



***Comparing Tax Rates
Using OECD and GTAP6 Data***

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In prior research, Babiker, Metcalf, and Reilly (2003) computed capital and labor tax rates to augment GTAP 4 data that did not comprehensively cover taxes. Recently, we updated these tax rates to 2001 to match the GTAP 6 base year. We realize there was an attempt to improve representation of taxes in GTAP 6, but as admitted by GTAP this was as yet incomplete. For those who might require a more complete tax accounting we have followed an approach that has the benefit of, at least in the aggregate, reconciliation with widely available tax receipt data. This note compares the tax rates derived for the OECD countries using this approach to those provided by the method GTAP uses. Those who are interested in economic impacts of fiscal measures--such as assuring revenue neutrality by raising tax rates in the face of a policy that reduces economic activity--may want to consider amending the tax data in GTAP. Alternatively, it may be useful to discuss the differences we note to as part of on-going efforts to improve data reported in GTAP.

Table 1 provides tax rates based on our methodology as well as from GTAP 6, aggregated to be approximately comparable. More disaggregated GTAP 6 tax rates are provided in Tables 2-3. GTAP6 reports taxes on factor income (rTF) as well as income taxes (rTO) whereas BMR combine income and factor taxes into a composite factor tax. We construct an accumulated factor tax (ACC) from the GTAP6 tax data which we believe is directly comparable to the BMR tax rates by the formula:

$$ACC = 1 - (1 - rTO)(1 - rTF)$$

Observations:

GTAP construct sector specific taxes in some cases as we report in Table 2 (consumption) and Table 3 (capital). However, the comparisons between BMR and GTAP6 (ACC) rates in Table 1 point to some large differences that are unlikely to be explained by slightly different aggregation. The aggregate OECD should be fairly accurate. Are there explanations for these differences?

(1) GTAP data for capital taxes appear unrealistically low. This may result in part from the GTAP attribution of all personal income taxes to labor though this should lead to the GTAP labor tax rates (ACC) generally being higher than the BMR rates, not the case as noted below.

(2) The consumption taxes in GTAP are sometimes much higher and sometimes much lower. The GTAP data for several countries seem unusually low – in particular, Great Britain, the Netherlands, Spain, and the United States.

(3) Labor tax rates for GTAP also diverge significantly in a number of countries from the BMR rates. We note that GTAP and BMR agree exactly on Japan and are pretty close in a number of other countries. As noted above, however, the GTAP (ACC) rates should be biased upward due to the attribution of personal income taxes entirely to labor.

Table 1. Comparison of Tax Rates for 2001: BMR and GTAP6 (percentage rates)

	Consumption			Labor				Capital				Land		Natural Resources	
Country	BMR	GTAP6 Domestic	GTAP6 Imports	BMR	GTAP6 (ACC)	GTAP6 (rTF)	GTAP6 (rTO)	BMR	GTAP6 (ACC)	GTAP6 (rTF)	GTAP6 (rTO)	GTAP6 (rTF)	GTAP6 (rTO)	GTAP6 (rTF)	GTAP6 (rTO)
Denmark	36.1	25.2	16.1	52.1	47.6	5.2	44.7	46.6	11.6	1.7	10.1	-61.6	10.1	2.0	10.1
Finland	27.3	26.9	26.3	49.5	22.9	8.4	15.8	36.0	6.3	0.0	6.3	-75.9	6.3	0.8	6.3
France	18.2	11.6	24.6	45.4	85.2	79.5	28.0	38.4	7.3	2.5	4.9	-64.3	4.9	3.0	4.9
Germany	15.5	13.2	14.1	41.8	60.6	45.7	27.4	21.5	2.4	0.8	1.6	-62.6	1.6	1.0	1.6
Great Britain	15.7	2.0	0.9	28.0	35.0	18.0	20.7	54.1	16.2	4.0	12.7	-58.0	12.7	4.4	12.7
Italy	15.1	11.4	19.6	45.5	66.7	44.1	40.4	34.4	7.2	0.5	6.7	-51.4	6.7	0.8	6.7
Japan	6.9	4.3	4.7	28.4	28.4	18.8	11.8	40.4	13.6	3.3	10.6	-8.5	10.6	3.3	10.6
Netherlands	21.0	2.8	14.3	41.6	71.8	64.0	21.8	34.5	13.9	1.9	12.2	-21.6	12.2	2.3	12.2
Spain	14.2	3.5	0.8	29.3	47.7	34.3	20.4	22.4	7.4	1.5	6.0	-54.4	6.0	2.2	6.0
Sweden	26.0	17.5	14.4	56.6	63.5	40.8	38.3	50.4	12.4	1.7	10.9	-79.7	10.9	2.0	10.9
United States	4.7	0.4	1.0	29.5	35.4	15.9	23.2	36.0	8.5	3.0	5.7	-34.5	5.7	3.0	5.7

BMR – Rates calculated as in Babiker, Metcalf, and Reilly (2003) using methodology of Mendoza et al. (1994).

GTAP6 – rates based on GTAP6 data: private domestic consumption taxes (rTPD), private import consumption taxes (rTPI), taxes on primary factors (rTF), income taxes (rTO). ACC refers to the accumulated factor tax: $1 - (1-rTF)(1-rTO)$.

Table 2. GTAP6 Taxes On Consumption
(Sectors Aggregated to Food, Manufactures, Services and Energy)

	Private consumption taxes (% ad valorem)							
	Food		Manufactures		Services		Energy	
Country	Domestic	Import	Domestic	Import	Domestic	Import	Domestic	Import
Denmark	15.4	15.3	15.4	14.6	15.4	0.0	228.4	253.3
Finland	23.4	23.2	23.5	23.5	23.5	23.4	83.7	119.6
France	7.8	7.8	7.8	7.4	7.8	7.8	177.2	437.5
Germany	9.2	9.2	9.3	9.3	9.3	9.2	133.7	181.5
Great Britain	0.0	0.0	0.0	0.0	0.0	0.0	92.1	274.9
Italy	7.2	7.2	7.3	7.0	7.2	1.3	272.0	150.8
Japan	5.0	4.5	5.6	5.6	2.0	0.0	60.7	130.1
Netherlands	15.8	4.2	0.6	11.5	-0.5	4.0	103.4	285.4
Spain	0.0	0.0	0.0	0.0	0.0	0.0	142.0	112.7
Sweden	11.2	11.1	11.2	10.9	11.2	0.7	124.6	471.1
United States	0.0	0.0	0.0	0.0	0.0	0.0	20.7	60.7

GTAP6 – rates based on GTAP6 data: private domestic consumption taxes (rTPD), private import consumption taxes (rTPI).

Breaking out consumption taxes for different sectors illustrate additional anomalies. Great Britain, for example, has a zero tax on consumption of any type (other than energy) despite having a VAT of 17.5 percent in 2001 (standard rate; food for home consumption is zero rated). Similarly, Spain has a standard VAT rate of 16 percent (4 percent rate for food).

Table 3. Sector Specific GTAP 6 Taxes on Capital

Country	Food	Manufactures/ Services
Denmark	-1.4	2.0
Finland	-20.7	0.8
France	-7.5	3.0
Germany	-3.4	1.0
Great Britain	-4.3	4.4
Italy	-4.7	0.8
Japan	1.0	3.3
Netherlands	-4.1	2.3
Spain	-9.7	2.2
Sweden	-8.3	2.0
United States	2.8	3.0

GTAP6 – rates based on GTAP6 data: taxes on primary factors (rTF).

The sector specific taxes in Table 3 are rTF taxes only. In addition to these sector specific rates, taxes on land in all these countries only apply for the Food sector and taxes on natural resources only for the Manufactures sector.

References

- Babiker, M., G. Metcalf, and J. Reilly, "Tax Distortions and Global Climate Policy," *Journal of Environmental Economics and Management*, 46 (2003): 269-287.
- Mendoza, E., A. Razin, and L. Tesar, "Effective Tax Rates in Macroeconomics: Cross-Country Estimates of Tax Rates on Factor Incomes and Consumption," *Journal of Monetary Economics*, 34(1994): 297-323.

Appendix: Tax Rate Calculations Using Data From OECD Datasets

Tax rates are based on formulas from Mendoza et al. (1994). We use data for the Babiker, Metcalf, Reilly (BMR) tax rates from two OECD data sources: *Revenue Statistics* and *National Accounts, Vol II*.

Data from OECD *Revenue Statistics*

1100 – Taxes on income, profits and capital gains of individuals

1200 – Taxes on income, profits and capital gains of corporations

2000 – Social Security contributions

2200 – Social Security contributions of employers

3000 – Taxes on payroll and workforce

4100 – Recurrent taxes on immovable property

4400 – Taxes on financial and capital transactions

5110 – General taxes on goods and services

5121 – Excise taxes

Data from OECD *National Accounts, Vol II*

C – Private final consumption expenditure (1.2 + 1.3)

1.2 – Household final consumption expenditures from GDP: expenditure approach table

1.3 – Final consumption expenditure of NPISHs from same table

G – Government final consumption expenditure (1.4)

1.4 – Government final consumption expenditure from same table

GW – Compensation of employees paid by producers of government services (12.11)

12.11 – Compensation of employees, payable from Generation of income account of Simplified general government accounts

OSPUE – Operating surplus of private unincorporated enterprises (13.5 – 13.20)

13.5 – Gross operating surplus and mixed income from Generation of income account of Simplified accounts for households and NPISH

13.20 – Consumption of fixed capital from Capital account of Simplified accounts for households and NPISH

PEI – Household property and entrepreneurial income (13.8 – 13.9)

13.8 – Property income, receivable from Distribution of income account of Simplified accounts for households and NPISH

13.9 – Property income, payable from Distribution of income account of Simplified accounts for households and NPISH

W – Wages and salaries (3.8)

3.8 – Wages and salaries from GDP: income approach table

OS – Operating surplus of the economy (3.15 – 4.6)

3.15 – Gross operating surplus and mixed income from GDP: income approach table

4.6 – Consumption of fixed capital from Disposable income table

The numbers in parentheses are the item numbers from the NA data. For example, the formula for C (1.2 + 1.3) means that variables 2 and 3 from Table 1 are added to form C.

The tax rate formulas then are

Consumption:
$$\tau_c = \frac{5110 + 5121}{C + G - GW - 5110 - 5121}$$

Income:
$$\tau_I = \frac{1100}{OSPUE + PEI + W}$$

Labor:
$$\tau_L = \frac{\tau_I W + 2000 + 3000}{W + 2200}$$

Capital:
$$\tau_K = \frac{\tau_I (OSPUE + PEI) + 1200 + 4100 + 4400}{OS}.$$