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Adapting WIOD tables to national IO Tables for Turkey

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Abstract

This paper presents the adjustment process of the WIOD (World Input-Output Database) tables of Turkey to national accounts data coming from the TurkStat (Turkish Statistical Institute). The database covers 27 EU countries and 13 other major countries in the world for the period 1995 to 2011. The main aim of the paper is to construct a series of balanced input-output tables (IOTs) for Turkey's Interindustry Analysis Model (Turina). TURINA is an Interdyme type (Interindustry dynamic macroeconomic) model developed by INFORUM (Interindustry Forecasting at University of Maryland). The Inforum model requires one or more IO tables with three blocks: i. Total intermediate (domestic plus import) interindustry flow matrix, FM ii. Final demand block, FD, iii. And Value added block, VA. A time series of 35-sector annual IO tables for the Turkish economy has been constructed by the WIOD. The format of national input-output tables in WIOD is different from the normal format of national input-output tables which can be directly used in building an INFORUM model. The WIOD structure consists of six blocks: i. Intermediate flow matrix which only shows domestically produced inputs. ii. Final demand goods produced by domestic industries. iii. An import matrix which shows import components of intermediate inputs into domestic industries. iv. Imports components of final demand categories. v. Value added block at the bottom rows of the whole table. vi. Some elements of value added rows inside the final demand block. In the adjustment process three major steps are taken. The first step requires the addition of import rows to domestic rows in order to obtain the total intermediate and final demand figures. The second step requires the adjustment of the sum of final demand categories to national account totals at aggregate level. The third step requires the adjustment of value added totals to national account income figures provided by national statistical office. After all these steps any imbalances which are almost always the case an RAS procedure is applied to balance the whole system at sectoral level. At the present stage I have checked the WIOD table for 2011. Starting from the final demand side, I observed that there are no deviations for Government expenditures and Gross domestic fixed investment between the WIOD and the TurkStat figures. For other variables of final demand block (Consumption, Changes in stocks, Exports, Imports,) some slight differences were observed. Therefore initially, the GDP figure in the TurkStat sources exceeded the WIOD figure by 3.2 percent. Finally, with a series of balancing adjustments both at macro and sectoral level the WIOD table for 2011 is made consistent with the TurkStat data.

Keywords: Balancing input-output tables, Interindustry macroeconomic model for Turkey, Database for multisectoral models

1. Introduction

In April 2012, the WIOD (World Input-Output Database) started to publish a series of 35-sector annual IOTs (Input-Output Tables) for 27 EU economies and 13 other major world economies (including Turkey) over the period of 1995 to 2009 out of a project funded by the European Commission. In 2014 WIOD (www.wiod.org) added two new annual tables for 2010 and 2011. In addition to IOTs the database also provides some additional macroeconomic aggregate figures in the form of socio-economic accounts (SEA). The general structure of these IOTs is given in Table 1 for 2011 with actual values.

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Table 1. Input-Output Table for 2011, by WIOD in current prices, (industry-by-industry), (millions of US$)

	Agriculture, Hunting, Forestry and Fishing TUR c1		Other Community, Social and Personal Services TUR c34	Final consumption expenditure by households TUR c37	Final consumption expenditure by government TUR c39	Gross fixed capital formation TUR c41	Changes in inventories and valuables TUR c42	Exports TUR c44	Total output
Agriculture, Hunting, Forestry and Fishing TUR c1	11,610	.	29	39,228	359	86	1,579	6,321	98,682
…	…	.	…	…	…	…	…	…	…
Other Community, Social and Personal Services TUR c34	41	.	2,990	12,015	3,805	158	6	402	23,591
Agriculture, Hunting, Forestry and Fishing Imp c1	1,439	.	3	5,836	29	16	0	0	12,594
…	…	.	…	…	…	…	…	…	…
Other Community, Social and Personal Services Imp c34	1	.	154	192	91	4	0	0	697
Total intermediate consumption TOT r60	32,607	.	10,334	442,057	105,714	162,765	14,054	0	0
Taxes less subsidies on products r99	3,748	.	544	40,522	2,304	5,018	929	0	0
Cif/ fob adjustments on exports r61	0	.	0	0	0	0	0	0	0
Direct purchases abroad by residents r62		.	0	5,007	0	0	0	0	0
Purchases on the domestic territory by non-residents r63	0	.	0	-27,941	0	0	0	0	0
Value added at basic prices r64	62,094	.	17,694	0	0	0	0	0	0
International Transport Margins	233	.	19	7,445	376	2,101	0	0	0
Output at basic prices r69	98,682	.	23,591	0	0	0	0	0	0

The aim of this paper is to produce, out of this rich data source, for our Turkish interindustry macroeconomic analysis model (TURINA) a set of well-balanced IOT series consistent with the national accounts statistics (NAS). The WIOD data for Turkey within the TURINA framework was also employed by the professional model builders at GWS (Großmann, Hohmann, Wiebe, 2012). Since the TurkStat has not published any further IOT since 2002, the rational choice is to make use of the WIOD data available free of charge. However, the format of the WIOD tables are different from the normal structure of the IOT applied by the INFORUM which is shown in Table 2. INFORUM models are of interindustry dynamic macroeconomic models which is known as Interdyme. Since TURINA is a special form of INFORUM model it is necessary to convert and adjust the WIOD tables to the one adapted by INFORUM.

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Table 2. Input-output table adapted by inforum (for an Imaginary Economy)

	Agriculture	Industry	Services	Consumption	Govern-ment	Invest- ment	Export	Import	Final demand	Row Sum
Agriculture	15	25	40	80	15	5	85	-15	170	250
Industry	40	60	80	150	25	60	60	-75	220	400
Services	80	90	100	200	40	30	40	-30	280	550
Intermediate	135	175	220							530
Depreciation	10	20	25							55
Labour	65	100	170							335
Capital	30	75	90							195
Indirect tax	10	30	45							85
Value added	115	225	330							670
Column Sum	250	400	550	430	80	95	185	-120	670	

Note: Numbers are author`s calculations. Format is adapted from Almon (2011).

The WIOD IOT structure consists of six blocks: i. Intermediate flow matrix which only shows domestically produced inputs. ii. Final demand goods produced by domestic industries. iii. An import matrix which shows import components of intermediate inputs into domestic industries. iv. Imports components of final demand categories. v. value added block at the bottom rows of the whole table. vi. Some elements of value added rows into final demand block. On the other hand the format of the IOT by INFORUM has only three blocks: i. Interindustry flow matrix, FM, which contains both domestic and imported intermediary inputs; ii. Final demand block, FD placed to the right of FM; iii. Value added block, VA, placed at the bottom of FM. In this form the fourth possible block which can be placed at the right corner of the whole table is left blank. In Miller and Blair (2013) this blank block designated as the region of GDP.

The remaining sections of the paper are designed as follows. The next section introduces the relationship between IOT and NAS statistics. Section three describes the conversion and adjustment process of the WIOD tables to INFORUM structure at macro level. It also introduces the IO model briefly. In the fourth section the process converting the macro balance into sectoral detail is explained. The final section concludes.

2. Input-output tables, national accounts and the IO model

One of the properties or benefits of an input-output table such as the one given in Table 2 is to calculate the basic elements of national accounts. The first one is GDP figure for a national economy. There are three approaches to measure GDP. The first is the expenditure or net output approach. Using this approach within the framework of an IO table GDP is measured as the sum of all final demand elements. In Table 2 let f_1, f_2, f_3 show the row totals of final demand vectors for three sectors respectively. Therefore

$$f_i = c_i + g_i + i_i + x_i - m_i \quad i = 1, \dots, 3 \qquad (1)$$

where,

c_i = Personal consumption expenditure supplied by sector i

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g_i = Government consumption expenditure

i_i = Gross fixed capital formation (including changes in stocks)

x_i = Exports

m_i = Imports

The sum of all final demand goods supplied by three production sectors gives GDP by the expenditure approach. Hence

$$GDP = \sum_{i=1}^{3} f_i = \sum_{i=1}^{3} c_i + \sum_{i=1}^{3} g_i + \sum_{i=1}^{3} i_i + \sum_{i=1}^{3} x_i - \sum_{i=1}^{3} m_i \qquad (2)$$

Or

$$GDP = C + G + I + X - M \qquad (3)$$

where,

C = Total consumption by all consumers in all three sectors

G = Total government expenditures in all three sectors

I = Total capital goods produced by all three sectors

X = Total exports

M = Total imports

Therefore with a balanced IOT it is easier to calculate the GDP figures with its main aggregate (macro) components. By applying Equation (3) and using the illustrative numbers for the imaginary economy represented in Table 2 the GDP figure is calculated as follows.

GDP = 430 + 80 + 95 + 185 – 120 = 670

The second method of measuring GDP is the income approach. This method uses the sum of all primary income payments to calculate GDP. Accordingly, from Table 2, GDP is the sum of four income categories paid by all three sectors.

$$GDP = D + L + K + T \qquad (4)$$

where,

D: Depreciation allowance by all three sectors

L: Labour income paid by all three sectors

K: Capital income (all non-wage income)

T: Net indirect business taxes (taxes minus subsidies)

By applying Equation (4) and again using the numbers for the same imaginary economy represented in Table 2, the GDP figure is calculated as follows

GDP = 55 + 335 + 195 + 85 = 670

The third method of measuring or estimating GDP is known as the production approach. It measures GDP in way to find value added generated by each sector of the economy by subtracting

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all intermediate cost of production from the total sectoral output. Therefore IOT is an ideal framework to find the income and the GDP in an economy in an indirect way. The process in this method is as follows.

Let v_i show the value added generated in sector i, q_i show the total output in the same sector. For the three-sector economy shown in Table 2 the amount (value) of intermediate input from sector i to sector j is given by x_{ij}. Thus, the value added in sector j is

$$v_j = q_j - \sum_{i=1}^{3} x_{ij} \quad (5)$$

Then, it follows that the GDP by the production approach is

$$GDP = \sum_{j=1}^{3} v_j \quad (6)$$

Applying Equation (6) and using the numbers for the same imaginary economy represented in Table 2, the GDP figure by this approach is calculated as follows

$$GDP = 115 + 225 + 330 = 670$$

Since there is only one GDP figure for every economy the three methods should provide the same figure. In our representative three-sector economy this figure is 670.

Finally, it would be informative to notice that the Turkish Statistical Institute (TurkStat) applies only two methods to calculate the GDP of Turkey: Production approach and expenditure approach. The institute also applied the income approach in the past but only for a brief period, from 1987 to 2006.

In order to appreciate the role of a series of well-balanced annual IOTs consistent with the basic macroeconomic time series data, a brief introduction to the IO model will be useful.

The core of a multisectoral macroeconomic model is a square matrix of input-output coefficients denoted as A. A typical element of A is defined by

$$a_{ij} = \frac{x_{ij}}{q_j} \quad (7)$$

For example, from Table 2,

$$a_{23} = \frac{x_{23}}{q_3} = \frac{80}{550} = 0.145.$$

Accordingly, for the three-sector economy the technology matrix A is calculated as follows.

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} = \begin{bmatrix} 0.060 & 0.063 & 0.073 \\ 0.160 & 0.150 & 0.145 \\ 0.320 & 0.225 & 0.182 \end{bmatrix} \quad (8)$$

Given the technology matrix A the IO production model is given by

$$q = Aq + f \quad (9)$$

where,

q = column vector of sectoral output totals obtained by summing the rows of the IO table

f = vector of final demand totals obtained by summing the rows of the FD block

The solution of the IO model is given by

$$q = [I - A]^{-1} f \quad (10)$$

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In Equation (10), $[I - A]^{-1}$ is known as the Leontief inverse. However in INFORUM models the Leontief inverse is seldom used (Almon, 2011). Instead an iterative approach is applied to find the output vector for every year of the historical as well as the forecast period of a dynamic multisectoral model. To secure the convergence of the iterative process consistent with the results of all other complementary macroeconomic equations and regressions in the model, IOTs should be balanced explicitly or implicitly for every year. Briefly, without a balanced IOT table for every year a multisectoral macroeconomic model will never converge, i.e., there will be no solution.

Multisectoral macroeconomic models are also called "structural" macroeconomic models. The term "structural" indicates that not only macro-economic key variables such as GDP and its components on the demand and supply side are modelled, but that the sectoral structure of the economy is represented as well (Stover, Wiebe, Lehr, 2013).

3. Adjustment at macro level

The aim of macroeconomic adjustment is, without loss of any information, to eliminate the figures at the GDP block of the WIOD IOT so that the resulting form should be identical with the form adopted by INFORUM. Furthermore in the final stage of this process all of the macro variables of the GDP by the expenditure approach, C, G, I, S, X, and M must be identical with those statistics published by the TurkStat. During the macro adjustment process three steps are taken.

Step 1. i. Add the intermediate import flow matrix to domestic flow matrix. The latter starts with imp c1 and ends with imp c35 in Table1. Note that both TUR c35 row (and column) and Imp 35 row are missing in Table 1 as they do not contain any intermediate inputs. Also dd the import flows to final demand items to domestic final demand cells. The result will be a four-block IOT.

ii. Ignore Cif/fob adjustment row since it has all zeros in every cell.

iii. In the VA block add, the "Taxes less subsidies on product" row to the "Value added at basic prices" row and call this last new row as "Value added at market prices".

iii. Convert dollar values to TL. For 2011 from the SEA data of WIOD I found the implicit exchange rate TL1.6668 per dollar. This rate is also checked with the local data sources from TurkStat and MoD (Ministry of Development). It is found that, $1 = TL1.7 in these last two sources.

The result of the first step at macro level is shown in Table 3.

At the end of the first step, the difference for the Consumption figure between the WIOD sources and the TurkStat data is only 3,042 million, which is about 0.3 percent. For Government and Investment there is no difference between the two sources. For the remaining three items of the FD block the deviations are relatively significant: For Stocks, it is 2,528 (11.2%), for Exports it is -49,426 (-15.9%), and for Imports it is -8,934 (-2.1%). As a result, the GDP figure in the WIOD sources appeared 41,044 (3.2%) less than the GDP in the TurkStat sources.

Step 2. After the completion of Step 1 there are now only four blocks, the last one is shown in Table 3 below. Inside the fourth block there are some numbers at the intersection of the row of "Taxes less subsidies on products" with the columns of Consumption, Government, Investment, and Stocks. Also at the bottom of Consumption column there are two non-zero entries: 8,346 in the row "Direct purchases abroad by residents", and -44,673 in the row "Purchases on the domestic territory by non-residents". Two adjustments had to be made.

i. Add 8,346 to Import column.

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ii. Add 44,673 to Export column.

iii. Still these two numbers are kept in the original consumption column.

Table 3. Adjustment at Macro Level, Step 1

First step (WIOD, Millions of TL)	Con-sumption	Govern-ment	Investment	Change in Stocks	Export	Import	Output (WIOD)
Column sum	891,478	176,831	274,799	23,425	261,722	414,737	1,213,517
Taxes less subsidies on products	67,542	3,840	8,365	1,632	0	0	81,378
Cif/ fob adjustments on exports	0	0	0	0	0	0	0
Direct purchases abroad by residents	8,346	0	0	0	0	0	8,346
Purchases on the domestic territory by non-residents	-46,573	0	0	0	0	0	-46,573
Value added at basic prices	0	0	0	0	0	0	0
International Transport Margins	0	0	0	0	0	0	0
Value added at basic [market] prices	29,316	3,840	8,365	1,632	0	0	43,152
Output at basic prices(Column sum of FD block at market prices), WIOD	920,794	180,670	283,163	25,057	261,722	414,737	1,256,669
Data from TurkStat, GDP by Ex-penditure (Millions of TL)	C	G	I	S	X	M	TurkStat GDP
GDP Components	923,836	180,708	283,163	22,528	311,148	423,670	1,297,713
Percent of GDP, TurkStat	71.2	13.9	21.8	1.7	24.0	32.6	100.0
Difference (WIOD-TurkStat)	-3,042	-37	0	2,528	-49,426	-8,934	-41,044
Difference (WIOD/TurkStat-1), %	-0.3	0.0	0.0	11.2	-15.9	-2.1	-3.2

The resulting balance at the end of second step is given in Table 4.

Table 4. Adjustment at macro level, step 2

Second step (WIOD, Millions of TL)	Consump-tion	Govern-ment	Investment	Change in Stocks	Export	Import	Output (WIOD)
Column sum	891,478	176,831	274,799	23,425	261,722	414,737	1,213,517
Taxes less subsidies on prod-ucts	67,542	3,840	8,365	1,632	0	0	81,378
Cif/ fob adjustments on ex-ports	0	0	0	0	0	0	0
Direct purchases abroad by residents	8,346	0	0	0	0	8,346	0
Purchases on the domestic territory by non-residents	-46,573	0	0	0	46,573	0	0
Value added at basic prices	0	0	0	0	0	0	0
International Transport Mar-gins	0	0	0	0	0	0	0
Value added at basic[market] prices	29,316	3,840	8,365	1,632	46,573	8,346	81,379
Output at basic prices (Col-umn sum of FD block at mar-ket prices), WIOD	920,794	180,670	283,163	25,057	308,295	423,083	1,294,896
Data from TurkStat, GDP by Expenditure (Millions of TL)	C	G	I	S	X	M	TurkStat GDP
GDP Components	923,836	180,708	283,163	22,528	311,148	423,670	1,297,713
Percent of GDP, TurkStat	71.2	13.9	21.8	1.7	24.0	32.6	100.0
Difference (WIOD-TurkStat)	-3,042	-37	0	2,528	-2,853	-588	-2,817
Difference (WIOD/TurkStat-1), %	-0.3	0.0	0.0	11.2	-0.9	-0.1	-0.2

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At the end of Step 2, there is a negligible difference (-0.2%) between the two GDP values coming from WIOD and TurkStat respectively. The only significant difference appeared in the "Change in Stocks" column (11.2%).

Step 3. After the sectoral adjustment which will be explained in Section 4, it was easy to eliminate the remaining difference in Stocks. In the process of sectoral adjustment any remaining differences are eliminated by necessary changes either in the total output vector or the changes in stocks. In the TurkStat sources there are no corresponding figures for output levels in any sector or at macro level. For that reason it was easy to change sectoral output levels in macro or sectoral adjustment process. Briefly, I left the sectoral total output figure to be residually determined and vary the figures in the changes in Stocks column freely.

Table 5. Adjustment at Macro Level, Step 3

Final step (WIOD, Millions of TL)	Consumption	Government	Investment	Change in Stocks	Export	Import	Output (WIOD)
Column sum	923,837	180,707	283,163	22,529	311,148	423,671	1,297,713
Taxes less subsidies on products							
Cif/ fob adjustments on exports							
Direct purchases abroad by residents							
Purchases on the domestic territory by non-residents							
Value added at basic prices							
International Transport Margins							
Value added at basic [margins]							
Output at basic prices (Column sum of FD block at market prices), WIOD	923,837	180,707	283,163	22,529	311,148	423,671	1,297,713
Data from TurkStat, GDP by Expenditure (Millions of	C	G	I	S	X	M	TutkStat GDP
GDP Components	923,836	180,708	283,163	22,528	311,148	423,670	1,297,713
Percent of GDP, TurkStat	71.2	13.9	21.8	1.7	24.0	32.6	100.0
Difference (WIOD-TurkStat)	0.0	-0.4	0.3	0.3	-0.2	0.5	-0.1
Difference (WIOD/TurkStat-1), %	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Finally, the resulting IO table balanced at macro level is shown in Table 5. All imbalances are eliminated and the error for each of the macro variables (C, G, I, S, X and M) in the GDP by expenditure method is now zero.

4. Adjustment at industry level

During or after the course of macro balances and adjustment process the following actions has been taken to satisfy sectoral balances.

Step 1. At the intersection of the Consumption column and the "Taxes less subsidies" row there is number 67,542 which represents taxes paid by consumers on their consumption. I distributed this item across 35 sectors in proportion to their shares in the Consumption column. Since the final demand (FD) block increased by this new tax column it was necessary to add one additional row by transposing this new taxes less subsidies column and inserting it into the value added block (VA). The rationale for this treatment is to maintain the balance between the income

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side and the expenditure side of GDP. Similarly, "Taxes less subsidies" on Government expenditure, Investment and Changes in Stocks are treated in the same way. That is the reason why there is another new row in the VA block, named "Taxes less subsidies on Government, Investment and Stocks".

Table 6. Shares of "Non-residents consumption on domestic territory" and "residents consumption abroad"

		Non-residents consumption	Residents consumption abroad
3	Food, Beverages and Tobacco	0.3464	0.3628
4	Textiles and Textile Products	0.0929	0.0320
5	Leather, Leather and Footwear	0.0732	0.0307
7	Pulp, Paper, Paper , Printing and Publishing	0.0075	0.0099
16	Manufacturing, Nec; Recycling	0.0880	0.0876
19	Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel	0.0151	0.0197
21	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods	0.0151	0.0197
22	Hotels and Restaurants	0.1649	0.2491
23	Inland Transport	0.0389	0.0402
24	Water Transport	0.0167	0.0172
25	Air Transport	0.0444	0.0460
26	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	0.0111	0.0115
27	Post and Telecommunications	0.0151	0.0197
28	Financial Intermediation	0.0075	0.0099
30	Renting of M&Eq and Other Business Activities	0.0151	0.0197
32	Education	0.0045	0.0098
33	Health and Social Work	0.0262	0.0042
34	Other Community, Social and Personal Services	0.0174	0.0103
		1.0000	1.0000

Source: Ozhan, Wang, Ozhan (2014).

Step 2. In the consumption column the sum of the two items (-37,727) mentioned in Section 3, namely, "Direct purchases abroad by residents", 8,846, and "Purchases on the domestic territory by non-residents", -46,573 is distributed among a number of Consumption sectors. The name of these sectors and their shares are given in Table 6, column 3. The rationale for this allocation is that the same net figure (-37,727) is contained in Consumption figure in GDP at macro level but excluded frpm sectoral origins.

Step 3. "Direct purchase abroad by residents", 8,846, is also distributed across the column of Imports with shares shown in Table 6, column 4. Again the reason for this step is the same as in Step 2.

Step 4. "Purchases on the domestic territory by non-residents", 46,573, is distributed across the column of Exports with shares shown in Table 6, column 3. Table 6 is imported from an earlier study by the TURINA team (Ozhan, Wang, Ozhan, 2014).

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Table 7. Final Balanced and Converted WIOD IOT Consistent with TurkStat NAS, 2011 (Millions of TL)

IOT 2011 (Millions of TL, current prices	Agriculture, Hunting, Forestry and Fishing c1	Other Community, Social and Personal Services 34	Final consumption expenditure by households c37	Final consumption expenditure by government c39	Gross fixed capital formation c41	Changes in inventories and valuables c42	Exports c44	Imports	Final demand	Total output
Agriculture, Hunting, Forestry and Fishing c1	21,883	53	81.807	664	176	2,768	10,536	22,481	73,470	170,482
…	…	…	…	…	…	…	…	…	…	…
Other Community, Social and Personal Services c34	70	5,247	21,313	6,649	278	10	1,495	1,311	28,434	41,143
Total intermediate consumption TOT r60	54,737	17,256	923,837	180,707	283,163	22,529	311,148	473,671	1,297,713	0
Taxes less subsidies on products r99	6,247	907	0	0	0	0	0			83,206
Taxes on private consumption	5,844	1,568								68,584
Taxes on Government, Investment, and Stocks	155	151								13,345
Cif/ fob adjustments on exports r61	0	0	0	0	0	0	0			0
Direct purchases abroad by residents r62	0	0	0	0	0	0	0			0
Purchases on the domestic territory by non-residents r63	0	0	0	0	0	0	0			0
Value added at basic prices r64	103,499	21,261	0	0	0	0	0			1,132,578
International Transport Margins	0	0	0	0	0	0	0			0
Value added at market prices	115,745	23,887								1,297,713
Output at basic [market] prices	170,482	41,143	923,837	180,707	283,163	22,529	311,148	473,671	1,297,713	0

The resulting balanced IOT of 2011 both at macro and sectoral level is given in Table 7. Finally, the names of all 35 IO sectors are given in Table A in the Appendix.

5. Conclusions

This paper summarizes the adjustment process of the Turkish IOTs constructed by the WIOD (World Input-Output Database) to local national accounts data. In particular, the 35-sector 2011

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IOT is balanced in a consistent way, on the premises that the TurkStat data is the best possible estimate at macro level. At sectoral level WIOD data are are highly reliable and accepted with greater confidence.

The main aim of the paper is to construct a series of balanced annual input-output tables (IOTs) from 1995 to 2011, which will be employed for the TURINA (Turkey's Interindustry Analysis model). The Turina is the Turkish version of multisectoral macroeconomic models adapted by INFORUM (Interindustry Forecasting at the University of Maryland) group. In general an Inforum model which we employ as the basic structure of TURINA requires one or more IO tables with three blocks, namely the interindustry flow matrix FM, the final demand block FD, and the value added block VA. However, the WIOD structure consists of six blocks. In addition to domestic interindustry and final demand flows it also contains detailed information for import flows into domestic industries and final demand categories.

The adjustment process is separated into two parts. The first is about macro balances and the second is about sectoral balances. At macro level three major steps are taken. The first step requires the addition of import rows to domestic rows in order to obtain the total intermediate and final demand figures. The second step requires the adjustment of the sum of the final demand categories to national account totals at aggregate level. The aggregate figures are taken from the TurkStat sources (www.tuik.gov.tr). The third step requires the adjustment of the value added totals to those coming from the national account income figures provided again by the TurkStat. At the initial stage of the macro adjustment process the GDP figure in TurkStat sources (TL1,297,713m) exceeded the WIOD figure (TL1,256,669m) by 3.2 percent. There were almost no differences between the two sources for the basic macro variables: Private final consumption (C), Government expenditures on goods and services (G), and the gross fixed capital formation (I). However there were relatively big differences for the remaining macro variables: The changes in stocks (S), Exports (X), and Imports (M).

After arriving at balances at macro level, that is equating the WIOD values to those of the TurkStat data, there were only small differences at sectoral level between the two sources. The remaining imbalances at sectoral level were simply eliminated by adjusting only three variables: the changes in Stocks, total output, and value added.

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