

Chapter 6

Macroeconomic Data

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This chapter provides an overview of the macroeconomic features of the GTAP 10 Data Base. We will first present how the macroeconomic data base is collected and processed. Then, the section will focus on highlighting the salient features of the uses of Gross Domestic Product in the construction of the GTAP Data Base.

6.1 Data Sources and Processing

Our primary source of macroeconomic data is the World Development Indicators (WDI).¹ This World Bank data is a suitable source of data for GTAP since it covers a wide range of countries and which data is already reconciled for statistical discrepancies. From the World Bank data base, we obtained data on GDP, GDP aggregates (private consumption, government consumption, and gross fixed capital formation), and population.² The GDP and GDP aggregates data are in millions of current US dollars. For some countries, GDP and population data were not available in WDI, for those countries we compiled data from other sources such as the UN Statistics Division and the CIA World Factbook among others.

The construction of the GTAP Data Base does not directly require data on exchange rates. All the coefficients in the regional I-O tables are simply scaled up to match the GDP reference year. Since most the GDP data comes from the World Bank's data base, the underlying exchange rate is the Atlas conversion factor³ that is used by the World Bank in its national accounts data.

Estimates of the GDP aggregates were generated for the countries for which only GDP and population data are available. This was done by first mapping the 249 countries with a smaller number of 19 geographic regions. For each geographic region, the average share of each GDP aggregate to total GDP was calculated for the countries for which GDP aggregates data are available. Estimates of the GDP aggregates were then generated for the countries with no GDP aggregates data by multiplying GDP of each country with the average share of the aggregate in the geographic region to which the country belongs. The estimates for each GDP aggregate were then summed up for each GTAP region after estimates have been

¹ WDI reports calendar year data, for the methodology behind please refer to this document: <http://data.worldbank.org/sites/default/files/wdi-2013-backmatter.pdf>

² Retrieved July 2016 data, see WDI Archives.

³ The Atlas conversion factor for any year is the average of a country's exchange rate (or alternative conversion factor) for that year and its exchange rates for the two preceding years, adjusted for the difference between the rate of inflation in the country and, for 2001 onwards, that in countries including the Euro Zone, Japan, the United Kingdom, and the United States. A country's inflation rate is measured by the change in its GDP deflator (<http://www.worldbank.org/data/aboutdata/working-meth.html>).

generated for the data gaps. This practice is based on the assumption that a country would have a similar macroeconomic profile to its neighboring countries. Since GTAP 6 Data Base, GDP aggregates (private consumption, gross fixed capital formation, and government consumption) are scaled in order to maintain consistency of the collected GDP data with the reconciled trade data (see Chapter 9). The reconciled trade data do not match the total exports and imports in the World Bank dataset, therefore, if we do not scale the GDP aggregates, the resulting final GDP will be different than that of World Bank's GDP totals.

Finally, we would like to highlight the fact that since Version 7, the GTAP Data Base has released updates for the 2004 reference year. While some data remain the same, there are some notable changes. The first major difference is the expansion of standard country set from 226 to 244 that occurred between version 7 and 8. The additional composite regions are composed of small countries (both in terms of GDP and population) and are not countries for which we have input output (I-O) tables. The second issue is that the composition of GTAP composite regions changes when we receive a new I-O table, a fact we should keep in mind when comparing version 7 against Versions 8 or 9. Third, for the remaining regions the 2004 base year data in Version 8 represents a substantial improvement to that of Version 7 data base. For Version 7 we used World Bank data for 130 countries, leaving us to collect data from other sources for the other 96 countries. For Versions 8 and 9, the WDI had both expanded its country coverage and updated the 2004 macroeconomic data. As a result, we collected GDP data for 190 countries from WDI and 54 from other sources.

For version 10, there was an expansion of standard country set from 244 to 249 that occurred between versions 9 and 10. The additional 5 regions are small countries (both in terms of GDP and population) and are not countries for which we have I-O tables. For the year 2014, we collected GDP data for 186 countries from WDI and 63 from other sources. For the year 2014, if GDP aggregates were not found in WDI, UN data aggregates were included.

For a few of the tiny countries/territories, GDP data is missing or zero, but population data is available. For such countries, we assumed the per-capita GDP to be the average per-capita-GDP of the corresponding geographical region to calculate the approximate GDP. For South Georgia and the South Sandwich Islands, Bouvet Islands, Saint Barthelemy, Bonaire, British Indian Ocean Territory, and Heard and MacDonald Islands, there was no data on GDP or sometimes population, so we assume and assigned a zero value for these territories.

6.2 *Uses of Macroeconomic Data*

During the GTAP Data Base construction process, macroeconomic data are used in various stages. The primary use of macroeconomic data is in updating the regional I-O tables to a common base year. As a first step, all the coefficients in the regional I-O tables, initially in national currency units, are scaled-up by the ratio of gross domestic product (GDP) calculated from the I-O tables to external GDP data in current US dollars. Then, data on GDP aggregates – private consumption (C), gross fixed capital formation (I), and government consumption (G) are used in the FIT process to update the values of these aggregates in the regional I-O tables (see Chapter 15.A).

Per capita GDP data are also required in the construction of input-output tables for composite regions, i.e. the aggregate regions for which input-output data are generated based on the I-O tables of the primary regions. Similar per capita GDP is used as a criterion for matching a member country in a composite region to one of the primary regions within the same geographic area (See Chapter 8.E). A combination of one or more primary region I-O tables is then used to generate an I-O table for a composite region.

Macroeconomic data are also used in extending various data sets to the standard country coverage and as weights for aggregating data from standard countries to GTAP regions. Particularly GDP and GDP

shares, are used in extending the trade datasets (Chapter 9) to the GTAP standard countries. GDP data are also used as weights for aggregating data on domestic support, factor shares (Chapter 12.A), and labor shares (Chapter 12.B) from standard countries to GTAP regions. Finally, macroeconomic data, government consumption and GDP are used to check and potentially revise the share of government consumption in each I-O table. This procedure imposes a more uniform treatment of government consumption expenditure across countries and is explained in greater detail in Chapter 8.E.

6.3 *Capital Stock and Depreciation*

The GTAP Data Base also reports data on physical capital stock and depreciation. Capital stock data was collected from the Penn World Tables version 9.04

From the Penn World Tables, we collect 167 countries for the three reference years in GTAP. Similar to the procedure for filling data gaps in the GDP aggregates data, data gaps for capital stock were filled by first calculating the average ratio of capital stock to GDP for the countries for which capital stock data are available. Estimates of capital stock were then generated for the countries with no capital stock data by multiplying GDP in each country with the average ratio of capital stock to GDP in the geographic region to which the country belongs. The capital stock estimates were then summed up for each region after estimates have been generated for the data gaps.

Capital depreciation is estimated at four percent of the physical capital stock for both base years. The last two columns of Table 6.1 present capital stock and depreciation data in millions of 2014 US dollars, respectively for the 141 regions of the GTAP 10 Data Base.

⁴ Available from: <http://www.rug.nl/research/ggdc/data/pwt/pwt-9.0>

Table 6.1 Macroeconomic Data (2014 US\$ Million)

Countries/regions	Gross Domestic Product	Private Consumption	Gross Fixed Capital Formation	Government Consumption	Capital Stock	Depreciation
Australia	1,454,845	789,054	389,153	253,985	4,981,384	199,255
New Zealand	200,142	116,630	45,640	37,951	580,812	23,232
Rest of Oceania	50,959	37,046	15,611	14,893	166,393	6,656
China	10,351,097	3,937,404	4,564,827	1,402,378	40,793,684	1,631,747
Hong Kong	291,229	190,879	67,429	27,187	1,132,088	45,284
Japan	4,596,166	2,706,347	981,496	920,294	17,727,390	709,096
Korea	1,411,313	718,271	415,916	215,735	5,433,621	217,345
Mongolia	12,226	6,915	3,488	1,589	43,893	1,756
Taiwan	530,000	214,329	170,277	72,788	1,822,670	72,907
Rest of East Asia	72,914	22,463	19,759	7,792	160,123	6,405
Brunei Darussalam	17,105	3,525	6,164	4,887	64,211	2,568
Cambodia	16,778	13,380	3,630	948	33,975	1,359
Indonesia	890,481	511,493	291,479	84,362	2,723,182	108,927
Lao People's Democratic Republic	11,716	9,119	4,205	1,926	34,128	1,365
Malaysia	338,104	170,127	84,343	43,315	985,235	39,409
Philippines	284,777	221,366	63,514	31,779	848,635	33,945
Singapore	306,344	143,513	103,926	38,594	628,390	25,136
Thailand	404,316	217,266	102,312	71,072	1,477,385	59,095
Viet Nam	186,205	147,385	53,376	14,032	509,829	20,393
Rest of Southeast Asia	67,849	30,441	21,728	11,294	104,226	4,169
Bangladesh	172,885	125,265	49,327	9,213	502,231	20,089
India	2,042,440	1,234,929	660,014	234,428	6,239,654	249,586
Nepal	19,770	18,777	5,563	2,689	54,011	2,160
Pakistan	243,383	208,431	34,584	27,925	405,233	16,209
Sri Lanka	80,028	58,938	23,771	7,241	210,554	8,422
Rest of South Asia	25,073	20,541	6,306	4,112	69,258	2,770
Canada	1,783,779	1,025,142	435,119	376,393	6,846,148	273,846
United States of America	17,348,100	11,987,010	3,403,422	2,574,956	53,848,504	2,153,940
Mexico	1,297,848	894,157	276,065	160,142	4,271,225	170,849

Table 6.1 Macroeconomic Data (2014 US\$ Million)

Countries/regions	Gross Domestic Product	Private Consumption	Gross Fixed Capital Formation	Government Consumption	Capital Stock	Depreciation
Rest of North America	8,047	4,691	1,163	2,615	29,010	1,160
Argentina	548,051	360,560	95,864	88,474	1,314,784	52,591
Bolivia	32,996	19,211	6,405	4,489	61,175	2,447
Brazil	2,417,048	1,509,522	488,253	471,792	6,651,878	266,075
Chile	258,733	165,102	59,430	33,590	776,458	31,058
Colombia	378,416	223,888	94,256	65,598	1,104,218	44,169
Ecuador	100,917	57,960	27,117	13,751	349,879	13,995
Paraguay	30,881	24,112	5,649	4,370	76,307	3,052
Peru	202,855	128,922	52,506	24,986	530,466	21,219
Uruguay	57,236	39,442	12,601	8,050	217,782	8,711
Venezuela	509,968	291,919	123,068	91,953	1,403,465	56,139
Rest of South America	13,569	7,439	4,239	1,963	37,343	1,494
Costa Rica	49,553	30,720	10,309	8,418	122,345	4,894
Guatemala	58,722	49,982	8,067	6,316	149,918	5,997
Honduras	19,380	15,048	4,133	2,915	62,756	2,510
Nicaragua	11,790	8,181	2,756	733	37,104	1,484
Panama	49,166	31,135	26,534	6,084	127,094	5,084
El Salvador	25,054	22,593	3,322	2,809	54,267	2,171
Rest of Central America	1,718	1,416	399	304	3,257	130
Dominican Republic	63,969	47,696	13,537	7,161	199,519	7,981
Jamaica	13,927	11,918	3,082	2,072	43,463	1,739
Puerto Rico	103,676	80,805	11,754	14,179	323,546	12,942
Trinidad and Tobago	28,874	15,133	3,473	3,278	90,109	3,604
Caribbean	122,337	84,147	19,564	38,927	381,896	15,276
Austria	436,888	239,934	99,615	88,733	1,677,727	67,109
Belgium	531,232	306,449	137,989	144,308	2,040,036	81,601
Bulgaria	56,716	37,822	12,684	9,901	154,554	6,182
Croatia	57,135	35,762	11,380	11,837	148,163	5,927
Cyprus	23,227	17,815	2,770	4,022	63,775	2,551
Czech Republic	205,269	98,067	50,463	39,227	467,701	18,708
Denmark	346,117	172,929	69,183	95,501	1,228,396	49,136

Table 6.1 Macroeconomic Data (2014 US\$ Million)

Countries/regions	Gross Domestic Product	Private Consumption	Gross Fixed Capital Formation	Government Consumption	Capital Stock	Depreciation
Estonia	26,485	15,181	7,515	5,716	93,997	3,760
Finland	272,975	147,719	54,792	65,929	968,194	38,728
France	2,843,941	1,618,842	634,730	702,666	10,910,485	436,419
Germany	3,868,252	2,128,402	782,104	754,015	15,101,804	604,072
Greece	235,573	181,622	29,947	51,387	610,879	24,435
Hungary	138,346	69,659	29,992	27,975	315,219	12,609
Ireland	250,814	94,068	41,000	36,406	982,689	39,308
Italy	2,138,533	1,336,116	361,167	422,057	5,545,560	221,822
Latvia	31,283	22,037	8,233	6,327	111,039	4,442
Lithuania	48,354	33,292	10,021	8,957	164,645	6,586
Luxembourg	64,874	39,583	23,580	21,641	249,127	9,965
Malta	10,536	9,219	3,092	3,406	39,942	1,598
Netherlands	879,317	407,723	165,857	235,754	3,376,740	135,070
Poland	544,980	339,901	111,803	103,759	1,267,628	50,705
Portugal	230,115	156,478	35,261	44,011	596,728	23,869
Romania	199,323	124,506	49,216	28,333	454,153	18,166
Slovakia	100,253	57,330	21,149	19,106	344,269	13,771
Slovenia	49,491	28,521	10,509	10,211	128,339	5,134
Spain	1,381,330	830,774	279,421	277,145	3,582,025	143,281
Sweden	571,097	263,711	134,183	150,080	2,270,698	90,828
United Kingdom	2,990,185	2,001,630	520,701	610,672	10,612,386	424,495
Switzerland	701,035	405,041	177,214	82,354	2,445,217	97,809
Norway	506,822	217,554	123,686	115,927	1,452,422	58,097
Rest of EFTA	22,891	15,189	5,279	6,001	90,426	3,617
Albania	13,278	10,755	3,337	1,555	47,124	1,885
Belarus	76,103	48,386	32,140	13,566	142,238	5,690
Russian Federation	2,030,970	1,081,102	429,644	376,445	4,325,966	173,039
Ukraine	131,805	91,272	18,071	24,000	466,590	18,664
Rest of Eastern Europe	7,983	7,412	2,014	1,624	15,320	613
Rest of Europe	112,462	82,326	22,258	22,942	368,696	14,748
Kazakhstan	227,437	127,039	51,606	26,750	390,964	15,639
Kyrgyzstan	7,468	10,558	3,612	1,922	9,537	381
Tajikistan	9,236	10,183	2,445	1,363	16,868	675

Table 6.1 Macroeconomic Data (2014 US\$ Million)

Countries/regions	Gross Domestic Product	Private Consumption	Gross Fixed Capital Formation	Government Consumption	Capital Stock	Depreciation
Rest of Former Soviet Union	106,619	46,072	45,818	17,019	223,212	8,928
Armenia	11,644	10,002	2,354	1,495	17,280	691
Azerbaijan	75,198	38,052	21,238	8,939	206,473	8,259
Georgia	16,509	13,572	4,939	3,189	26,910	1,076
Bahrain	33,851	20,204	7,527	7,717	92,946	3,718
Iran Islamic Republic of	425,326	239,544	123,790	50,642	1,180,280	47,211
Israel	305,674	180,375	62,490	72,776	976,326	39,053
Jordan	35,827	31,780	11,066	8,163	90,893	3,636
Kuwait	163,612	50,452	28,262	34,581	296,629	11,865
Oman	81,797	26,411	23,977	21,395	262,976	10,519
Qatar	210,109	30,967	64,726	28,285	544,603	21,784
Saudi Arabia	753,833	234,451	184,049	190,464	2,513,273	100,531
Turkey	798,794	566,472	165,487	126,128	2,052,908	82,116
United Arab Emirates	399,453	252,553	124,589	39,635	1,096,783	43,871
Rest of Western Asia	353,269	202,841	82,417	61,181	716,973	28,679
Egypt	301,499	259,549	39,577	37,682	391,647	15,666
Morocco	110,009	69,125	33,736	22,795	226,410	9,056
Tunisia	47,603	34,702	9,584	9,648	97,972	3,919
Rest of North Africa	256,858	103,891	99,705	66,078	757,509	30,300
Benin	9,575	10,907	3,916	2,554	26,715	1,069
Burkina Faso	12,549	5,919	3,563	2,348	32,979	1,319
Cameroon	32,051	24,041	6,416	3,694	70,961	2,838
Cote d'Ivoire	34,253	23,904	5,881	4,920	86,011	3,440
Ghana	38,616	25,999	10,236	7,012	120,793	4,832
Guinea	6,625	6,335	937	606	8,101	324
Nigeria	568,494	415,512	88,346	43,149	1,085,265	43,411
Senegal	15,658	13,568	4,625	2,717	54,707	2,188
Togo	4,482	4,851	1,422	851	13,031	521
Rest of Western Africa	38,983	30,605	10,107	6,298	86,056	3,442
Central Africa	63,838	26,054	24,340	6,817	174,083	6,963

Table 6.1 Macroeconomic Data (2014 US\$ Million)

Countries/regions	Gross Domestic Product	Private Consumption	Gross Fixed Capital Formation	Government Consumption	Capital Stock	Depreciation
South Central Africa	159,558	95,025	25,797	29,410	514,152	20,566
Ethiopia	55,612	36,860	19,945	4,855	150,598	6,024
Kenya	61,395	50,352	14,398	8,912	135,745	5,430
Madagascar	11,011	8,343	1,560	1,083	20,172	807
Malawi	6,048	4,967	737	769	17,799	712
Mauritius	12,613	9,825	2,544	1,931	45,659	1,826
Mozambique	16,946	10,688	6,193	3,730	40,365	1,615
Rwanda	7,913	5,471	1,865	1,121	14,637	585
Tanzania	48,025	31,726	16,062	6,810	126,311	5,052
Uganda	26,999	17,776	6,478	2,049	78,944	3,158
Zambia	26,963	13,603	10,382	3,396	70,909	2,836
Zimbabwe	14,197	11,263	1,686	3,074	46,310	1,852
Rest of Eastern Africa	85,980	67,684	15,341	7,344	188,477	7,539
Botswana	15,880	7,934	4,856	2,695	52,783	2,111
Namibia	12,838	8,476	4,514	3,599	50,301	2,012
South Africa	349,871	208,360	69,701	69,922	1,155,281	46,211
Rest of South African Customs Union	6,594	4,259	1,380	1,135	21,918	877
Rest of the World	167	96	42	30	533	21