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Computing Tax Rates for Economic Modeling: *A Global Dataset Approach*

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Abstract

Much work on climate policy has shown that there can be significant tax interaction effects that affect the cost of climate policy. Many modeling exercises that examine climate policy costs rely on data compiled by the Global Trade Analysis Project (GTAP). Maintaining and improving the GTAP data set is a massive effort, and the construction of tax data is one area that has not received significant attention. We use global data sets on tax collections and the tax base, available for most major countries of the world, to develop revised estimates of capital, labor, and consumption tax rates for 57 major countries that account for the major share of gross world product. We also aggregate these tax rates to the regions we use in the Emissions Prediction and Policy Analysis (EPPA) model. We compare the revised tax rates with those in the GTAP data set and discuss reasons for the differences and the need for further work to resolve remaining discrepancies. While the data we use is far from ideal, we believe the revised tax rates we estimate represent an improvement particularly for global or multi-country analyses where consistency across countries is an important consideration.

This note describes a procedure to calculate national tax rates on capital and labor income and consumption using global datasets to supplement GTAP6 data that do not fully account for taxes (see Gurgel *et al.*, 2006). An advantage of this procedure is that tax data for countries are constructed using a consistent methodology. For global economic models such as the Emissions Prediction and Policy Analysis (EPPA) model such consistency can be important for making comparisons across countries and considering international linkages.

Our procedure extends the approach proposed by Babiker, Metcalf and Reilly (2003), hereafter referred to as BMR, to non-OECD countries relying mainly on the World Development Indicators from the World Bank. Part 1 of the note describes the tax rate construction and the data sources. Tax rates constructed using this approach are hereafter referred to as GDA rates (for this Global Dataset Approach) to distinguish them from GTAP6 rates and BMR rates constructed using OECD data. Part 2 summarizes the GDA national tax rates and compares them to tax rates for OECD countries using the BMR methodology. Part 3 describes the aggregation of national results into tax rates at the regional scale using regions as defined in the EPPA model. We conclude with an assessment of the GDA methodology.

1. TAX RATE CONSTRUCTION

We compute tax rates for consumption, labor income, and capital income, in 2001. Our base year is chosen to be consistent with GTAP6 data, on which EPPA is based. In general, each rate is defined as the ratio of tax collections over the relevant tax base exclusive of taxes paid by individuals:

$$Tax\ Rate = \frac{Tax\ Collections}{Tax\ Base}$$

All data on tax collections come from the IMF Government Finance Statistics (IMF, 2002, 2004, and 2005). These tax collections correspond to taxes paid in 2001, and are reported in 2001 local currency units (LCUs). The specific IMF variables used are listed in **Table 1**.

Table 1. IMF Tax Rate Variables.

Variable	Code	IMF Table No.
Individual Income Tax Collections	*PT*	1111 (1.1)
Corporate Income Tax Collections	*CT*	1112 (1.2)
Social security contributions	*SST*	121 + 122 (2)
Social security contributions of employers	*SSE*	(2.2)
Taxes on payroll and workforce	*WT*	112 (3)
Taxes on property	*KT*	113 (4)
General taxes on goods and services	*GST*	1141 (5.1)
Excise taxes	*ET*	1142 (5.2)

Table numbers in parentheses refer to the classification number before the 2001 classification change (first applied in the 2003 report).

In addition to tax data, we need data on the tax bases. Here we rely on the World Development Indicators from the World Bank (World Bank, 2003). The relevant variables are described in **Table 2**.

Table 2. World Bank Tax Base Variables.

Variable	Code
Employment in agriculture (% of total employment)	*Agr*
Employment in industry (% of total employment)	*Ind*
Employment in services (% of total employment)	*Ser*
General government final consumption expenditure (in 2001 LCU)	*G*
Gross capital formation (in 2001 LCU)	*GCF*
Labor force, total	*Lab*
Household final consumption expenditure (in 2001 LCU)	*C*
Compensation of government employees (in 2001 LCU)	*GE*
Official exchange rate (2001 LCU per US$)	*M*
Unemployment, total (% of total labor force)	*RU*

In addition to the above data, we need a measure of total wages and salaries (W), a variable not provided in the World Development Indicators. We use two methods to assess W: an approximation using data from the World Bank (World Bank, 2006) that are available for a significant number of countries and a more recent study conducted by the U.S. Import Administration (Import Administration, 2003) for a limited number of countries. The Import Administration study assesses 2001 wages using figures reported between 1996 and 2001 by the International Labor Office. **Appendix A** discusses in detail these two estimates of total wages. We choose the Import Administration estimate whenever data are available as we view these estimates as superior to the estimates we derive from World Bank data.

Using the codes from Tables 1 and 2, the tax rate for consumption (t_C) is defined as:

$$t_C = \frac{GST + ET}{C + G - GE - GST - GT}$$

The data provided by the IMF and the World Bank are therefore sufficient to compute this rate. The tax rates for income (t_I), labor income (t_L) and capital (t_K) also require our estimate of wages and salaries:

$$t_I = \frac{PT}{W + GCF}$$

$$t_L = \frac{t_I W + SST + WT}{W + SSE}$$

$$t_K = \frac{t_I GCF + CT + KT}{GCF}$$

2. NATIONAL TAX RATES

Table 3 shows the consumption, labor and capital tax rates given by the GDA methodology described in section 1. GDA is applied to only about forty countries, but tax rates could also be calculated for additional countries by reporting more data from the IMF. The BMR figures are also provided when available. As explained in **Appendix B**, the BMR approach is more accurate than GDA, since the former relies on more comprehensive data. BMR figures can be used to assess the accuracy of the GDA data and could replace them in those countries where both data are available.

Table 3. Country Tax Rates (percentage). (*Table continues on next page.*)

	Consumption tax rate		Income Tax Rate		Labor Tax Rate		Capital tax rate	
Country	**BMR**	**GDA**	**BMR**	**GDA**	**BMR**	**GDA**	**BMR**	**GDA**
Argentina		6.2		4.9		10.6		33.7
Australia	12.5	9.3	21.0	14.2	25.3	17.5	41.9	51.8
Austria	19.4	17.0	18.3	17.4	51.9	54.3	31.0	34.5
Bahrain		0.2						13.0
Bangladesh		6.9		2.2				5.4
Belgium	16.9		23.9		49.6		52.3	
Brazil		3.8		0.3		9.9		5.1
Canada	12.6		22.7		33.4		44.3	
Chile		18.0		5.0		10.4		21.0
China		10.8		0.4		0.4		3.1
Colombia		7.2		0.7		2.9		43.7
Czech Republic		13.0		5.8		40.2		18.5
Denmark	36.1		47.6		52.2		48.0	
Finland	27.3	21.8	29.3	22.4	49.5	40.8	37.7	48.6
France	18.2	15.9	13.9	16.0	45.4	57.2	42.4	52.7
Germany	15.5	13.5	15.1	13.0	41.8	38.7	22.2	19.9
Greece	19.7		8.1		44.0		19.5	
Hong Kong, China		0.7		5.0		5.0		22.4
Hungary	27.7		22.0					
Iceland	26.2	22.6	26.5	31.6				43.7
India		4.5		2.9		3.1		10.7
Indonesia		6.8		0.9		1.2		21.9
Iran, Islamic Rep.		1.3		3.8				13.5
Ireland	25.3		23.3					
Italy	15.1		17.5		45.6		35.0	
Japan	6.9		9.4		28.4		42.3	
Korea, Rep.	14.1	11.5	5.3	3.2	14.9	8.2	22.8	14.1
Kuwait								3.7
Luxembourg	26.5		16.5					

Table 3. (*continued*)

	Consumption tax rate		Income Tax Rate		Labor Tax Rate		Capital tax rate	
Country	**BMR**	**GDA**	**BMR**	**GDA**	**BMR**	**GDA**	**BMR**	**GDA**
Malaysia		7.1		4.1		4.1		42.7
Mexico	8.5	6.2	7.0	4.7	17.5	9.7	6.8	17.2
Morocco		11.4		13.0				26.1
Netherlands	21.0		11.6		41.6		36.0	
New Zealand	18.4		38.2					
Norway	32.6		24.7		43.4		38.4	
Peru		11.5		2.5		4.8		12.3
Philippines		4.4		3.3		3.3		17.7
Poland	17.8		11.0		37.5		15.5	
Portugal	22.3		10.9		33.1		33.6	
Romania		8.9		1.1		2.8		9.6
Russian Federation		18.8		5.1		25.6		38.0
Singapore		4.0		5.3		5.3		24.6
South Africa		12.7		11.5		12.5		56.4
Spain	14.2		10.1		29.6		24.5	
Sri Lanka		14.4		1.8		2.4		11.2
Sweden	26.0	19.6	31.5	26.5	56.6	48.3	53.2	55.6
Switzerland	10.3	8.8	12.1	11.0	23.0	22.2	49.8	35.5
Thailand		12.0		3.8		5.8		17.9
Turkey	25.5	15.1	27.3	16.6		16.6		36.8
Uganda		5.4		5.9				12.2
United Arab Emirates		2.2		0.0				
United Kingdom	15.7	14.4	17.1	12.8	28.0	22.6	55.4	46.2
United States	4.7	5.6	17.4	18.4	29.5	31.6	37.6	44.3
Uruguay		13.3		3.5		19.5		30.2
Venezuela, RB		8.8		0.3		2.2		16.5
Vietnam		7.9		0.4		0.4		19.6
Zambia		6.4		11.9				16.8

We discuss differences between the BMR and GDA rates for those countries in which we can construct both rates in Appendix B. Note also that we have chosen to use non-GTAP data for both the total tax revenue and the tax base (*i.e.* wage and capital income). There are fairly large differences between our estimates of the tax base and the data in GTAP as we show in **Appendix C**. Particularly for the OECD countries we believed we had solid data on both tax revenue and the tax base. Using both the tax revenue and tax base data thus, in our view, provided a superior estimate of the tax rate. In terms of the distortionary effect of taxes it seemed most important to get the best estimate of the tax rate. However, to the extent that we apply these rates in our model with the GTAP data set and then tax base (*e.g.*, wage or capital income) the total tax revenue generated by these tax rates will not equal the revenue estimates we have. For our purposes we are less interested in getting the total tax revenue correct. Of course the total size of the tax base also affects estimates of distortionary effects of taxes as well. Clearly further improvements in the GTAP representation of taxes should seek to reconcile differing estimates of tax rates, revenues, and the tax base to which these rates apply.

3. AGGREGATION INTO EPPA REGION TAX RATES

Most global economic models aggregate countries into larger regions which become the unit of analysis in their economic model. Here we describe the aggregation procedure for the EPPA regions. The tax rate at the EPPA region level is also the ratio of tax collections over the corresponding tax base. The region tax collections are the sum of the national tax collections and the tax base measure is the sum of national tax bases. The tax calculation formula applied in Table 4 is therefore:

$$\text{Region tax rate} = \frac{\sum_{\substack{\text{Countries in} \\ \text{the EPPA region}}} \textit{National tax collections}}{\sum_{\substack{\text{Countries in} \\ \text{the EPPA region}}} \textit{National tax bases}}$$

Regional tax rates are constructed using countries within that region for which we have complete tax collection and base data. In cases where data for the BMR and GDA rates exist, we use the BMR data.

A rate of "region coverage" is also computed to give an idea of the data breadth the tax calculation is based on. More specifically, this ratio gives the share of the region's GDP that is taken into account in the tax calculation. For example, the region coverage rate amounts to 90% for ANZ labor taxes because we have data on labor taxes in Australia, but not in New Zealand (which accounted for 10% of the ANZ GDP in 2000). We present regional tax rates as well as coverage in Table 4. As would be expected, our coverage is better in developed than developing countries.

Table 4. EPPA Region Tax Rates (percentage).

	GDA Tax Rate			Region coverage		
Region	**Consumption**	**Labor**	**Capital**	**Consumption**	**Labor**	**Capital**
USA	4.7	29.5	37.6	100	100	100
CAN	12.6	33.4	44.3	100	100	100
MEX	8.5	17.5	6.8	100	100	100
JPN	6.9	28.4	42.3	100	100	100
ANZ	13.2	25.3	41.9	100	90	90
EUR	17.4	39.7	36.8	100	99	99
EET	17.4	31.5	15.5	84	74	74
FSU	18.8	25.6	38.0	69	69	69
ASI	11.3	11.7	23.9	100	100	100
CHN	9.3	1.0	4.8	100	100	100
IND	4.5	3.1	10.7	100	100	100
IDZ	6.8	1.2	21.9	100	100	100
AFR	12.2	12.5	46.5	47	43	47
MES	1.4	-	11.9	43	0	54
LAM	5.7	9.0	15.2	83	83	83
ROW	19.0	9.9	24.6	51	45	51

Finally, **Table 5** compares the GDA and GTAP6 tax rates at the EPPA Region level. Appendix B of Technical Note 7 (Gurgel *et al*., 2006) describes how GTAP6 figures are computed; the labor and capital tax rates correspond to the so-called accumulated "ACC" rates. As for consumption taxes, the GTAP6 rate we give here is a weighted average of the rates for domestic and imported consumption. More precisely, we add the domestic consumption to the imported consumption, under two distinct price assumptions: at "market" prices (*i.e*. taxes excluded) and at "agent" prices (*i.e.* taxes included). The total agent consumption is for example:

$$Consumption_{agent} = Consumption_{agent,\ domestic} + Consumption_{agent,\ imported}\ .$$

The GTAP6 consumption tax rate is then: $\dfrac{Consumption_{agent} - Consumption_{market}}{Consumption_{market}}$.

Table 5. Comparison between GDA and GTAP tax rates (percentage).

	Consumption		Labor		Capital	
Region	**GDA**	**GTAP6**	**GDA**	**GTAP6**	**GDA**	**GTAP6**
USA	4.7	0.4	29.5	35.4	37.6	8.5
CAN	12.6	10.0	33.4	40.4	44.3	11.5
MEX	8.5	0.3	17.5	6.1	6.8	8.5
JPN	6.9	4.3	28.4	28.4	42.3	13.6
ANZ	13.2	7.0	25.3	27.3	41.9	14.2
EUR	17.4	9.4	39.7	54.2	36.8	8.1
EET	17.4	6.7	32.5	47.7	13.7	5.8
FSU	18.8	1.2	28.9	23.7	32.9	8.5
ASI	11.3	1.6	12.5	13.5	22.3	6.5
CHN	9.3	-	2.2	1.1	3.9	1.2
IND	4.5	1.9	5.4	3.3	7.7	3.4
IDZ	6.8	–0.1	1.4	6.2	21.0	8.6
AFR	12.2	3.3	15.3	14.2	34.6	13.8
MES	1.4	3.3	-	25.0	8.6	7.4
LAM	5.7	10.0	9.5	18.4	13.8	9.2
ROW	19.0	3.1	16.1	17.9	15.5	7.8

The comparison at the EPPA Region level in Table 5 thus enables us to refine the observations from Technical Note 7 (Gurgel *et al*., 2006):

(1) GTAP6 capital tax rates seem too low, probably because GTAP6 attributes all income taxes to labor whereas GDA distributes them between capital and labor.

(2) GTAP6 consumption tax rates are in many cases significantly lower than GDA rates; they even seem unrealistically low for regions such as the United States.

(3) At the EPPA region level, GTAP6 labor taxes appear to be on average higher than GDA rates, which is consistent with the interpretation for low capital rates, namely that income taxes are not spread between capital and labor.

4. SUMMARY

Much work on climate policy has shown that there can be significant tax interaction effects that affect the cost of climate policy. Maintaining and improving the GTAP data set is a massive effort, and the construction of tax data is one area that has not received significant attention. The purposes of this note were two-fold: (1) to develop and document our best estimates of tax rates at the regional level for our EPPA model to replace those in the GTAP data base; (2) to explore further the BMR approach for estimating tax rates, extending the approach to developing countries to see whether this approach could improve the standard GTAP data set. This led us to compare our estimates of taxes rates with those in GTAP and try to show where differences exist and how they arise. The BMR approach is based on the assumption that total tax collections and the tax base can be used to infer an effective tax rate. As such it is an average rate. The premise is that data on tax collections and revenue are relatively well reported and thus provide a better estimate of the effective rate than trying to deduce an average rate from those in tax codes. The approach does not attempt to separately identify who actually pays the tax. For example, in the U.S. employers pay part of the social security tax and part is deducted from the employee's pay check. While for some purposes it may be useful to separately identify the employer and employee contribution, economic theory concludes that the incidence of the tax is the same regardless of whether employee or employer pays the tax. For our modeling purposes we are concerned with measuring the economic burden of the tax rather than the statutory burden.

We believe we have developed global tax data set that is superior to that in the standard GTAP data set. Given that the GTAP data is contributed from different sources, with individual research groups in different countries providing data for different countries and regions, an aspect of the data is that quality and attention to different aspects of the data can vary by country. This appears to have generated some large inconsistencies in apparent tax rates among countries in the GTAP data in many cases. Our approach has instead tried to use a couple of major international sources for tax and tax base data for all countries on the assumption that these international data sets bring some consistency among countries in reporting, and thus differences in tax rates among countries represent real differences. That said, however, it may be the case that for some countries for which detailed country-specific tax data exist our approach leads to less precise estimates than those in the GTAP data.

Our estimates of tax revenues, the tax base, and tax rates often differ substantially from those provided in GTAP. In the end, we apply the rates we have estimated to the GTAP data (and the tax base reported in the data) and so this leads to some inevitable inconsistencies. Thus, there clearly remains the need for more effort to improve the representation of taxes in GTAP and models that use the GTAP data.

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APPENDIX A. Estimates of Total Wages and Salaries

Our approach for the GDA data uses two methods to estimate the total wages and salaries, *W*: the first is based on data from the U.S. Import Administration, and the second relies on data from the World Bank.

1. Estimate based on data from the U.S. Import Administration

The U.S. Import Administration (Import Administration, 2003) provides the average wage in manufacturing (hereafter called *IAManufWage*) in 2001 dollars for about 50 countries. Assuming that this wage is relevant to both the secondary and tertiary sectors, and assuming that the agricultural wage can be neglected with regard to the high manufacturing wages, the work force that corresponds to this IA wage is:

$$WorkForce = LabForce * (1 - Unemplt) * (EmpltInd + EmpltSer).$$

Total wages and salaries (in 2001 LCUs) then amount to:

$$W = IAManufWage * WorkForce * r$$

using the notation for variables as in Table 2.

Table 6 compares these total wage estimates to OECD data (OECD, 2005): in most cases, the approximation using IA figures overestimates wages, despite the absence of agricultural wages.

Table 6. Comparison of IA Wage Estimate with OECD Data.

	Wage†		Difference		Wage†		Difference
Country	**IA Approx**	**OECD data**	(%)	**Country**	**IA Approx**	**OECD data**	(%)
Australia	384	306	–20	Mexico	1.72 T	1.89 T	10
Austria	84	88	4	Netherlands	284	178	–37
Belgium	100	100	0	New Zealand	68	52	–24
Canada	636	505	–21	Norway	656	557	–15
Finland	60	52	–12	Poland	267	282	6
France	467	574	23	Spain	370	335	–10
Germany	1.21 T	903	–25	Sweden	1.14 T	962	–15
Greece	41	34	–18	Switzerland	268	267	–1
Ireland	38	44	15	Turkey	47.3	50.6	7
Japan	2.16 T	2.33 T	8	United Kingdom	677	486	–28
Korea, Rep.	4.06 T	2.70 T	–33	United States	4.73 T	4.95 T	5

† All currency amounts are in billions of LCUs unless indicated as trillion (T) in table.

2. Estimate based on data from the World Bank

As an alternative, we rely on data from World Bank (2006), adjusted to take inflation into account, as described in **Table 7**.

Table 7. Additional Parameters from World Bank Data.

Variable	Description
WageAgr	Agricultural Wage, adjusted to 2001 dollars using the U.S. CPI
ManufLabCost	Labor Cost per Worker in Manufacturing, adjusted to 2001 dollars using the U.S. CPI

The average wage (in 2001 dollars) is then defined as:

$$\bar{w} = WageAgr * EmpltAgr + ManufLabCost * (EmpltInd + EmpltSer)$$

Total wages and salaries (in 2001 LCUs) then amount to:

$$W = \bar{w} * LabForce * (1 - Unemplt) * r$$

This approximation gives poorer wage estimates than the IA approach (see the comparison with OECD countries in **Table 8**), mainly because the data are often old (some date back to the 1980s) and incomplete. We use these data mainly for non-OECD countries (for which no IA data are available), the non-OECD labor tax rates should be taken with great caution.

Table 8. Comparison of the WB Wage Estimate to OECD Data.

	Wage†		Variation		Wage†		Variation
Country	**WB Approx**	**OECD data**	(%)	**Country**	**WB Approx**	**OECD data**	(%)
Australia	496	306	–38	Korea, Rep.	3.48 T	2.70 T	–22
Austria	141	88	–38	Mexico	2.59 T	1.89 T	–27
Belgium	136	100	–26	Netherlands	366	178	–52
Canada	853	505	–41	New Zealand	93	52	–45
Denmark	809	666	–18	Norway	853	557	–35
Finland	84	52	–38	Poland	121	282	134
Germany	1.705 T	903	–47	Portugal	39	48	23
Greece	63	34	–46	Spain	420	335	–20
Hungary	4.56 T	5.16 T	13	Sweden	1.53 T	962	–37
Ireland	51	44	–15	Turkey	206	51	–75
Italy	1007	363	–64	United Kingdom	585	486	–17
Japan	2.94 T	2.33 T	–21	United States	5.05 T	4.95 T	–2

† All currency amounts are in billions of LCUs unless indicated as trillion (T) in table.

APPENDIX B. Comparison between the BMR and GDA Approaches

Our JP Technical Note No. 7 (Gurgel *et al*., 2006) describes our construction of BMR tax rates for OECD countries. A comparison between the BMR and GDA methods is possible for several OECD countries for which both sets of tax rates were constructed (see **Table 9**).

In general, GDA consumption tax rates are lower than the BMR estimates, essentially because the IMF estimate of the government employee compensation is lower than the OECD estimate.

Variations in income tax rates were expected given the approximation in the estimate of total wages, and given the change in capital base (GCF for GDA *vs*. OSPUE + PEI for BMR).

Capital tax rates are fairly close to those calculated through BMR. The large positive variation for Mexico is an artifact due to different assumptions in the distribution of income tax collections between individuals and corporations.[1]

Finally, GDA labor tax rates follow the variations in income tax rates, for the OECD countries from Table 9. However, as already mentioned in Appendix A, GDA labor taxes are very rough for most non-OECD countries, because of the need to approximate wages and salaries when no IA data are available.

Table 9. Comparison of BMR and GDA Tax Rates (percentage).

	Consumption tax rate			Income Tax Rate		
Country	**BMR**	**GDA**	**Variation** (%)	**BMR**	**GDA**	**Variation** (%)
Australia	12.5	9.3	–26	21.0	14.2	–32
Austria	19.4	17.0	–12	18.3	17.4	–5
Finland	27.3	21.8	–20	29.3	22.4	–23
France	18.2	15.9	–13	13.9	16.0	16
Germany	15.5	13.5	–13	15.1	13.0	–14
Korea, Rep.	14.1	11.5	–18	5.3	3.2	–40
Mexico	8.5	6.2	–27	7.0	4.7	–33
Sweden	26.0	19.6	–24	31.5	26.5	–16
Switzerland	10.3	8.8	–15	12.1	11.0	–9
United Kingdom	15.7	14.4	–8	17.1	12.8	–25
United States	4.7	5.6	21	17.4	18.4	6
	Labor Tax Rate			**Capital tax rate**		
	BMR	**GDA**	**Variation** (%)	**BMR**	**GDA**	**Variation** (%)
Australia	25.3	17.5	–31	41.9	51.8	24
Austria	51.9	54.3	5	31.0	34.5	11
Finland	49.5	40.8	–18	37.7	48.6	29
France	45.4	57.2	26	42.4	52.7	24
Germany	41.8	38.7	–7	22.2	19.9	–10
Korea, Rep.	14.9	8.2	–45	22.8	14.1	–38
Mexico	17.5	9.7	–45	6.8	17.2	154
Sweden	56.6	48.3	–15	53.2	55.6	5
Switzerland	23.0	22.2	–3	49.8	35.5	–29
United Kingdom	28.0	22.6	–19	55.4	46.2	–16
United States	29.5	31.6	7	37.6	44.3	18

[1] Our data does not provide individual and corporate income taxes separately for Mexico (*i.e.* we know 1111+1112, but not 1111 and 1112 separately). BMR attributes all the aggregate to individual taxes (1111), whereas GDA spreads the aggregate half and half between 1111 and 1112.

APPENDIX C. Differences in the Tax Base for the Labor Tax

Table 10 shows the differences in the tax base (*i.e.* wage income and employer contributions for social insurance) for the labor tax between our estimate and the tax base in the GTAP data. As shown the differences can be quite large even for the developed OECD countries where we believe the data we have used is fairly solid. There appears to be no consistent error—in some cases the GTAP wage tax base is much lower, and in other cases much higher than the data we have assembled. Nor is there a consistent pattern for OECD and non-OECD countries, although in our case the data for developing countries is often much weaker.

Table 10. Comparison of Labor Tax Base (in 2001 million dollars), our estimate and GTAP's.

	Our estimate				GTAP			difference (%)	
Country	Wage data source	Wages	Social security, employers	Total labor tax base	VOA	VFM	VFA	VFA–Total labor tax base	VFM – Wages
Argentina	IA	134,977	7,362	142,339	101,140	109,691	121,652	–15	–19
Australia	OECD	158,276	0	158,276	140,997	184,805	192,477	22	17
Austria	OECD	78,471	14,847	93,318	27,509	46,504	80,299	–14	–41
Belgium	OECD	89,494	0	89,494	68,724	99,246	134,273	50	11
Botswana	IA	758	0	758	2,780	2,869	2,870	278	278
Brazil	IA	263,178	141,951	405,129	192,763	194,400	248,265	–39	–26
Bulgaria	IA	2,644	0	2,644	4,887	5,372	6,448	144	103
Canada	OECD	325,917	0	325,917	227,287	318,509	371,079	14	–2
Chile	IA	19,844	0	19,844	23,002	23,002	24,166	22	16
China	WB	307,053	0	307,053	525,576	531,364	531,364	73	73
Colombia	IA	31,533	0	31,533	45,867	46,041	46,331	47	46
Croatia	IA	8,945	0	8,945	7,476	8,345	11,130	24	–7
Czech Republic	WB	19,746	0	19,746	14,064	16,787	25,363	28	–15
Denmark	OECD	79,974	0	79,974	47,854	86,610	91,077	14	8
Finland	OECD	46,874	13,356	60,230	45,201	53,692	58,203	–3	15
France	OECD	513,858	142,356	656,215	228,152	317,069	569,134	–13	–38
Germany	OECD	808,413	168,268	976,681	456,167	628,578	916,009	–6	–22
Greece	OECD	30,347	0	30,347	57,273	62,616	63,940	111	106
Hong Kong, China	WB	42,615	0	42,615	58,390	72,276	73,863	73	70
Hungary	OECD	18,016	0	18,016	11,099	15,004	21,139	17	–17
India	IA	139,760	0	139,760	193,310	199,656	199,769	43	43
Indonesia	WB	173,338	0	173,338	41,574	43,440	44,294	–74	–75
Ireland	OECD	39,112	0	39,112	38,421	48,800	54,067	38	25
Italy	OECD	325,197	0	325,197	188,624	316,469	455,874	40	–3
Japan	OECD	1,918,464	0	1,918,464	1,646,694	1,866,437	2,217,978	16	–3
Korea, Rep.	OECD	209,505	8,401	217,906	167,417	181,445	190,215	–13	–13
Latvia	WB	373	0	373	3,116	3,561	4,292	1052	855
Malaysia	IA	39,420	0	39,420	39,761	41,837	42,309	7	6
Mexico	OECD	202,419	0	202,419	165,495	165,495	175,554	–13	–18
Netherlands	OECD	158,911	0	158,911	90,396	115,559	189,512	19	–27
New Zealand	OECD	21,666	0	21,666	16,114	23,058	23,211	7	6

(*Table continues on following page*.)

Table 10. (*continued*)

Country	Our estimate: Wage data source	Our estimate: Wages	Our estimate: Social security, employers	Our estimate: Total labor tax base	GTAP: VOA	GTAP: VFM	GTAP: VFA	difference (%): VFA–Total labor tax base	difference (%): VFM – Wages
Peru	IA	24,606	456	25,062	14,818	15,724	16,401	–35	–36
Philippines	IA	33,813	0	33,813	18,614	20,174	20,178	–40	–40
Poland	OECD	68,917	0	68,917	49,253	57,029	80,842	17	–17
Portugal	OECD	42,997	0	42,997	47,185	53,569	63,847	48	25
Romania	WB	19,697	0	19,697	10,022	13,324	13,643	–31	–32
Russian Federation	WB	104,097	0	104,097	96,697	123,135	126,517	22	18
Singapore	IA	42,194	0	42,194	36,221	36,221	36,635	–13	–14
Slovenia	IA	7,204	0	7,204	7,549	8,294	11,199	55	15
South Africa	IA	74,148	526	74,673	46,942	57,914	59,659	–20	–22
Spain	OECD	299,498	0	299,498	165,631	208,167	279,525	–7	–30
Sri Lanka	IA	5,046	0	5,046	7,169	7,317	7,388	46	45
Sweden	OECD	93,137	33,343	126,480	58,210	94,299	132,748	5	1
Switzerland	OECD	157,999	6,188	164,188	80,820	107,626	141,583	–14	–32
Tanzania	WB	6,195	0	6,195	3,392	4,189	4,287	–31	–32
Thailand	IA	29,283	302	29,584	27,853	30,024	30,719	4	3
United Kingdom	OECD	699,968	61,427	761,395	562,846	710,043	837,766	10	1
United States	OECD	4,948,000	342,630	5,290,630	4,137,949	5,386,894	6,243,458	18	9
Uruguay	WB	6,456	638	7,094	4,538	4,855	6,095	–14	–25
Venezuela, RB	WB	50,115	0	50,115	47,308	47,579	48,708	–3	–5
Vietnam	WB	23,416	0	23,416	11,276	11,415	11,534	–51	–51
Zimbabwe	IA	16,978	0	16,978	3,641	4,458	4,489	–74	–74