and paste this into the database, I eliminated GEO categories not needed (European Union, etc.). |
| Problems | * Need to somehow include imputed rents (this is the main reason the Eurostat says that the consumption data is not comparable across countries). * Need US (and non-EU data in general) from external source. |

*Variable 2: Mean consumption expenditure by COICOP level (CP04 - Housing, water, electricity, gas and other fuels)*

|  |  |
| --- | --- |
| Variable Source | [Eurostat](http://ec.europa.eu/eurostat/web/household-budget-surveys/database)   * Living conditions and welfare (livcon)   + Consumption expenditure of private households (hbs)     1. Mean consumption expenditure of private households (hbs\_exp)        1. ***Mean consumption expenditure by detailed COICOP level (in PPS) (hbs\_exp\_t121)*** |
| Time Coverage | 1988, 1994, 1999, 2005, 2010 |
| Unit of Measure | Currency = Euro/PPS; Structure = per 1000; PPS = Avg. EU (Reference Year 2010)  \*[Information on PPS by Eurostat](http://ec.europa.eu/eurostat/cache/metadata/EN/prc_ppp_esms.htm) |
| Instructions | * Need to choose the COICOP category you want to look at * Convert table to country-year observations.   1. Bring the QUANTILE down to the columns.   2. Drag the TIME on top of GEO to get country-year observations. * To manually copy and paste this into the database, I eliminated GEO categories not needed (European Union, etc.). |
| Problems | * This is not equal to imputed rents. Eurostat has rent data available via Rent Surveys. From what I can tell, you need to apply to access this data. * This tells us nothing about spending per decile, which we know from the literature will display large differences. * Need US (and non-EU data in general) from external source) |

**Dataset II: Distribution of Income by Quintile**

*Variable 1: Distribution of income by quintile*

|  |  |
| --- | --- |
| Variable Source | [Eurostat](http://ec.europa.eu/eurostat/web/household-budget-surveys/database)   * Income and living conditions (ilc)   + Income distribution and monetary poverty (ilc\_ip)     - Income distribution (ilc\_di)       1. ***Distribution of income by quantiles (source: SILC) (ilc\_di01)*** |
| Time Coverage | 1988, 1994, 1999, 2005, 2010 |
| Unit of Measure | Currency = Euro/PPS; Structure = per 1000; PPS = Avg. EU (Reference Year 2010) |
| Instructions | * Need to manually change from quartiles and add all quantiles to match data on consumption expenditures. * Change Currency from Euro to PPS to match data on consumption expenditures. * Convert table to country-year observations.   + Bring the QUANTILE down to the columns.   + Drag the TIME on top of GEO to get country-year observations. * To manually copy and paste this into the database, I eliminated GEO categories not needed (European Union, etc.). * Note that the fifth quintile shows as missing. This is because these numbers represent the top cut-off point for the quintiles (for the highest possible quintile there will be no top cut-off point). |
| Problems | * Need US (and non-EU data in general) from external source. * [Information on how to reconcile this with consumption data.](http://ec.europa.eu/eurostat/documents/3888793/5857145/KS-RA-13-007-EN.PDF) |

**Dataset III: Implicit Tax Rate (Eurostat)**

*Variable 1: Implicit tax rate of consumption*

|  |  |
| --- | --- |
| Variable Source | [Eurostat](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=gov_a_tax_itr&lang=en)   * Economy and Finance   1. Government statistics (gov)      1. Annual government finance statistics         1. Derived tax indicators (gov\_a\_tax)            1. ***Implicit tax rates by economic function (gov\_a\_tax\_itr)*** |
| Time Coverage | 2000-2012 |
| Unit of Measure | Rate; ITR on consumption = revenue from all consumption taxes / final consumption expenditure  \*This follows Mendoza et al. (1994) methodology    *Numerator: Sum of the Following ESA95 Categories*  VAT (D.211) + Excise and consumption taxes (D.214a) + Excise duties (D.2122c) + Taxes and duties on imports excluding VAT (D.212), excluding excise duties (D.2122c) + Taxes on products except VAT and import duties (D.214), excluding excise duties (D.214a) + Other taxes on production (D.29)    [More Information](http://ec.europa.eu/taxation_customs/resources/documents/taxation/gen_info/economic_analysis/tax_structures/2014/methodology.pdf)  [Additional Source](http://ec.europa.eu/taxation_customs/resources/documents/taxation/gen_info/economic_analysis/tax_structures/2013/methodology.pdf) |
| Instructions | * Need to manually change from quartiles and add all quantiles to match data on consumption expenditures. * Change Currency from Euro to PPS to match data on consumption expenditures. * Convert table to country-year observations.   + Bring the QUANTILE down to the columns.   + Drag the TIME on top of GEO to get country-year observations. * To manually copy and paste this into the database, I eliminated GEO categories not needed (European Union, etc.). * Note that the fifth quintile shows as missing. This is because these numbers represent the top cut-off point for the quintiles (for the highest possible quintile there will be no top cut-off point). |
| Problems | * Need US (and non-EU data in general) from external source. * Find working paper that further details how to calculate this. * Check Turkey figures at bottom. |

**Dataset IV: Implicit Tax Rate (OECD)**

*Variable 1 & 2 (Revenue Side):* 5110 -> General taxes on goods and services & 5121 -> Excises 

|  |  |
| --- | --- |
| Variable Source | [Revenue Statistics](https://stats.oecd.org/Index.aspx?DataSetCode=REV)   * Public Sector, Taxation, and Market Regulation   + Taxation     1. Revenue Statistics - OECD Member Countries        1. ***5110 General Taxes on Goods and Services***        2. ***5121 Excises***        3. ***5122 Profits of fiscal monopolies***        4. ***5123 Customs and import duties***        5. ***5126 Taxes on specific services***        6. ***5128 Other taxes on specific goods and services***        7. ***5200 Taxes on use of goods and performances*** |
| Time Coverage | 1965-2014 |
| Unit of Measure | Tax revenue as % of GDP (Total))  \*Equation = (Tax revenue in national currency / GDP)\*100 |
| Instructions | * Make sure Tax Revenue as % of GDP is selected - this is the easiest measure to compare. * Customize the table to get Country-Year observations. |
| Problems |  |

*Variable 3 & 4 (Consumption Data Side):* CP2 -> Private final consumption expenditure & CG2 -> Government final consumption expenditure

|  |  |
| --- | --- |
| Variable Source | [Consumption Data](https://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE5)   * National Accounts   1. Annual National Accounts      1. Main Aggregates         1. Gross Domestic Product (GDP)            1. Gross Domestic Product (GDP)   ***P31S4: Final consumption expenditure of households***  ***P3S13: Final consumption expenditure of resident households on the territory and abroad***   * + 1. General Government Accounts        1. 12 Government deficit/surplus, revenue, expenditure, and main aggregates           1. ***GD1P: Compensation of employees payable*** |
| Time Coverage | 1965-2014 |
| Unit of Measure | * Current prices/national currencies; in millions; Government expenditures are in government totals (inclusive of state, local, etc.) - this is used to calculate cp2 as a % of GDP since that figure is also * Current prices/current PPP (in other words USD) - this is used as cp2\_usd |
| Instructions | * For cp2 we will later need to convert this so it is expressed as a % of GDP. Therefore, given that methodology for PPP on consumption and GDP could be theoretically different, using current prices is the simplest and “safest” way to do this. * For cp2\_usd we need this in current prices, current PPP to match the measure used for household disposable income. We use this figure to calculate apc\_oecd. |
| Problems | * cp2 represents final consumption expenditure of households but does not specify if it’s on the territory or not * Also note the GDP figure presented in this section of OECD stats is labelled as (income approach) and different than the one used for taxes (expenditure approach). Currently we are using GDP\_expenditure approach for both measures but not sure if we should be doing that. |

*Variable 5 (Household):* GHHDI -> Gross household disposable income per capita (US dollars, current prices, current PPPs)

|  |  |
| --- | --- |
| Variable Source | [Household Data](http://www.oecd-ilibrary.org/economics/data/oecd-national-accounts-statistics/national-accounts-at-a-glance_data-00369-en)   * National Accounts at a Glance   + Part V: Households     1. ***Gross household disposable income per capita (US dollars, current prices, current PPPs)*** |
| Time Coverage | 1965-2014 |
| Unit of Measure | * Current prices/current PPP (in other words USD) - this is used as our household disposable income measure (ghhdi) |
| Instructions | * You need to click on the Data link to get the full dataset. Then go to Customize -> Indicators and find the Part V: Households. There you can find several household disposable income measures. * Note that this is per capita. This is why we obtain population figures from OECD and multiply this number by the population. Then we divide this by 1 million to make it match the units for cp2, as we use both to calculate apc\_oecd. |
| Problems | * Most papers would probably use GDP instead of HHDI, but theoretically ours should be a superior measure. However, we must note that this is why apc figures are higher than we would otherwise expect. * The difference between “gross” and “net” HHDI figures in OECD has to do with replacement of capital assets. Net figures already have figures needed for replacement of capital assets deducted. [Documentation Here](http://www.oecd-ilibrary.org/economics/understanding-national-accounts/the-household-account_9789264027657-6-en) |

# 4 Methodology

There were several stages to this work. This section will detail main steps, issues, etc. Lines of code will be included along with limited preliminary results.

## 4.1 Dataset Prep

The first step was to merge the different datasets used. Data was drawn from several sections of both Eurostat and OECD. Significant time was thus required to make sure data was comparable. Much of this has already been described in the previous section. Since several options were imported for specific variables, labels were added to all variables. It was also important to declare the dataset as panel data.

\*Need to change country variable so we can set this as a panel data set

rename country country\_string

encode country\_string, gen(country)

describe

tab country

tab country, nolabel

order country year dname

xtset country year

## 4.2 Selection of OECD Variables

The data from OECD warrants its own separate discussion, since several options for each variable are presented in OECD datasets. This data was mostly used to calculate implicit tax rates and an average propensity to consume that was later used as a correction. The important step here was deciding which variables to use. Results are presented in Appendix B. The second task was making all revenue and tax data a percentage of GDP (expenditure approach) to avoid problems with units later.

## 4.3 Implicit Tax Rate

There are three main methodologies presented in the literature regarding the implicit tax rate. In this work, all three were calculated for later use, although some modifications were made. For the numerator of the equation, the recommendation of Carey and Tchilinguirian (2000) was used. For the denominator, Mendoza et al. (1994) was followed. The analysis is presented below:

*Source: stat.oecd.org*

|  |  |
| --- | --- |
| [**Revenue Data**](https://stats.oecd.org/Index.aspx?DataSetCode=REV) | [**Consumption Data**](https://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE5) |
| 5000 -> Taxes on goods and services | CP -> Private final consumption expenditure |
| 5110 -> General taxes on goods and services (5111 VAT) | CG -> Government final consumption expenditure |
| 5120 -> Taxes on specific goods and services | CGW -> Government final wage consumption expenditure |
| 5200 -> Taxes on use of goods and performances |  |
| 5121 -> Excise taxes |  |
| 5122 -> Profits of fiscal monopolies |  |
| 5123 -> Customs and import duties |  |
| 5126 -> Taxes on specific services |  |
| 5128 -> Other taxes on specific goods and services |  |

*Methodology:*



(Mendoza et al. 1994)



(Carey and Tchinlinguirian (2000))



(Carey and Tchinlinguirian (2000))

\*The first equation is from [Mendoza et al. (1994)](http://www.sas.upenn.edu/~egme/pp/JME1994.pdf). The second equation is constructed for increased cross-country comparability. This is from [Carey and Tchilinguirian (2000)](http://www.keepeek.com/Digital-Asset-Management/oecd/economics/average-effective-tax-rates-on-capital-labour-and-consumption_247874530426#page15). They state that failing to include government wages in the tax base would result in an overstatement of AETR on consumption where labor-intensive services are provided publicly vs. countries where provided privately (the reasoning is that many services provided by govt sector are not subject to indirect taxes when privately provided as well). Tax base here is also expressed in gross terms (including indirect taxes) as both labor and consumption taxes should affect labor supply decisions. The third equation includes all taxes on specific goods and services except: taxes on exports (5124), taxes on investment goods (5125), and other taxes on international trade and transactions (5127). Assumptions regarding the decision to include and exclude different taxes on specific goods and services is explained in [Carey and Tchilinguirian (2000)](http://www.keepeek.com/Digital-Asset-Management/oecd/economics/average-effective-tax-rates-on-capital-labour-and-consumption_247874530426#page15).

[Source](http://www.keepeek.com/Digital-Asset-Management/oecd/economics/average-effective-tax-rates-on-capital-labour-and-consumption_247874530426#page10)

*Check on Work*:

[*Source: Eurostat*](https://datamarket.com/data/set/1b6t/implicit-tax-rates-by-economic-function#!ds=1b6t!tbt=4:6d7b=1.2.o.w.3.4.5.7.9.a.n.p.b.s.r.c.e.d.t.u.f.g.h.i.v.l.k.8.j.m&display=choropleth&map=europe&classifier=natural&numclasses=5)

Discussion Over CG and CGW

|  |  |  |
| --- | --- | --- |
|  | Reasons For Inclusion in Tax Base | Reasons Against Inclusion in Tax Base |
| CP | This is included as the main consumption base. There is no question that it should be included.  Caveat: This overstates consumption tax base because many goods not subject to consumption. We must adopt the assumption that tax burden on inputs for such goods and services is passed on to the consumer in terms of higher prices. |  |
| CG | * OECD Revenue Statistics reports data on on indirect tax revenues paid by government sector.   Mendoza et al. (1994)  Carey and Tchilinguirian (2000)  Eurostat (Previous) | * CG is not a completely accurate measure of intermediate consumption of government.   Eurostat (Current)  -Good explanation of exclusion of [CG in Annex C of 2003 Edition](http://ec.europa.eu/taxation_customs/resources/documents/taxation/gen_info/economic_analysis/tax_structures/structures2007.pdf) Page 416 |
| CGW | * Many of services provided by government are not subject to indirect taxes when provided privately either. If you don’t include it then you overstate AETR in countries where services are publicly provided.  Carey and Tchilinguirian (2000) Eurostat  (Previous) | * They are not subject to indirect tax.  Mendoza et al. (1994) |

Our implicit tax measures thus became a hybrid of previous works. The code for the construction was as follows:

\*Methodology 1: Mendoza et al. (1994) - CP+CG in denominator ITRc = (5110 + 5121 + 5122 + 5123 + 5126 + 5128 + 5200) / (CP + CG)

gen itrc\_1 = (tax\_5110 + tax\_5121 + tax\_5122 + tax\_5123 + tax\_5126 + tax\_5128 + tax\_5200) / (cp2 + cg2) \*100

label var itrc\_1 "Formula with cp+cg in denominator - Mendoza et al. (1994)"

\*Methodology 2: Carey and Tchilinguirian (2000) - Excluding CGW: ITRc = (5110 + 5121 + 5122 + 5123 + 5126 + 5128 + 5200) / (CP + CG - CGW)

gen itrc\_2 = (tax\_5110 + tax\_5121 + tax\_5122 + tax\_5123 + tax\_5126 + tax\_5128 + tax\_5200) / (cp2 + cg2 - cgw2) \*100

label var itrc\_2 "Formula with cp+cg-cgw in denominator - Casey and Tchilinguirian (2000)"

\*Methodology 3: Eurostat - Only cp in demoninator: ITRc = (5110 + 5121 + 5122 + 5123 + 5126 + 5128 + 5200) / (CP)

gen itrc\_3 = (tax\_5110 + tax\_5121 + tax\_5122 + tax\_5123 + tax\_5126 + tax\_5128 + tax\_5200) / (cp2) \*100

label var itrc\_3 "Formula with cp in denominator - Eurostat"

Tests were then conducted to see how the three tax measures correlated with each other. Itrc\_2 was the measure with the most missing values. Itrc\_1 and itrc\_3 had an equal number of missing values. We thus ran tests and replaced missing values from itrc\_2 using the relationship between itrc\_2 and itrc\_1.

reg itrc\_2 itrc\_1

predict yhat2 if e(sample)

\*scatter yhat2 itrc\_2

reg itrc\_2 itrc\_1

predict resid2, residuals

\*scatter resid2 itrc\_1

reg itrc\_2 itrc\_1

gen itrc\_2ee=\_b[itrc\_1]\*itrc\_1

\*xtline itrc\_2 itrc\_2ee if itrc\_2ee!=.

## 4.4 Consumption/Income Relationship

The last stage in this work, and the most important for later analysis, was to measure the relationship between consumption and income. The first step in this stage was to generate an average propensity to consume and median income by quantile using Eurostat data. The dataset was then reshaped to allow measures to differ by quantile-country-year.

\*Find APC by quintile - we want to divide the mean consumption expenditure by quintile (cons\_q) by median income for each quintile (using top cutoff points for deciles)

gen apc\_q1 = cons\_q1 / cutoff\_d1

gen apc\_q2 = cons\_q2 / cutoff\_d3

gen apc\_q3 = cons\_q3 / cutoff\_d5

gen apc\_q4 = cons\_q4 / cutoff\_d7

gen apc\_q5 = cons\_q5 / cutoff\_d9

\*Let's rename income deciles into quantiles so we can use them for reshaping (deciles act as medians to quantiles)

gen inc\_q1 = cutoff\_d1

gen inc\_q2 = cutoff\_d3

gen inc\_q3 = cutoff\_d5

gen inc\_q4 = cutoff\_d7

gen inc\_q5 = cutoff\_d9

\*We now need to generate variable that captures all 5 quintiles for income

reshape long inc apc cons, i(dname) j(quantile \_q1 \_q2 \_q3 \_q4 \_q5)

The next step is very important. It has been previously mentioned that data from income and budget surveys are not directly comparable. Therefore a correction must be made. Some papers apply an imputation method using Engel curves. This work does something similar with a slight alteration. One suggested alternative was to take an average correction, but the choice was made to apply a homothetic correction using average propensities to consume from both Eurostat and OECD. The code is as follows:

\*Now we need to find average apc in Eurostat so we can later apply our correction

gen apc\_euro = cons\_total / cutoff\_d5

\*Now we can generate the avg apc for OECD

gen apc\_oecd = cp2\_usd / hhdi\_agg

\*ALTERNATIVE 1: HOMOTHETIC CORRECTION

\*First make the correction

gen apc\_adj = apc / apc\_euro \* apc\_oecd

\*Then use that to deflate our consumption numbers

gen cons\_adj = apc\_adj \* inc

The subsequent step was to find relationships between consumption and income and then average propensity to consume and income.

\*\*\*consumption parameters (selection: models 2, 3, 6 or 8)\*\*\*

sort country year quantile

set more off

\*normalisation of income (income as a share of median inc)

gen inc\_norm = inc/cutoff\_d5

\*log conversion

gen loginc=log(inc)

gen logconsadj=log(cons\_adj)

gen logincnorm = log(inc\_norm)

gen logapcadj=log(apc\_adj)

\*\*PART 1: based on consumption-income relationship (propensity to consume)\*\*

\*option 1: linear consumption model

xtreg cons\_adj inc, fe

\*store the coefficient for income (propensity to consume)

gen pc\_cilinear=\_b[inc]

\*store the constant

gen constant\_cilinear=\_b[\_cons]

\*store the country fixed effects

predict fe\_cilinear, u

\*option 2: log-log consumption model //BETTER FIT !!

xtreg logconsadj loginc, fe

gen pc\_ciloglog=\_b[loginc]

gen constant\_ciloglog=\_b[\_cons]

predict fe\_ciloglog, u

\*option 3: linear normalised consumption model //BETTER FIT HERE !!

xtreg cons\_adj inc\_norm, fe

gen pc\_cinlinear=\_b[inc\_norm]

gen constant\_cinlinear=\_b[\_cons]

predict fe\_cinlinear, u

\*option 4: log-log normalised consumption model

xtreg logconsadj logincnorm , fe

gen pc\_cinloglog=\_b[logincnorm]

gen constant\_cinloglog=\_b[\_cons]

predict fe\_cinloglog, u

\*\*PART 2: based on propensity-income relationship (derivative of the propensity to consume)\*\*

\*option 5: linear propensity model

xtreg apc\_adj inc, fe

gen dpc\_apcilinear=\_b[inc]

gen constant\_apcilinear=\_b[\_cons]

predict fe\_apcilinear, u

\*option 6: log-log propensity model //BETTER FIT !!

xtreg logapcadj loginc, fe

gen dpc\_apciloglog=\_b[loginc]

gen constant\_apciloglog=\_b[\_cons]

predict fe\_apciloglog, u

\*option 7: linear normalised propensity model

xtreg apc\_adj inc\_norm, fe

gen dpc\_apcinlinear=\_b[inc\_norm]

gen constant\_apcinlinear=\_b[\_cons]

predict fe\_apcinlinear, u

\*option 8: log-log normalised propensity model //BETTER FIT !!

xtreg logapcadj logincnorm , fe

gen dpc\_apcinloglog=\_b[logincnorm]

gen constant\_apcinloglog=\_b[\_cons]

predict fe\_apcinloglog, u

The best fitting models were the linear model and the log-log model. Thus, these were carried over into LIS. Final datasets for use are labeled as follows:

* consumptiontax.dta
  + Contains all the code up to the merge with LIS
* consumptionlis.dta
  + Contains the code below to keep the relevant variables for the LIS merge

\*\*\*prepare for merge with LIS\*\*\*

rename dname countryyear

keep countryyear country year quantile apc\_oecd itrc\_1 itrc\_2 itrc\_3 pc\_cilinear constant\_cilinear fe\_cilinear pc\_ciloglog constant\_ciloglog fe\_ciloglog pc\_cinlinear constant\_cinlinear fe\_cinlinear pc\_cinloglog constant\_cinloglog fe\_cinloglog dpc\_apcilinear constant\_apcilinear fe\_apcilinear dpc\_apciloglog constant\_apciloglog fe\_apciloglog dpc\_apcinlinear constant\_apcinlinear fe\_apcinlinear dpc\_apcinloglog constant\_apcinloglog fe\_apcinloglog

The final doset version to date is labeled consumptiontaxv4.do.

# 5 Conclusion

This work lays the ground work for merging with LIS and then using the new measures as part of the overall analysis of fiscal systems on inequality. Recommendations for future work include:

* Further categorization of literature into different strands
* Closer study of competing methodologies for implicit tax rate
* Comparison of methodology used here to literature
* Calculation of new average propensity to consume figures in LIS using the paramaters that are carried over
* Calculation of share of VAT in consumption expenditures as the final step

# 6 Appendices

## Appendix A: Literature Review

1.

|  |  |
| --- | --- |
| **Name** | [Summary of Project April 2016](evernote:///view/2147483647/s302/355224c7-970b-4f51-bb42-24b924fd5676/355224c7-970b-4f51-bb42-24b924fd5676/) |
| **Approach** | * Time Series Cross Section * Contribution to lit:   1. jointly mandatory Treat levies and cash transfers   2. Take into account |
| **Main Results** |  |
| **Research Suggestions** | * Korpie and Palme (1998) * Prasad and Deng (2009) * Kenworthy (2011) * Marx et al. (2013) * Brady and Bostic (2015) * McKnight (2015) |
| **Category** | General; Fiscal Systems and Inequality |

2.

|  |  |
| --- | --- |
| **Name** | [Piketty, Thomas and Emmanuel Saez. (2007). “How Progressive is the U.S. Federal Tax System? A Historical and International Perspective.”*Journal of Economic Perspectives* 21, P. 3-24.](evernote:///view/2147483647/s302/725b9cf7-489c-44a4-87a0-0b79e87b17e0/725b9cf7-489c-44a4-87a0-0b79e87b17e0/) |
| **Approach** | * Descriptive and comparative - focus on top incomes * Use market income (=wages and salaries before Social Security taxes, capital gains, self-employment income)   + All government contributions are excluded * Consider four taxes: income, corporate, estate, payroll   + EXCLUDES CONSUMPTION TAX     1. Reasoning: state and local taxes only 1/3 of total taxes in US; sales and excise taxes about 35% of that (25% state income, 30% property income        1. If property tax is assumed to fall on owners of capital then Pechman (1985) shows that state and local taxes are close to proportional across income groups and can thus be ignored           1. Essentially that excluding state and local counterbalances excluding consumption        2. Heavily criticized by other papers: Prasad and Deng (2009) |
| **Main Results** | * Progressivity of tax system at top income in US has declined dramatically since 1960’s   1. Mostly due to drop in corporate and estate taxes combined with sharp change in top incomes away from capital income towards labor income * Tax deductions, exemptions, etc. distorts tax system so that marginal rates aren’t always accurate representation of tax burden |
| **Research Suggestions** | * Strudler, Petska, and Petska (2005) - uses IRS stats to look at same issue * Congressional Budget Office (2001) - focuses on income quintiles * Pechman and Ochner (1974) * Pechman (1985) * Kasten, Sammartino, and Toder (1994) * Feenberg and Coutts (1993) - use TAXSIM calculator from NBER to compute federal individual income taxes * Fullerton and Rogers (1993) - include excess burdens created by behavioral changes due to taxes |
| **Category** | General; Tax and Inequality; U.S. |

3.

|  |  |
| --- | --- |
| **Name** | [OECD. (2012). “Income Inequality and Growth: The Role of Taxes and Transfers.” *OECD Economics Department Policy* No. 9.](evernote:///view/2147483647/s302/07395d2f-679d-4b62-9d2a-232f496357e5/07395d2f-679d-4b62-9d2a-232f496357e5/) |
| **Approach** | * Summary stats (international) |
| **Main Results** | * Taxes and transfers lower inequality in all countries   + So there is a need to differentiate inequality before and after taxes/transfers     1. 3/4 reduction due to transfers and 1/4 due to taxes   + Differentiation also needed for taxes     1. Income taxes progressive but consumption taxes regressive * Reducing inequality vs. stimulating growth   + Some reforms do both but others face tradeoff     1. Ex: moving taxes from labor to consumption would stimulate growth but also inequality * Most unequal countries before transfers/taxes remain so after as well even though redistribute more |
| **Research Suggestions** |  |
| **Category** | General; Fiscal Systems and Inequality; Growth |

4.

|  |  |
| --- | --- |
| **Name** | [Duncan, Denvil and Klara Sabirianova, Peter. (2012). “Unequal Inequalities: Do Progressive Taxes Reduce Income Inequality?” *Institute for the Study of Labor,* Discussion Paper No. 6910.](evernote:///view/2147483647/s302/4a31a11c-0a01-4f84-91af-6a246ea17419/4a31a11c-0a01-4f84-91af-6a246ea17419/) |
| **Approach** | * Uses several measure of inequality from 1981-2005 * Use consumption-based measure of income (they say is closer to true income) * Sources:   + World Development Index (WDI), World Institute for Development Research (WIDER), International Labor Office (LABORSTA), European Commission (EUROSTAT), Review of Economic Dynamics (RED) |
| **Main Results** | * Progressivity reduces inequality in observed income but has significantly smaller impact on actual inequality (estimated using consumption-based GINIs)   1. Differential effect much larger in countries with weak legal institutions      1. Reason is due to tax evasion |
| **Research Suggestions** |  |
| **Category** | General; Tax and Inequality; Behavioral responses to taxation |

5.✓

|  |  |
| --- | --- |
| **Name** | [Joumard, Isabelle, Mauro Pisu and Debbie Bloch. (2012). “Tackling Income Inequality: The Role of Taxes and Transfers”. *OECD Journal: Economic Studies*, Published Online First.](evernote:///view/2147483647/s302/8912426c-1199-4e1c-991c-44161813e10d/8912426c-1199-4e1c-991c-44161813e10d/) |
| **Approach** | * Descriptive with some empirics |
| **Main Results** | * Taxes/transfers reduce inequality in DI (disposable income) relative to MI (market income) but effect varies across countries   + Redistributive impact depends on size, mix, and progressively of each tax component     1. Reliance on means-tested transfers and income taxes increases progressivity (so Australia achieves same redistributive impact as Germany with less taxes) * Main limitation of current studies is they rely on HH surveys and don’t take into account consumption taxes, employers’ social security contributions and corporate income taxes (more than 50% of total tax revenue) * GOOD SECTION ON CONSUMPTION TAXES |
| **Research Suggestions** | * OECD (2008) - uses implicit consumption tax rates to derive estimates of redistributive impact of consumption taxes   + OECD (2008b), Taxing Wages 2008-2009, OECD Publishing. * Warren (2008) - finds consumption taxes more regressive   + Warren, N. (2008), “A Review of Studies on the Distributional Impact of Consumption Taxes in OECD Countries”, OECD Social, Employment and Migration Working Paper, No. 64. * OECD (2010) - reduction of VAT benefits avg individual in top income bracket 2.5 times more than avg in bottom decile   + OECD (2010b), OECD Economic Surveys: Czech Republic 2010, OECD Publishing. * OECD (2011b), Consumption Tax Trends 2010: VAT/GST and Excise Rates – Trends and Administration Issues, OECD Publishing. * Moffit (2011) - behavioral consequences of taxes |
| **Category** | General; Tax and Inequality; International |

6.✓

|  |  |
| --- | --- |
| **Name** | [OECD. (2008). "Taxing Wages 2007-2008." *OECD Publishing.*](evernote:///view/2147483647/s302/3dba0c91-b808-491a-929b-d42032ce8c03/3dba0c91-b808-491a-929b-d42032ce8c03/) |
| **Approach** | * Special Feature covers consumption taxes (this is normally not done and the main report excludes such taxes) * Microsimulation using HH budgets from OECD and Eurostat to look at eight family types defined in OECD’s Taxing Wages - problem: family types determined by income not consumption   1. Solution: Identify HHs that correspond to 8 family types (by non-monetary characteristics first then net income), classify expenditures according to taxes they bear (using OECD (2006) to identify tax rates), simulate avg amount of VAT/sales taxes and excise duties paid by each family type, express this as % of income * When sufficient quantity info not available use avg prices and not direct simulation: take monetary expenditure and divide by avg price (estimate of consumption quantity) then multiply by rate to get tax paid   1. This causes decrease in precision * Noted limitations: unknown quality of data, small size of some subsamples, imprecise allocation of some tax rates, difficult treatment of housing costs, treatment of VAT-exempt goods as if they were zero-rated (exempted goods still include VAT paid in earlier stage of production but lack of data to distinguish this) * Note that the special feature comes from: [Picos-Sanchez, Fidel. (2011). “Consumption Taxation as an Additional Burden on Labor Income.” *OECD Taxation Working Papers,* No. 7. OECD Publishing.](http://www.oecd-ilibrary.org/docserver/download/5kg3h0t4xlq4.pdf?expires=1466426668&id=id&accname=guest&checksum=218270AF2C321CCAC96C8E3B618BD667) |
| **Main Results** | * Note on regressivity of sales tax: consumption tax liabilities should be lower for low income bc lower and zero rates applied to basic commodities/food but they tend to save less and consume more * Single individuals without dependents show lower tax rates as income increases and lower rates than families with same income * Inclusion of consumption tax has a significant effect (substantial differences in VAT/sales tax that often offset differences in income tax wedge) and more accurate methodology should thus be developed |
| **Research Suggestions** | * Household Budget Surveys and Eurostat as potential data sources * OECD (2006). Consumption Tax Trends: VAT/GST and Excise Rates, Trends in Administration Issues |
| **Category** | Taxes; Consumption tax |

7.

|  |  |
| --- | --- |
| **Name** | [OECD. (2015). "Consumption Tax Trends 2014: VAT/GST and Excise Rates – Trends and Policy Issues." *OECD Publishing*.](http://www.keepeek.com/Digital-Asset-Management/oecd/taxation/consumption-tax-trends-2014_ctt-2014-en#page11) |
| **Approach** | * Mostly a general overview to consumption tax trends in OECD countries (this is an annual publication as far as I can tell) |
| **Main Results** | * Includes consumption taxes as % of total taxes and GDP for several countries from 1965 to 2012 (but with large gaps between measurements)   + See page 62 for detailed info on VAT rates |
| **Research Suggestions** |  |
| **Category** | Taxes; Consumption tax; General overview |

8.✓

|  |  |
| --- | --- |
| **Name** | [Dauvergne, Roy. (2012). "Qui paie les taxes indirectes en France? Estimations a partir d'un modele de microsimulation." Master's Thesis, Paris School of Economics.](evernote:///view/2147483647/s302/6318eebf-2cc2-4355-a014-8c9163a506ab/6318eebf-2cc2-4355-a014-8c9163a506ab/) |
| **Approach** | * Uses microsimulation to analyze redistributive effects of indirect taxes in France since 1995 * Basic formula for VAT (2 options)   + = t (PHC+ Sum taxes)     1. PHC = price before tax   + = (t/1+t) PTTC     1. PTTC = price after tax * Microsimulations   + Two main objectives     1. Calculate amount of indirect taxes paid each year by HH according to consumption basket        1. Source: Budget des Familles (every 5 years by INSEE)     2. Estimate changes in paramaters to see redistributive effects   + Steps     1. Homogenization        1. Utilize consistent names for variables across different survey years        2. Construct DI from other income measures           1. revenu disponible = revenus d’activité nets des cotisations sociales + revenus sociaux + revenus du patrimoine + revenus d’aide + loyers imputés - taxe d’habitation - impôt sur le revenu     2. Wedging (to average between national accounts and HH budgets totals)        1. Calage of Consumption           1. To do this you take the consumption of each HH for a particular item category and multiply by the ratio (agg C from national accounts / agg C from BDF) for a specific year           2. Note: don’t use too specific of categories in determining basket because you will find mismatches between summed amounts of these and totals as listed at aggregate level        2. Calage of DI           1. Use TAXIPP microsimulation program from INSEE (need to read more)     3. Transformation of excise duties into ad valorem taxes (incurred through ownership of assets - sales taxes are transaction in contrast)        1. Cigarettes, alcohol, gas     4. Compare simulated VAT numbers with the VAT collected according to Projets de loi de finances     5. Impute rents for HH owners (hot deck method)     6. Innovation of study: uses ratio of income (taux d’effort) according to consumption rather than income (to compare)        1. This is equal to share of taxes in consumption rather than share of taxes in income (the latter is the standard in the literature) |
| **Main Results** | * In first DI decile the taux d’effort constructed with C is lower than the same ratio for income - this indicates spend more than they earn (most likely shocks that lower income but they don’t adjust C accordingly)   + For nine other deciles situation is opposite * Breakdown into spending categories (which gets closer to concept of quality of life according to authors) shows they make up different % for different income deciles (as expected) * Main results on regressivity:   + Disposable income (taux d’effort): then find that indirect taxes are regressive (especially tobacco and alcohol)   + Consumption: opposite (positive but weak) relationship     1. This is mostly explained by decrease in spending on housing as % of budget as you move up income deciles (rent)   + Permanent income: regressive but less so than when use disposable income * Note: Taxes on alcohol and tobacco are certainly regressive but as you move up income deciles they differ only slightly |
| **Research Suggestions** | * Kopp, Laurent, Ruiz (2009) - for description on how to deal with excise taxes (tobacco, alcohol, etc.) * Trannoy, Alain and Nicolas Ruiz. (2007). "Impact redistributif de la fiscalité indirecte à l’aide d’un modèle de microsimulation comportemental.” Working Paper, Institut d’Économie Publique. * Trannoy, Alain and Nicolas Ruiz. (2008). Le caractère régressif des taxes indirectes : les enseignements d’un modèle de microsimulation, Economie et statistique, 413 (2008), pp. 21–46. |
| **Category** | Consumption tax; France; Simulation of VAT |

9.✓

|  |  |
| --- | --- |
| **Name** | [Courtioux, Pierre and Gadenne, Lucie. (2009). "Inegalites et prelevements obligatoires en France: l'apport d'une methode de microsimulation avec bootstrap." HAL.](evernote:///view/2147483647/s302/53f07fa7-2bc7-46be-b22d-28fc5c8995b8/53f07fa7-2bc7-46be-b22d-28fc5c8995b8/) |
| **Approach** | * Uses model that integrates four taxes (VAT, payroll taxes, income tax and the CSG tax on all types of income) and bootstrap method * Create a new indicator - elasticity of inequality to collected financial sums * Use Budget des Familles (INSEE - same as Dauvergne 2012)   1. BDF lets you look at HH level at both revenue and consumption side - only source available in France for this purpose * Describes a number of assumptions made regarding consumption and consumption taxes   1. Common one: increase in VAT is fully reflected in prices      1. More precision would require a model that takes into account relative price changes and changes in consumer behavior (substitution, income = second order effects)         1. Ruiz and Trannoy (2005) examine these effects * Uses a log term to get the semi-elasticity of inequality to different taxes * Limitation: don’t take into account changes in behavior related to labor supply and individual consumption - usually in lit this is not considered a major problem when only looking at ST - see Bourguignon and Spadaro (2006) for more on this issue   1. One LT issue mentioned - one could argue that the fact that VAT is regressive is partly smoothed by indexation of welfare benefits on prices |
| **Main Results** | * General: confirms earlier studies that income tax is progressive and VAT is regressive |
| **Research Suggestions** | * C. Landais, T. Piketty, and E. Saez, Pour une révolution fiscale. Un impôt sur le revenu pour le XXIe siècle, Seuil, La République des Idées, Paris, 2011. * Blanchet 1998 * Legendre 2004 * Forgeot and Starzec (2003) * Albouy et al. (2004) * Gardes et al. (2004) * Bourguignon et Spadaro (2006) - discuss problems of taking into account behavioral changes due to labor supply and individual consumption |
| **Category** | Consumption tax; France; Simulation |

10.✓

|  |  |
| --- | --- |
| **Name** | [Warren, Neil (2008). “A Review of Studies on the Distributional Impact of Consumption Taxes in OECD Countries.” *OECD Social, Employment and Migration Papers,* No. 64, OECD Publishing.](http://www.keepeek.com/Digital-Asset-Management/oecd/social-issues-migration-health/a-review-of-studies-on-the-distributional-impact-of-consumption-taxes-in-oecd-countries_241103736767#page1) |
| **Approach** | * Overview of several important theoretical considerations concerning consumption taxes |
| **Main Results** | * Paper advocates for wider adoption of methodology used by Australia, Canada, and UK (based on input-output tables and modeling of large part of consumption taxes) * Omission of consumption taxes affects overall redistribution and differences among countries - lack of comprehensive studies due to two factors:   + No broad agreement on how to model incidence of consumption tax on individuals   + Data demands not met * Valuing taxes based on revenues raised is theoretically incorrect but normally applied practically   + Need two additional data sources for more accurate measure:     - Surveys of HH income and expenditure       * But note these often don’t cover all types of HHs (like those in remote areas)     - Input-output data from national accounts - allows identification of how statutory incidence of consumption taxes ultimately flows to final consumers * Annual income distorts the picture somewhat bc over lifetime consumption taxes are often shown to be progressive (bc consumption depends on individual’s lifetime income)   + Approach is to use annual consumption as proxy for expected lifetime income (but not necessarily the best measure since varies) * Main problem in this area is paucity of data * Two main recommendations for future papers   + Analysis of distributional impact of tax compliance and admin costs, tax expenditures, and distortionary impact of taxes   + Estimating lifetime incidence of consumption taxes |
| **Research Suggestions** | * CONTAINS DETAILED TABLE WITH OVERVIEW OF RESEARCH IN THIS AREA (TABLE 1 PAGE 30) * Tax Reform: Not a New Tax, A New Tax System (1998)   + Done by Australian government to model distributional result expected for change in sales tax (not normally done by countries)     - Australian Bureau of Statistics (2007), Cat 1351.0.55.012 - Research Paper: Review of Methodology for Estimating Taxes on Production in the Calculation of Household Final Income, Apr 2006 <<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1351.0.55.012Apr%202006?OpenDocu> ment> * Consumption tax incidence:   + Barrett and Wall (2005); Creedy (2001, 2002); Decoster (1995); De Swerdt and Verbist (2007); Garfinkel, Rainwater, and Smeeding (2006); Kaplanoglou (2004) * STATAX (Australia) - assumes all consumption taxes shifted forward to HHs - this has been applied in two different ways:   + Warren (1979, 1983, 1998) - allocated aggregated taxes and income to HHs using HH income and expenditure shares observed in HH surveys   + Harding et al. (2005, 2006, 2007) - relied on conversion of natl accounts tax aggregates into effective tax inclusive tax rates and then applied those to HH unit using STINMOD * LIS Studies (useful for studying “what is” according to paper)   + Garfinkel, Rainwater, Smeeding (2006) - 12 countries     - New concept of full income = DI + value of edu and health benefits - VAT, corporate, property, etc.     - Take decile-specific consumption to income ratios from micro data surveys for four countries (Canada, France, UK, US) and apply average of these four to the others       * Consumption exceeds income in these four countries for bottom decile       * This is considered a rough approximation and there is a lot of room for improvement in precision * EUROMOD more useful for “what could be” to assess impact of reform possibilities * Marical, Mira d’Ercole, Vaalavuo and Verbist (2006) * Atkinson A.B., L. Rainwater and T. Smeeding (1995), *Income Distribution in OECD Countries. Evidence from the Luxembourg Income Study*, OECD, Paris. * Bradbury, B. (ed) (1990), “Tax-Benefit Models and Microsimulation Methods”, *SPRC Reports and Proceedings* No 87, Social Policy Research Centre, University of New South Wales, Sydney. * Caspersen E. and G. Metcalf (1994), “Is a Value Added Tax Regressive? Annual versus Lifetime Incidence Measures”, *National Tax Journal* 47: 731-46. * Giles, C. and J. McRae (1995), “TAXBEN: the IFS microsimulation tax and benefit model”, *WP95/19*, Institute for Fiscal Studies, London. * Helliweg, O. (1990), “The Overseas Experience with Microsimulation Models”, in Bradbury, B. (ed), “Tax-Benefit Models and Microsimulation Methods”, *SPRC Reports and Proceedings* No 87, 5-28, Social Policy Research Centre, University of New South Wales, Sydney. |
| **Category** | Consumption tax; International; Overview |

11.✓

|  |  |
| --- | --- |
| **Name** | [Garfinkel I., L. Rainwater and T. Smeeding. (2006). “A Re-examination of Welfare State and Inequality in Rich Nations: How In-Kind Transfers and Indirect Taxes Change the Story.” *Journal of Policy Analysis and Management* 25 (4), P. 897–919.](evernote:///view/2147483647/s302/dff834f4-2b91-40bf-a34c-9e55c417ab16/dff834f4-2b91-40bf-a34c-9e55c417ab16/) |
| **Approach** | * Includes both in-kind transfers and indirect taxes in model   + In-kind: close to or more than 1/2 of welfare state transfers in many developing countries consist of in-kind benefits   + Indirect taxes: sometimes large and known to be regressive * Data sources:   + Aggregate public expenditures from OECD   + LIS for micro data (1967-2002 and 10 countries) * Focus on two concepts for resources of HH:   + Disposable income (as usual)   + Full income = DI + value of health and education benefits - direct/indirect taxes needed to finance these + income taxes that fund non-transfer govt services     - Assume equal distribution of those benefits across income distribution * Dealing with taxes   + Calculate aggregate amount of taxes needed to finance cash, near-cash, health, education, and ECE benefits (from OECD relative distribution)   + Assume incidence of corporate tax, goods and services tax, and property tax is on consumer     - Use Sierminska and Garner (2002) to assign expenditure to income ratios by LIS DI income deciles   + Get decile specific consumption to income ratios are taken from micro surveys from four countries (Canada, France, UK, US) and then avg is applied to other countries * Measure of inequality = distance 10-50-90 deciles   + Recommend using Gini in future research to see if their result upholds * Use two sub-groups (all households and those with children and elderly)   + Reasoning: a lot of spending from welfare systems simply transfers wealth across generations |
| **Main Results** | * Aggregate value of social welfare transfers: Suggest that when you use their model the rankings of welfare systems changes and the differences shrink   + Caveat: Some of their claims should produce major doubts (Ex: They talk about high US spending on education and health care as evidence that US actually spends quite a bit - common knowledge is that this money isn’t used very effectively and has a lot to do with a distorted pricing model) * Cross-national differences in inequality   + DI: find same result as previous research and three distinct groups of systems (Esping-Anderson)   + Full income: bottom of income distribution changes dramatically - three groups no longer exist at bottom but still do at top     - US and other Anglo-Saxon states rely on in-kind benefits and less on indirect taxation |
| **Research Suggestions** | * [Sierminska and Garner (2002)](http://poseidon01.ssrn.com/delivery.php?ID=092093029105099084001018094123127112020052090029040071000078002029082098124065124094062054007100062009029093065019086014010044040025032002102091015127091001069051081011007114096068104019101070097093003066122027023098109026097081066004078001119088&EXT=pdf)   + Did work with consumption from LIS specifically |
| **Category** | Consumption tax; International; LIS |

12.✓

|  |  |
| --- | --- |
| **Name** | Prasad, Monica and Deng, Yingying. (2009) "Taxation and the Worlds of Welfare." *Socio-economic Review*, 7(3), P. 431-457. |
| **Approach** | * Use LIS data to compare progressivity of tax structure in US and Europe   + Criticize Piketty and Saez (2007) [Paper #2 Above] for excluding consumption taxes     - Consumption tax in Europe is regressive but some state and local taxes (income and property) are progressive; state and local taxes make up much smaller share of US rev than consumption taxes make up of Euro rev; US sales taxes not levied on services but Euro VAT is (Carey and Rabesona 2002)     - Believe Piketty and Saez understate progressivity in US and understate regressivity in Euro   + Main advantage of LIS: allow systematic comparison that attempts to take into account issues such as different tax rates, thresholds and exemptions; captures taxes actually paid   + Update on Zandvakili (1994) by weighing progressively according to importance of particular tax in rev structure * Measure consumption tax for only five countries (UK, Belgium, France, Germany Switzerland) from LIS + US from Labor of Bureau Statistics   + For US data is by income quintile - use share of expenditure by income quintiles to approximate quintile-specific share of consumption tax paid * Calculate progressivity (Kakwani 1977 index) and then compare to results when add consumption tax   + Income quintiles used bc this is format of US data   + Factor income (excludes taxes and transfers) instead of gross DI bc interested in pre-tax pre-transfer distribution of income   + Equivalency scales and exclusion of some countries follows Mahler and Jesuit (2006) * Three major categories of variables   + Factor income   + Four types of taxes (income, consumption, property/wealth, employee contribution)   + Transfer payments (social transfers + non-cash transfers) |
| **Main Results** | * US taxes much more progressive than continental or social democratic states (but UK less) * Income taxes can sometimes be regressive and payroll and property taxes are most of the time * Sales tax is regressive in every country and every year studied   + Role that sales tax plays in revenue structure can serve as proxy for regressivity of state when data not available * Argue that lifetime incidence perspective for consumption taxes is inappropriate bc doesn’t consider how incidence of tax alters behavior |
| **Research Suggestions** | * Papers that only look at income tax progressivity   + Alesina and Glaeser (2004) - criticized in this paper as don’t cite data sources or methods * Caspersen, E. and Metcalf, G. (1995) ‘Is a Value Added Tax Progressive? Annual vs. Lifetime Incidence Measures’, NBER Working Paper No. 4387. |
| **Category** | Taxes; Consumption tax; Welfare systems and inequality; LIS |

13.✓

|  |  |
| --- | --- |
| **Name** | [Sierminska, Eva and Garner, Thesia. (2002).](http://poseidon01.ssrn.com/delivery.php?ID=092093029105099084001018094123127112020052090029040071000078002029082098124065124094062054007100062009029093065019086014010044040025032002102091015127091001069051081011007114096068104019101070097093003066122027023098109026097081066004078001119088&EXT=pdf) ["A Comparison of Income, Expenditures, and Home Market Value Distributions using Luxembourg Income Study Data from the 1990's (Augmented with Select Data from the U.S. Consumer Expenditure Survey)." LIS Working Paper No. 338.](http://poseidon01.ssrn.com/delivery.php?ID=092093029105099084001018094123127112020052090029040071000078002029082098124065124094062054007100062009029093065019086014010044040025032002102091015127091001069051081011007114096068104019101070097093003066122027023098109026097081066004078001119088&EXT=pdf) |
| **Approach** | * Take data from LIS and augment it with expenditure data for US from U.S. Consumer Expenditure Survey * Detailed description of how you can use LIS data and problems with expenditure side |
| **Main Results** | * Notes that expenditure data in LIS are not comparable across countries * In most cases income inequality > total expenditure inequality (marginal but statically significant) |
| **Research Suggestions** | * Recommended data sources   + [Household Surveys Data Bank Initiative](http://www.iadb.org/sds/POV/site_19_e.htm)   + Eurostat - working on harmonizing data but for micro-level need to work with country-specific statistical agencies |
| **Category** | Consumption; Inequality; LIS; Data work |

14.✓

|  |  |
| --- | --- |
| **Name** | [Trannoy, Alain and Nicolas Ruiz. (2008). Le caractère régressif des taxes indirectes : les enseignements d’un modèle de microsimulation, Economie et statistique, 413 (2008), pp. 21–46.](http://www.persee.fr.gate3.inist.fr/doc/estat_0336-1454_2008_num_413_1_7034) |
| **Approach** | * Look at potential impacts of two reforms * Comportamental microsimulation model * Uses BDF from France 2001 * Goes over how to deal with taxes ad valorem (excise taxes: tobacco, alcohol, petrol) |
| **Main Results** | * Indirect taxes increase as income level increases (as expected) * Taxes spent on tobacco are more or less constant but with a decreasing tendency as you move up income deciles * Measure taux d’effort and find that indirect taxes are regressive   + Decreases as you move up income deciles |
| **Research Suggestions** | * Bourguignon. (1998). "Fiscalite et Redistribution." * Forgeot, G. and Starzec, C. (2003). “L’Impact Redistributif des Impots Indirects en France.” *Economie Publique* 13, P. 165-205. |
| **Category** | Consumption tax; VAT; France; BDF |

15.✓

|  |  |
| --- | --- |
| **Name** | [Forgeot, G. and Starzec, C. (2003). “L’Impact Redistributif des Impots Indirects en France.” *Economie Publique* 13, P. 165-205.](https://economiepublique.revues.org/301?file=1) |
| **Approach** | * Use new database created from BDF from INSEE   + Able to look at HH level at where money is being spent * Mostly descriptive statistical analysis |
| **Main Results** | * Indirect taxes are anti-redistributive and therefore regressive |
| **Research Suggestions** |  |
| **Category** | Indirect taxes; VAT; France; BDF |

16.✓

|  |  |
| --- | --- |
| **Name** | Metcalf, Gilbert. (1997). “The National Sales Tax: Who Bears the Burden*?” Cato Policy Analysis No. 289*, Cato Institute. <http://www.cato.org/pubs/pas/pa-289.html>. |
| **Approach** | * Uses Consumer Expenditure Survey to determine expenditures and simulate sales tax   + This process isn’t described in great detail however * Use lifetime income model which they say is a better approach for measuring the effects of the sales tax   + Detailed in Appendix to paper |
| **Main Results** | * Annual income: reform away from income tax to sales tax would be regressive * Lifetime income: reform regressive but less so * Universal rebate tied to poverty thresholds: reform is about as progressive as income tax regime * Payroll tax rebate: reform only slightly less progressive than income tax regime |
| **Research Suggestions** |  |
| **Category** | Sales tax; U.S.; Progressivity |

17.

|  |  |
| --- | --- |
| **Name** | Mahler, Vincent. (2015). “Indirect Taxes and Government Inequality Reduction: A Cross-National Analysis of the Developed World.” Western Political Science Association, Las Vegas, Nevada, April 2-4, 2015. |
| **Approach** | * Methodology is very simplistic |
| **Main Results** | * Exclusive focus on direct taxes presents limited picture of role taxes play on inequality |
| **Research Suggestions** |  |
| **Category** | Indirect taxes; Progressivity; LIS |

\*Probably can’t be cited but a good resource to point to overall picture of the situation and other papers on the subject

18.✓

|  |  |
| --- | --- |
| **Name** | [Figari, Francesco and Paulus, Alari. (2012). “The Impact of Indirect Taxes and Imputed Rent on Inequality: A Comparison with Cash Transfers and Direct Taxes in Five EU Countries.” AIAS. Gini Discussion Paper 28.](http://www.uva-aias.net/uploaded_files/publications/DP28-Figari,Paulus-1.pdf) |
| **Approach** | * Use EUROMOD to analyze redistributive impact of imputed rent (in-kind benefit) and indirect taxes * Extended income concept = DI - Indirect Taxes + Imputed Rent * Impute indirect taxes   + Major limitation of data sources is that don’t include information on both income and consumption - the solution is imputation using national surveys that include detailed expenditure variables   + Main steps (uses [Decoster 2010](http://onlinelibrary.wiley.com/doi/10.1002/pam.20494/epdf) methodology)     - Goods are aggregated to highest level of Classification of Individual Consumption by Purpose (COICOP)     - Imputation is done by means of Engel curves based on same variables present in both income and expenditure datasets     - Individual indirect tax liability simulated according to VAT and excise legislation (statutory) for each country, considering weighted avg tax rate for each COICOP category     - Use C-efficiency indicator to get synthetic measure of coverage of VAT * Evaluate effect on inequality using “benefit incidence” method and Reynolds-Smolensky index (1977) |
| **Main Results** | * As expected indirect taxes have a regressive impact on income - but large cross-country differences   + Three driving factors     - rate structure     - consumption pattern     - propensity to consume   + This is true when we look at indirect tax payments as % of DI income by decile as well * This effect becomes smaller when we look at difference between extended income and DI + imputed rent (bc we should assume that imputed rent can increase consumption capacity of individuals) * The relationship changes completely when we use expenditure instead of income as denominator   + One main reason is that goods that low income HHs buy are taxed at lower VAT rates on avg |
| **Research Suggestions** | * Papers that consider indirect taxes   + [Decoster et al. (2010)](http://onlinelibrary.wiley.com/doi/10.1002/pam.20494/epdf)     - Great resource on papers that describe methodological challenges of imputing indirect taxes   + O’Donoghue, C., Baldini, M., and Mantovani, D., 2004, Modelling the redistributive impact of indirect taxes in Europe: an application of EUROMOD. EUROMOD Working Paper No. EM7/01. * Papers that consider imputed rents   + Frick et al. (2010) * Papers that consider in-kind benefits   + Paulus et al. (2010) * Papers that consider all but in single country   + Sung, M. J., and Park, K., 2011. Effects of taxes and benefi ts on income distribution in Korea. The Review of Income and Wealth 57(2): 345-363. * Authors say this paper is extension of analysis in [Garfinkel et al. (2006)](evernote:///view/2147483647/s302/dff834f4-2b91-40bf-a34c-9e55c417ab16/dff834f4-2b91-40bf-a34c-9e55c417ab16/) |
| **Category** | Indirect taxes; Imputation (statutory); VAT; Europe; EUROMOD |

19.✓

|  |  |
| --- | --- |
| **Name** | [Decoster, Andre, Loughrey, Jason, O’Donoghue, Cathal and Dirk Verweft. (2010). “How Regressive are Indirect Taxes? A Microsimulation Analysis for Five European Countries.” *Journal of Policy Analysis and Management* 29 (2), P. 326-350.](http://onlinelibrary.wiley.com/doi/10.1002/pam.20494/epdf) |
| **Approach** | * Microsimulation model using EUROMOD to determine effect of VAT changes   + Apply old and new tax rules to representative HH * Take data from EUROMOD and enrich it at HH level with country-specific expenditure data * Imputation occurs in two steps   + Use Engel curves to estimate expenditures per aggregate category of COICOP   + Calculate general indirect tax rate over each COICOP category by calculating weighted avg over all HHs and items belonging to that category |
| **Main Results** | * Indirect taxes are regressive with respect to DI but proportional or progressive with respect to expenditures * Indirect taxes are less progressive than other components of the tax system * Even when you separate excise and VAT the VAT remains regressive - this rejects arguments that the regressivity is exclusively (or even mostly) due to inclusion of excise taxes |
| **Research Suggestions** | * Atkinson and Brandolini (2010) * Decoster et al. (2009) - describes how to deal with methodological issues such as statistical matching of the data, differences in nature of distributions between data sets, zero expenditures, etc. * Decoster et al. (2007) - discusses imputation methods and Engel curves * Keen and Lockwood (2006) - C-efficiency measure |
| **Category** | VAT; Europe; Regressivity; Europe |

20.

|  |  |
| --- | --- |
| **Name** | Decoster, Andre, Loughrey, Jason, O’Donoghue, Cathal, and Dirk Verwerft. (2011). “Microsimulation of Indirect Taxes.” *International Journal of Microsimulation* 4 (2), P. 41-56. |
| **Approach** | * Uses HH budget surveys from Belgium, Hungary, Ireland, and UK to impute expenditure data * Uses Engel curve method (discussed in detail in Decoster 2007 and Banks et al. 1997) which utilizes common variables between income and expenditure datasets   + Total expenditures and total durable expenditures are estimated upon DI and common socio-demographic variables   + These estimated equations then used to predict total expenditures and total durable expenditures in EUROMOD dataset   + Nondurable budget shares for each category are constructed as the share of the category in total nondurable expenditure   + Can then obtain expenditures by category by multiplying total expenditures by category shares * Problem of zero expenditures (i.e. some HHs don’t consume tobacco at all)   + Population divided into subgroups according to whether or not have expenditures in different categories and then separate Engel curves estimated for each subgroup   + To determine this use Tobit model to find probability and compare this to inverse normal distribution function |
| **Main Results** | * Tax shift from labor to consumption would have regressive effects * Redistributive effect of a tax is a function of progressivity and avg tax rate |
| **Research Suggestions** | * Decoster (2007) |
| **Category** | Indirect tax; Statutory; Microsimulation; Europe; EUROMOD |

21.✓

|  |  |
| --- | --- |
| **Name** | [Decoster, Andre, De Rock, Bram, De Swerdt, Kris, Loughrey, Jason, O’Donoghue, Cathal, and Dirk Verwerft. (2007). “Comparative Analysis of Different Techniques to Impute Expenditures Into an Income Data Set.” Accurate Income Measurement for the Assessment of Public Policies (AIM-AP) Contract No. 028412.](http://www.andredecoster.be/wp-content/uploads/2007-Decoster-De-Rock-Flannery-Hayes-Hynes-Loughrey-ODonoghue-Verwerft-WP3.4-Comparative-Analysis-Different-Techniques-Impute-Expenditures-into-Income-Data.pdf) |
| **Approach** | * Compares five different techniques used for imputation of expenditures into income datasets   + Explicit - aggregate expenditure terms (to avoid zeroes) and then estimate Engel curves of aggregates     - parametric estimation of Engel curves     - nonparametric estimation   + Implicit - avoids theoretical assumptions and implications - uses values of observation in HH survey that is as similar as possible to the target observation     - constrained matching using a distance function     - unconstrained matching using a distance function     - grade correspondence |
| **Main Results** | * Parametric and non-parametric estimation get best results |
| **Research Suggestions** | * Pudney (1989) for zero expenditure problem |
| **Category** | Indirect taxes; Statutory; Imputation |

22.✓

|  |  |
| --- | --- |
| **Name** | [Alm, James and Asmaa El-Ganainy. (2013). “Value-Added Taxation and Consumption.” *International Tax and Public Finance* 20, P. 105-128.](http://download.springer.com.gate3.inist.fr/static/pdf/39/art%253A10.1007%252Fs10797-012-9217-0.pdf?originUrl=http%3A%2F%2Flink.springer.com%2Farticle%2F10.1007%2Fs10797-012-9217-0&token2=exp=1466503795~acl=%2Fstatic%2Fpdf%2F39%2Fart%25253A10.1007%25252Fs10797-012-9217-0.pdf%3ForiginUrl%3Dhttp%253A%252F%252Flink.springer.com%252Farticle%252F10.1007%252Fs10797-012-9217-0*~hmac=a8fdd165973b635389a9beeb77de45620bcf125d5b9189f3e6f651b472c94f6a) |
| **Approach** | * Use GMM to look at effects of VAT on consumption behavior * Use effective VAT rate, which they argue is more appropriate measure than either statutory or revenue based measure   + Better comparability - effective rate better able to control for variations in rates, exemptions, etc. across EU countries and within   + Better able to capture inter temporal effect of VAT than revenue measure |
| **Main Results** | * One % increase in VAT leads to roughly one % reduction of agg C in SR and larger reduction in LR |
| **Research Suggestions** | * Provides many papers that look at theoretical assumptions behind consumption, taxation, and savings |
| **Category** | VAT; Consumption |

23.✓

|  |  |
| --- | --- |
| **Name** | [O’Donogh ue, C., Baldini, M., and Mantovani, D. (2004). Modeling the Redistributive Impact of Indirect Taxes in Europe: An Application of EUROMOD. EUROMOD Working Paper No. EM7/01.](https://www.iser.essex.ac.uk/research/publications/working-papers/euromod/em7-01.pdf) |
| **Approach** | * Model to simulate expenditure and indirect taxes in 12 EU countries with EUROMOD tax-benefit model   + First total expenditure is simulated   + Then budget shares for specific groups are estimated     - Use Eurostat categories except further divide alcohol into beer, wine, and spirits (so 20 total)     - Consumption on particular goods is estimated as budget shares of total consumption using Engle functions     - Use only coefficients not residuals (bc of zero expenditure problem - infrequent purchases)     - Advantages       * Reduces impact of zero expenditures problem (which can substantially affect OLS results)         + This problem can come from infrequent purchases or abstention from consumption (tobacco)       * Can compare results from different countries       * Estimates for smaller groups of goods could be unstable but 20 categories is still enough to allow significant heterogeneity     - Disadvantages       * Certain categories of good that face different indirect tax rates are grouped together   + Simulate indirect taxes according to Redmond et al. (1998)     - Note simulated expenditures must be on post tax prices (requires modification because VAT measured on pre tax prices)     - Excise duties levied on quantity - to obtain this divide expenditures by sample unit prices |
| **Main Results** | * Simulated amounts are different from those found from revenues   + Not all indirect taxes are passed on to consumers - i.e. some sectors don’t pay VAT and can’t claim VAT refunds   + HH sector is not only final consumer (gov and charities pay VAT but not included in totals here)   + Incidence analysis using input-output tables (Scutella 1997) will help accuracy by identifying true incidence of indirect taxes) * VAT increases as % of total expenditure over DI distribution   + However in most countries difference is very low between poor and rich * VAT as % of DI shows opposite trend - bottom deciles have higher VAT rates than higher ones * Reynolds-Smolensky effect of redistribution - finds that VAT is regressive in all countries |
| **Research Suggestions** | * Redmond et al. (1998) - simulation of VAT and other indirect taxes |
| **Category** | VAT; Simulation; Inequality |

24.

|  |  |
| --- | --- |
| **Name** | [Sutherland, Holly and Francesco Figari. (2013). “EUROMOD: The European Union Tax-Benefit Simulation Model.” *International Journal of Microsimulation* 6 (1), P. 4-26.](http://repository.essex.ac.uk/7780/1/2_IJM_6_1_Sutherland_Figari.pdf) |
| **Approach** | * Overview of EUROMOD and microsimulation models in general |
| **Main Results** | * EUROMOD can be used to build microsimulation for non-EU countries as well * EU-SILC data provided by national statistics bureaus |
| **Research Suggestions** |  |
| **Category** | EUROMOD; Microsimulation |

25.✓

|  |  |
| --- | --- |
| **Name** | [Savage, Michael and Tim Callan. (2015). “Modeling the Impact of Direct and Indirect Taxes Using Complementary Datasets.” *Institute for the Study of Labor* Discussion Paper No. 8897.](http://ftp.iza.org/dp8897.pdf) |
| **Approach** | * Assess sensitivity of distributional effects of indirect taxes to choice between actual, estimated, and imputed expenditure data |
| **Main Results** | * Looks at three different approaches   + Use data from HH expenditure surveys to estimate indirect tax payments by HH   + Imputation of expenditure data to income survey (see Pestel and Sommer 2013 for classification)     - Expenditure estimated based on set of characteristics observable in both expenditure and income surveys     - Literature recommends between 10-18 categories     - Advantages       * Produces plausible distributions of estimated expenditures in income surveys * Assessment   + Sutherland et al. conclude that imputation is not a perfect substitute for using actual data (duh)   + Results among three are highly comparable to each other     - Very important to have well-fitted model of HH expenditure in first stage of estimation process   + Results for bottom decile most sensitive to choice between expenditure data |
| **Research Suggestions** | * Pestel and Sommer 2013 - categorize methods of imputation of expenditure data * Weber and Tonkin 2013 - describes importance of having similar distributions of variables in income and expenditure surveys while also arguing that having small number of variables runs risk of misspecifying model |
| **Category** | Indirect taxes; Comparative; Microsimulation; Imputation; Ireland |

## Appendix B: OECD Selection of Variables

CP = Final consumption expenditure of households (recommendation highlighted)

|  |  |  |
| --- | --- | --- |
|  | **Positive** | **Negative** |
| P31DC Final consumption expenditure of households on the territory  *(Variable: cons\_privatedom)* |  | * More missing values * This value is higher even though it specifies “on the territory” – not sure how to account from this |
| P31S14 Final consumption expenditure of households  (*Variable: cp2)* | * Less missing values | * Doesn’t specify if on territory or not |

CG = Government final consumption expenditure (recommendation highlighted)

|  |  |  |
| --- | --- | --- |
|  | **Positive** | **Negative** |
| P3CG Government final consumption expenditure  *(Variable: cg)* | * Good definition for what we want | * Many missing |
| P3S13 Final consumption expenditure of general government  (*Variable: cg2)* | * Least amount of missing * Exactly the same values as cg |  |
| GP3P Final consumption expenditure [of government]  *(Variable: cg3)* | * Almost exactly the same values as cg and cg2 | * Only small improvement on number of missing |
| GTE: Total general government expenditure  *(Variable: cg4)* |  | * Definition isn’t what we are looking for – doesn’t specify consumption * Doesn’t improve much on missing |

CGW = Government final wage consumption expenditure (recommendation highlighted)

|  |  |  |
| --- | --- | --- |
|  | **Positive** | **Negative** |
| D1CG Total compensation of employees paid by government  *(Variable: cgw)* | * Close to the definition we want | * More missing |
| GD1P Compensation of employees payable by government  (*Variable: cgw2)* | * Less missing | * Not sure if this is the definition we want |

|  |  |  |
| --- | --- | --- |
|  | **Positive** | **Negative** |
| Net national disposable income  *(Variable: nndi)* |  | * This is not the definition we want – will include corporations. |
| Gross household disposable income per capita US dollars current prices and current PPPs  (*Variable: ghhdi)* | * This is close to the definition we want and is in current prices, which matches our other variables. | * This is gross – definition for gross is different for national accounts - only difference is that real includes amortization for investment * We need to know why this is called gross and not net?   + P. 164 * Difference between this and GDP pc is remittances – OECD says measurement of this is not reliable |
| Gross household adjusted disposable income per capita US dollars current prices and current PPPs  *(Variable: ghhdi\_adj)* | * This is adjusted for social transfers (not sure if this is positive for us if I’m honest) and therefore better for international comparisons | * This is gross |
| Real household net disposable income deflated by household final consumption millions of national currency  *(Variable: rhhdi\_defhhc)* | * Real measure | * Not sure what this deflation means for us |
| Real household net adjusted disposable income deflated by actual individual consumption millions of national currency  *(Variable: rhhdi\_defindc)* | * Real measure | * Not sure about deflation |

HHDI= Real household disposable income (selection highlighted)

## Appendix C: OECD Selection of Variables

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Paper | Purpose | Time Frame | Sample | Taxes Included | Method | Main Results |
| OVERVIEW PAPERS | | | | | | |
| Warren (2008) | Provide overview of how papers deal with consumption taxes and assess the need for improved methodologies to include these in studies. | 1965-2004 | 34 OECD Countries | All | Overview of papers covering consumption taxes.  Experimental methodological approach taking consumption tax incidence from Australia and applying it to all OECD countries. | * Consumption taxes have a regressive impact on distribution of HH annual income even despite methodological differences in papers studied. * Optimal approach is to use input-output table (used in Australia, Canada, UK) to estimate consumption tax burden. Next best is combining HH surveys and tax rates. Third approach is to apply consumption tax incidence from one country to another. |
| Joumard, Pisu, and Bloch (2012) | Assess redistributive effect of main taxes and cash transfers. | Late 2000’s | 34 OECD Countries | All (Limited Section on Consumption)   * Rates: Implicit taken from OECD (2008) | Literature review, summary statistics, and cluster analysis (by country). | * Taxes and transfers reduce inequality from market income to DI * Impact differs across countries and depends on size, mix, and progressivity * Limitation of most studies is they don’t take into account consumption taxes |
| Sierminska and Garner (2002) | Review recent data changes in LIS and how these can be used to study inequality. | Mid- to Late 90’s | 9 Countries  LIS and U.S. Consumer Expenditure Survey | N/A | Analysis of LIS data and comparability. Doesn’t examine effect of taxes. | * Methodological decisions when using LIS data:   + Cases with zero values dropped (can’t distinguish from missing values - same procedure followed by LIS)   + When sum of expenditure component values exceed total expenditure then replaced total with sum   + Focus on HHs and use equivalence scales * Expenditure data in LIS are not comparable across countries. |
| SINGLE COUNTRY STUDIES | | | | | | |
| Metcalf (1997) | Examine regressivity of sales tax in U.S., especially in comparing annual and lifetime income. | 1994 | U.S.  Consumer Expenditure Survey (CES) | Sales Tax   * Rates: Implicit * Shift to Consumers: All | 1. Use micro data from CES to distribute income and sales taxes. 2. Subtract indirect taxes from personal income. Adjustments made for medical and housing expenditures. 3. Adjustments made to C and I to match National Account data. 4. Analyze shift from income tax to broad-based sales tax by looking at change in tax burden and avg. tax rate by quintile. 5. Further analysis using lifetime income method. | 1. Using annual income: reform away from income tax to sales tax would be regressive. 2. Using lifetime income: reform still regressive but less so vs. annual income method. 3. When include universal rebate tied to poverty thresholds reform is about as progressive as income tax regime at the time. 4. When using payroll tax rebate reform only slightly less progressive than income tax regime at the time. |
| Forgeot and Starzec (2003) | Assess importance and redistributive effects of indirect taxation in France. | 2001 | France  Budget des Famille (2001) | All Indirect Taxes (VAT, Excise Duties, TIPP and Other Mandatory Contributions)   * Rates: Statutory * Shift to Consumers: All | 1. Use BDF and statutory rates to simulate consumption. 2. Transform excise duties. 3. Apply simulation of VAT rate evolution since 1976 to population and consumption structure of 2001) | * Indirect taxes are regressive and lead to increases in inequalities. * Disparities in terms of VAT tax rates between rich and poor HHs over period 1976 to 2001 changes very little. |
| Trannoy and Ruiz (2008) | Looks at implications of VAT reforms in France. | 2001 | France  Budget des Famille (2001) | VAT + Excise Duties   * Rates: Statutory * Shift to Consumers: All | 1. Use BDF and statutory rates to simulate consumption (8 categories). 2. Transforms excise duties into ad valorem taxes. 3. Calculate price and income elasticities. | * Indirect taxes increase as income level increases (as expected) * Taxes spent on tobacco are more or less constant but with a decreasing tendency as you move up income deciles. |
| Courtioux and Gadenne (2009) | Apply new approach to microsimulation analysis of fiscal systems, including four taxes and utilizing the bootstrap technique. | 2001 | France  Budget des Famille (2001) | VAT, Payroll, Income, CSG  \*No excise duties   * Rates: Statutory * Shift to Consumers: All | 1. Use BDF and statutory rates to simulate consumption patterns and thus VAT. 2. Construct confidence intervals for semi-elasticities of Gini coefficients to use of each tax. | * Confirms earlier studies that income tax is progressive and VAT is regressive. |
| Dauvergne (2012) | Analyze redistributive effects of indirect taxes in France. | 1995-2012 | France  Budget des Familles | VAT + Excise Duties (and Imputed Rents)   * Rates: Statutory * Shift to Consumers: All | 1. Homogenization of surveys and wedging (calage) with figures using implicit rates. 2. Use BDF to calculate consumption of each HH for particular category. 3. Transform excise duties into ad valorem taxes. 4. Analyze both share of taxes in consumption and income. | * Indirect taxes are regressive when using DI measure. * Positive but weak relationship when you use consumption measure (mostly explained by decrease in % spent on housing as income up). * Taxes on alcohol, etc. are regressive but as move up income deciles differences are slight. |
| Savage and Callan (2015) | Assess sensitivity of distributional effects of indirect taxes to choice between actual, estimated, and imputed expenditure data. | 2009/2010 | Ireland  Irish Household Budget Survey (HBS) | VAT + Excise Duties + Carbon Tax   * Rates: Test Statutory and Implicit * Shift to Consumers: All | 1. Assess distributional results using actual expenditure data recorded in HBS. (Actual) 2. Estimate expenditure on a range of goods and services using characteristics observable in expenditure and income surveys – 15 categories (Estimated) 3. Coefficients from estimation stage used to impute expenditure into the income survey (Imputed) | * Results among three methods are comparable. Biggest differences arise in lower income deciles. |
| MULTIPLE COUNTRY STUDIES | | | | | | |
| O’Donoghue, Baldini, and Mantovani (2004) | Provide model to simulate expenditure and indirect taxes to evaluate redistributive effect and progressivity. | 1990’s  (Year of Reference Differs by Country Due to Data Availability) | 12 EU Countries  EUROMOD | VAT + Excise Duties + Ad Valorem Taxes   * Rates: Statutory * Shift to Consumers: All | 1. Simulate expenditure using national HH budget surveys. 2. Use Eurostat categories (17) and estimate consumption of particular goods as budget shares of total C using Engle curves (Redmond et al. 1998). 3. Compares figures to those obtained in national accounts. | * Simulated expenditure amounts are different than those found in national accounts. * VAT increases as a percentage of total expenditure over DI distribution. * VAT decreases as percentage of DI over DI distribution. * VAT is regressive in all countries studied (Reynolds-Smolensky effect). |
| Garfinkel, Rainwater, and Smeeding (2006) | Examine the implications of including in-kind benefits (at government cost) and accounting for indirect taxes in models examining inequality. | 1990’s and 2000’s  Most Recent Datasets (Cross-Sectional) | 10 OECD Countries  OECD and LIS | Goods and Services (VAT, Excise, Sales), Income, Payroll, Corporate Income, Property   * Rates: Implicit * Shift to Consumers: All | 1. Construct DI and full income (adds value of health/education benefits and subtracts taxes that fund these). 2. Calculate agg. amount of taxes that finance benefits. Use OECD for relative distribution. 3. Use LIS reports on income/payroll taxes to distribute by income. 4. Assign corp., goods and services, and property taxes using LIS expenditure-income ratios. 5. Decile specific C/I taken from micro data from four countries and avg. is applied to others. 6. Utilize distance between deciles 10-50-90 for inequality measure. | * When you use this model, rankings of welfare systems by country change and differences among them shrink. * When use DI you get same result as previous research (Esping-Anderson groups). When use full income, groups of systems no longer exist at bottom of income distribution. |
| OECD (2008) | Explore possible consequences of broadening taxation model by including consumption taxes. | 2003-2006 (Cross-Sectional but Lack of Data Forces Authors to Vary Years for Country Observations) | 11 OECD Countries  OECD and Household Budget Surveys (Eurostat) | VAT + Excise Duties (Estimation)   * Rates: Statutory * Shift to Consumers: All | 1. Identify families according to 8 HH types. 2. Classify expenditures according to taxes they bear. 3. Simulate avg. amount of VAT paid by family type. 4. Express as % of income and add to tax wedge. | * Inclusion of consumption taxation has significant effect but current methodologies are very limited. |
| Prasad and Deng (2009) | Compare progressivity of tax structure in U.S. and Europe. | 1979-2004 | 13 Countries Full Analysis & 6 Countries Consumption Tax Analysis  LIS | VAT (but not housing), Income, Property, Wealth and Mandatory Contributions   * Rates: Implicit * Shift to Consumers: All | 1. Define income quintiles using factor income (excludes taxes and transfers). 2. Use OECD to determine relative distribution of taxes. 3. Use Kakwani (1977) index of tax progressivity. | * Cross-country: US has more progressive tax structure than Europe but UK more regressive (puts doubts on Esping-Anderson’s groups). * Regressive examples of income and property tax exist in the data. * Sales tax are always regressive and thus proportion of tax rev. raised this way can proxy regressivity. |
| Decoster, Loughrey, O’Donoghue, and Verweft (2010) | Simulate shifting of taxes from labor to consumption. | 2000’s  (Different for Each Country) | 5 EU Countries  EUROMOD | VAT + Excise, Income, Payroll   * Rates: Statutory * Shift to Consumers: All | 1. Goods aggregated to highest level COICOP. 2. Imputation done by Engel curves based on variables present in income and expenditure datasets. 3. Individual indirect tax liability simulated according to VAT and excise legislation (statutory) for each country, considering weighted avg. tax rate for each COICOP category. 4. C-efficiency indicator to get synthetic measure of coverage of VAT. | * Indirect taxes regressive with respect to DI but proportional or progressive with respect to expenditures * Indirect taxes are less progressive than other components of the tax system * Even when you separate excise and VAT the latter remains regressive - this rejects arguments that the regressivity is mostly due to inclusion of excise taxes. |
| Figari and Paulus (2012) | Examine redistributive impact of imputed rent and indirect taxes vs. effects of cash transfers and direct taxes. Introduce extended income measure. | 2000’s  (Different for Each Country) | 5 EU Countries  EUROMOD  \*Same dataset as Decoster (2010) | VAT + Excise, Income, Payroll   * Rates: Statutory * Shift to Consumers: All | 1. Calculate extended income concept by subtracting indirect taxes and adding imputed rents. 2. Use national HH budget surveys to imputed expenditure data (Decoster 2010).   \*Extension of concepts used in Garfinkel, Rainwater, and Smeeding (2006) | * Indirect taxes regressive impact on income but large cross-country differences driven by: rate structure consumption pattern, propensity to consume. * Effect becomes smaller when we look at difference between extended income and DI + imputed rent (bc we should assume that imputed rent can increase consumption capacity of individuals) * Relationship changes completely when we use expenditure instead of income as denominator (low income HHs buy are taxed at lower VAT rates on avg.) |
| Alm and El-Ganainy (2013) | Estimate impact of broad-based consumption tax on aggregate consumption. | 1961-2005 | 15 EU Countries | VAT   * Rates: Effective * Shift to Consumers: All | 1. Calculate empirical estimate of effective VAT. 2. Estimate aggregate consumption function using panel data (most papers use time series or cross section). 3. Use GMM | * 1 percentage increase in VAT leads to roughly 1 percentage reduction in level of aggregate consumption in SR and larger reduction in LR. |