18.E

Income and Factor Taxes

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From its first release, the GTAP Data Base has had the capability implicitly to record income and factor employment tax payments. Factor employment taxes denotes such taxes as payroll tax, social security levies, and land taxes. Although no arrays have represented these data explicitly, they are implicit as the difference between different valuations of primary factor flows. Income tax, by factor (endowment commodity) and region is the difference between market value *VFM* (summed over industries) and agents' value *EVOA* (where the agents are owners of factors); factor employment tax, by factor, industry, and region is the difference between market value *VFM* and agents' value *EVFA* (where agents are employers of factors).

In early releases however this capability was unused; the relevant valuations were equated, so that the implicit tax payments were zero. In GTAP 5, the capability was used, but in a limited way, to represent land-based and capital-based components of domestic support to agriculture (Dimaranan, 2002). These are represented as negative income tax payments, that is, as income subsidies. This still leaves unrepresented income taxes ordinarily so called, and factor employment taxes.

In GTAP 6, for the first time, we incorporate into the data base comprehensive data for income and factor employment taxes. Our principal data source is the International Monetary Fund's *Government Finance Statistics* (IMF 2003*a*). This provides a relatively wide country coverage, with 106 countries nominally covered, though for some countries the series coverage is patchy, and for later years there are many missing observations. We extract five series: taxes on income and profits, corporate; taxes on income and profits, individuals; social security contributions; taxes — payroll, manpower; and taxes on property. We sum the fourth and fifth items, that is,"taxes — payroll, manpower", and "taxes on property", to calculate total factor employment tax excluding social security contributions.

To deal with the missing observations problem, we extract data for 1997, the latest year for which data are available for most countries in the data set. Since our reference year is 2001, this creates an obvious comparability problem. To address this, we convert the data from money values to ratios to GDP, taking GDP from the IMF's *International Financial Statistics* (IMF 2003*b*). These we hope are relatively stable over time.

We now fill in data for the missing countries, to extend the country coverage from the initial 106 to the 226 standard GTAP countries. This is done by calculating average tax-to-GDP ratios across the present 106 countries, and applying them to the missing countries. We then aggregate from standard GTAP countries to GTAP regions.

Table 18.E.1 shows the regions not covered or only partly covered in the source statistics. The table reports a coverage status, defined as the share in regional GDP accounted by uncovered countries. The coverage status therefore lies between 0 and 1, with lower numbers better, and a status of 0 representing complete coverage. Sixty-one regions have complete coverage; to save space we omit these from the table. The regions included are then most of the composite regions (all except "rest of SACU"), with coverage status typically strictly between 0 and 1, and nine primary regions, with coverage status of 1.

Table 18.E.1 Coverage Status by GTAP Region

Region	Coverage	Region	Coverage
Rest of Oceania	0.66	Rest of EFTA	0.00
Hong Kong	1.00	Rest of Europe	1.00
Taiwan	1.00	Albania	1.00
Rest of East Asia	1.00	Romania	1.00
Rest of South East Asia	1.00	Russia	1.00
Bangladesh	1.00	Rest of former Soviet Union	0.28
Rest of South Asia	0.24	Rest of Middle East	0.50
Rest of North America	0.68	Rest of North Africa	0.16
Rest of Andean Pact	0.69	Malawi	1.00
Rest of South America	0.27	Mozambique	1.00
Central America	0.09	Tanzania	1.00
Rest of FTAA	0.13	Rest of SADC	0.74
Rest of Caribbean	1.00	Rest of Sub-Saharan Africa	0.76

We now incorporate these regional tax ratios into the main GTAP data file. For each region, we calculate GDP from the I-O data; multiplying this by the tax ratios gives us the taxes as money values.

We need now to map from our *GFS* data series to GTAP primary factors (endowment commodities). For taxes on factor employment, we assign all social security contributions to labor, and distribute them *pro rata* between skilled and unskilled labor. All other factor employment taxes we assume to bear equally on all factors, so we distribute them *pro rata* across all five GTAP primary factors (the two kinds of labor, capital, agricultural land, and natural resources). In future versions, it should be possible to improve on this treatment, by mapping "taxes — payroll, manpower" to labor, and property taxes to the non-labor factors.

For income taxes, we assign personal income tax to the two labor primary factors, and corporate income tax to the three non-labor primary factors. Whether this is the best treatment is unclear. Certainly, in almost all countries, personal income tax includes in principle income from both labor services and capital; in assigning it all to labor, we take the (disputable) view that in practice, recipients of non-labor income have much better access to arrangements for tax avoidance.

For factor employment taxes, we allocate not only across factors but also across industries. We assume that the rate of tax is uniform across industries.

Finally, we must consider the relation between land- and capital-based domestic support to agriculture and income tax. We take the view that these are separable, more specifically, that the GFS tax estimates do not include domestic support to agriculture. Our final income taxes are therefore the sum of GFS income tax and land- and capital-based domestic support. Although it makes no difference to the operation of the model, for the information of users we record the domestic support values separately in the array *FBEP* in the data file.

References

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