MULTIREGIONAL SOCIAL ACCOUNTING MATRIX AND MULTIPLIER ANALYSIS: AN APPLICATION FOR TURKISH ECONOMY

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ABSTRACT

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Social accounting matrix (SAM) is one of the tools used in regional economic analysis, enabling understanding the structure of the economy as well as analyzing the impacts of policies or exogenous shocks. In this thesis, a two-region SAM of Turkey is constructed for the year 2002 and the findings of multiplier analysis are presented. To this end, first, a two-region input-output (I-O) table is constructed using location quotient (LQ) method and using this two-region I-O table, a two-region SAM is compiled. Then, multiplier analysis is performed on the two-region SAM constructed. According to the results of the multiplier analysis, through an exogenous shock amounting to 1% of GDP gives better results both in absolute and distributional terms when it is originated in region East than region West. This thesis should construct a first step towards more comprehensive analyses including higher level of sectoral detail and micro-data.

Keywords: Multiregional Social Accounting Matrix, Multiplier Analysis, Turkey

ÖZ

ÇOKBÖLGELİ SOSYAL HESAPLAR MATRİSİ
VE ÇARPAN ANALİZİ:
TÜRKİYE EKONOMİSİ İÇİN BİR UYGULAMA

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Ekonominin yapısını anlamaya ve politika ve dışsal şokların etkilerini analiz etmeye imkân tanıyan sosyal hesaplar matrisi (SHM), bölgesel ekonomik analizde kullanılan önemli araçlardan biridir. Bu çalışmada, Türkiye için 2002 yılına ait iki bölgeli SHM oluşturulmuş ve bu matris üzerinde uygulanan çarpan analizi sonuçları sunulmuştur. Bu amaçla, öncelikle yoğunlaşma katsayısı yöntemi kullanılarak iki bölgeli girdi-çıktı tablosu oluşturulmuş ve bu tablodan yararlanılarak iki bölgeli SHM düzenlenmiştir. Oluşturulan SHM üzerinde çarpan analizi uygulanmıştır. Çarpan analizinin genel sonuçları, GSYİH'nın %1'ine karsılık gelen bir dışsal şokun Doğu bölgesinden başlatıldığında hem mutlak veriler hem de dağılıma göre daha iyi sonuçlar verdiğine işaret etmektedir. Bu tez temel olarak sektörel ve mikro bazda verilerin de kullanıldığı daha detaylı çalışmalara öncülük etme amacındadır.

Anahtar Kelimeler: Çok Bölgeli Sosyal Hesaplar Matrisi, Çarpan Analizi, Türkiye

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CHAPTER 1

INTRODUCTION

The disparities among countries had been the focus of the studies on development economics until 1980's. However, it has now been accepted that, as the nations and their economies continue to grow, some regions grow slowly relative to others and thus, the development does not bring prosperity to all regions at the same time. Thus, the disparities among regions now draw the attention of most of the economists and in this new era of globalization, with the expansion of market boundaries and the reduction of trade barriers, regions and their economies have become critically important at both national and international scale. As a consequence, there has been increasing interest in concerns for the methods and tools of regional economic analysis. Regional science, dating from 1950's, is an interdisciplinary field of study attracting the interest of economists, planners, geographers, sociologists and regional scientists. The approaches and tools used for regional economic analysis have shown difference in the course of time though.

Analyses based on the construction of Social Accounting Matrices (SAMs) are among the tools used in regional economic analysis. SAM is basically a square matrix showing the transfers and transactions between economic agents within a socioeconomic system. Besides providing a basis for general equilibrium models, it can be used for understanding the structure of the economy and analyzing the effects of policies or external shocks. These can be done, for example, through SAM multiplier analysis.

SAM multiplier analysis enables studying the effects of exogenous changes such as an increase in exports or government expenditure on the whole economic system. In

addition, having a regional dimension in a SAM allows for analyzing the regional effects of policies or effects of regional policies as well as interregional or region-nation feedbacks.

In this respect, this thesis aims to construct a two-region SAM of Turkey for the year 2002 and provide an application of a SAM multiplier analysis. The two regions are classified as West and East, by grouping the level 2 regions[1] with respect to their demographic and socio-economic characteristics.

First, a two-region input-output (I-O) table for Turkey is compiled with the use of 2002 national input-output (I-O) table and non-survey techniques of regionalization. Then, using the data contained in the two-region I-O table and other sources, a two-region SAM is constructed. Lastly, multipliers generated by the two-region SAM are computed and interpreted.

According to the matrix of accounting multipliers, it is found that both intraregional and interregional multipliers of the region West is greater than that of region East. These imply that an exogenous change would have greater effects within the region West than it would have within the region East and that a change originating in region East would have larger effects on region West than vice versa.

The shocks investigated through multiplier analysis includes an exogenous export demand injection, an increase in income of households in the form of transfers to households and an increase in rural production achieved by government subsidies. The effects of changes are analyzed and compared when they are originating in region West and in region East. The results of these scenarios indicate that through an exogenous shock amounting to 1% of GDP gives better results both in absolute and distributional terms when it is originated in region East than region West.

[1] Level 2 regions are defined in the study "The Classification of Regional Units for Statistics", see Chapter 3.

Hence, it is seen that a change or policy implication has a greater effect on region West whether it is implemented in region West or region East. This can be interpreted as that most of the value added created in region East is transferred to region West at the end whereas the value added created in region West stays in region West. At this point, policy makers may have to work on the factors behind and long-term consequences of this situation.

The thesis is organized as follows: Chapter 2 provides a literature review on the use of I-O tables, SAMs and applications of multiplier analysis. The determination process of the two regions used in this study is explained in the third chapter. Chapter 4 reviews the main features of SAMs and regional SAMs and discusses in detail the method of construction of a two-region SAM used in this thesis. Concerning this issue, the construction of a two-region I-O table is also discussed and accordingly, a two-region I-O table of Turkey is compiled for 2002. In Chapter 5, derivation of multipliers is studied. Here, regional multipliers for 2002 Turkish economy are computed and main findings are presented. The last chapter summarizes and concludes.

CHAPTER 2

LITERATURE REVIEW

In this new era of globalization, with the expansion of market boundaries and the reduction of trade barriers, regions and their economies have become critically important at both national and international scale.

In this respect, as Stimson et al. (2006) claims, "Methods and tools of regional analysis are vital both for research and to inform local and national policy makers and industry leaders in assessing the performance of a region and to formulate strategic planning frameworks to enhance a region to position itself to build and maintain competitiveness" (p. 4).

Regional science, as an interdisciplinary field of study, dates from 1950's. Isard et al. (1960) brought together a comprehensive volume of techniques including population projection, migration estimation, industrial location analysis, regional input-output techniques, gravity and potential models, which attracted the interest of economists, planners, geographers, sociologists and regional scientists. With the increasing use of computers for analytical purposes, the emphasis and attention shifted from particular subjects as migration and regional income, per se, to casual interconnection and interrelationship of forces leading to change, for instance in migration and regional income (Isard et al., 1998).

This chapter provides a literature review mainly on two topics. Firstly, the use of I-O tables and SAMs, which are important tools used in regional science, is discussed. Also, the construction of multiregional I-O tables and multiregional SAMs is covered. Secondly, literature on SAM multiplier analysis is reviewed.

Synopsis on Regional I-O Tables and Regional SAMs

First developed by Wassily Leontief in the 1930s, input-output analysis is one of mostly used techniques in regional economic analysis. The analysis of interindustry linkages and the evaluation of impacts of changes in one sector on others can be performed through I-O models.

An I-O table shows the interindustry sales and sales to final demand in the rows. The interindustry purchases of sectors, purchases from value added elements and payments for imports constitute the columns of an I-O table.[2] The data needed to complete a transactions table is usually not available.

I-O tables can be constructed at the national level as well as for a single region or multiple regions. Regional I-O tables enable to examine both the transactions between the region and the rest of the world and among activities within the region. On the other hand, the transactions between the regions of an economy as well as between regions and the rest of the world can also be studied with the use of a multiregional I-O table.[3]

On the other hand, Social Accounting Matrices, which can be seen as extension of I-O tables, are also widely used in regional or interregional analysis. The usage of SAMs in regional analysis was first formulated by Pyatt and Thorbecke (1976) built upon the pioneering work of Richard Stone. As a comprehensive, consistent and complete data system, a SAM provides a snapshot of the economy during a given period. It provides information about key issues as intersectoral linkages, interregional flows and income distribution.

[2] The detailed description of I-O models can be found in Miller and Blair (1985).
[3] Miller (1998) and Stimson et al. (2006) provides detailed information on the use of I-O analysis in regional science.

A SAM is simply a square matrix showing the transfers and transactions between economic agents within a socioeconomic system. The accounts captured in a SAM are basically production activities, factors of production, institutions, capital account and rest of the world (ROW). Each account is recorded both in a row and a column. Since total expenditure should equal the total receipt for each account, row sums and column sums should be equal.

The degree and extent of disaggregation differs depending on the questions that SAM framework is expected to answer. Since SAM can be used as a tool to understand socioeconomic structure of an economy and to analyze the effects of exogenous changes or policy means, the classification matters.

Thorbecke (1998) describes the classification and disaggregation criteria for the basic accounts of a SAM as follows: The criteria in classification of production activities account can be listed as nature of the item, type of technology used, form of organization in production process (farm, firm, state enterprise) and commodities being tradable or nontradable. From factors of production; labor can be broken down by skill, educational level, sex or age and capital can be distinguished between land and other forms of capital or domestic and foreign or private and public. Location (e.g., rural vs. urban), resource endowment and wealth, educational attainment, sex and occupation of the head of the household can be the criteria for disaggregating the households account.

SAM, at the national level, provides a strong tool for economic analysis. It can be used to explore the impact of exogenous changes in such variables as exports and government expenditures through multiplier analysis. Multipliers explain the results but do not clarify the structural and behavioral mechanism responsible for the effect. At this point, structural path analysis reveals the specific individual sectors through which influence is transmitted (Thorbecke, 1998). On the other hand, SAM provides a database for CGE models which analyze main policy changes simultaneously to

capture their combined effects, based on empirical data (Bandara, 1991). Besides, for studying characteristics of a region or regional differences within a country, one needs a regional dimension in a SAM. Having a regional dimension also enables analyzing the impacts of national and regional policies as well as interregional or region-nation feedbacks.

In this respect, one can construct a SAM for a single region as well as for multiple regions. A regional SAM shows the same relationships with its national counterpart but at the regional level. In such a design, the ROW account may be divided into two, as rest of the nation and rest of the world, in order to distinguish the external relationships. On the other hand, a two-region SAM can be compiled to be composed of a region and rest of the nation or two distinct regions constituting the nation together.

Pyatt and Round (1985) states that the development of a regional accounting system may be approached from two standpoints: disaggregating a SAM for the economy, taken as a whole, into its constituent regional components or combining SAMs for two or more regions into an integrated system.

The latter approach requires the compilation of two or more regional SAMs with survey data. The construction of a regional SAM entails the estimation of regional I-O tables, regional final demand and supply, regional household savings and tax payments, interregional flows and exports to and imports from the ROW (OECD, 2003). However, the difficulties in data collection, mentioned for the I-O tables, apply to the SAM compilation too. The high cost and time-requirements makes survey-based methods unfavorable for the construction of a regional SAM.

Kuhar et al. (2006) argues that to build a regional SAM, the national I-O tables (NIOT) should be regionalized and other entries of the SAM should be provided with data at regional level. This is consistent with the approach of disaggregating a

SAM for the economy into its constituent regional components, suggested by Pyatt and Round (1985). Thus, compiling a multiregional I-O table and estimating the regional distribution of the other entries would be a valid method in constructing a two-region SAM.

For the construction of multiregional I-O tables, one has to choose between survey and non-survey methods. Survey methods mean compiling the table with survey data, i.e. collecting primary data for the interindustry transactions. This method is highly time consuming and contains the risk of non-sampling errors. Thus, the method is not preferred by most of the researchers. Instead, non-survey methods, which rely on applying various techniques for the regionalization of the national I-O table, are used for constructing multiregional I-O tables.

Non-survey methods used in constructing multiregional I-O tables include unadjusted national coefficients, the techniques location quotient (LQ), commodity balance (CB), supply-demand pool (SDP) and RAS. The simplest method is to use unmodified national coefficients for representing the regional economy. However, as the regional coefficients vary considerably from the national ones, this method seems to be highly questionable. LQ and CB methods, on the other hand, attempt to adjust the national coefficients to the regional level.

SDP technique, first derived by Isard (1953), relies upon subtracting regional requirements from total regional output in each industry to obtain a net surplus or deficit. If a surplus is obtained then the national coefficients may be used since the regional supply is sufficient to cover regional demand. However, if a deficit is obtained then importation is necessary and the national coefficients are reduced accordingly (Jensen et al., 1979).

The estimation of a regional I-O table using the RAS technique is described in Miller and Blair (1985). Various mathematical procedures are applied to define

vectors of regional production, value added and final demand. However, information related to vectors of intermediate sales and purchases is needed.

Kronenberg (2007) notes that the disadvantage of the RAS method is that it requires more data as the row and column totals of the transactions table are presumed to be known. He also argues that "…RAS as a regionalization method possesses no such theoretical justification at all. It is a purely mathematical adjustment process." Lahr (1993) argues that only the LQ and CB techniques should be regarded as "true" non-survey techniques as Stevens et al. (1989) describe non-survey approaches as estimating regional purchase coefficients (RPCs). Since the RAS technique requires some survey data, it cannot be classified as a non-survey method at all. In addition, Miernyk (1976), citing from Malizia and Bond (1974), argues that "the RAS is not a satisfactory way of deriving a regional input output table from a national counterpart."(p. 48)

Jensen et al. (1979) presents a review of literature on the subject and refers to the studies evaluating the non-survey techniques, especially LQ and RAS techniques. In terms of simulating acceptable coefficients, Shaffer and Chu (1969a, 1969b) came out with the fact that LQ gives better results. Similarly, according to the study of Smith and Morrison (1979), simple location quotient (SLQ) is the most compromising non-survey method. The RAS technique seems to give superior results only with respect to matrix comparisons but some survey material was incorporated in that study.

There exist some modified versions of the LQ method aiming to increase the accuracy such as purchases-only, cross-industry or semilogarithmic LQ. Studies show that these modifications have slight effects on the results (Smith and Morrison 1974, Bonfiglio 2005, Riddington et al. 2006).

Synopsis on SAM Multiplier Analysis

Social accounting matrices provide a strong tool for economic analysis. Effects of exogenous changes such as an increase in exports or government expenditure on the whole economic system can be studied using SAM multiplier analysis.

Thorbecke (1998, 2000) provide detailed information on SAM based multiplier analysis. Before using multiplier analysis, several assumptions as the existence of excess capacity and unused resources have to be made. Also, the prices are assumed to be fixed and this assumption can result in an overestimation of multipliers.

By dividing elements in each column of endogenous accounts in SAM by the column total, the matrix of average expenditure coefficients is computed and SAM multiplier matrix is computed with the use of this coefficients matrix.

The construction of multiplier matrix for multiregional SAM is similar to that of national. Multiregional SAM based multiplier analysis would give an insight for such issues as the effects of changes in regional policy means or regional external shocks. Also, multiregional SAM based analysis would be meaningful for cases in which applying different policy means to different regions is more rational or external shocks may have different affects on different regions of a country.

Two examples of multiplier analysis applications are given in Thorbecke (1998) as Keuning and Thorbecke (1989) and Hidayat (1992). Firstly, Keuning and Thorbecke (1989) studies the impact on income distribution of alternative patterns of government expenditures for Indonesian economy. The SAM consists of 75 accounts, 70 of which are endogenous, and is constructed for the year 1980. An accounting multiplier matrix (70 x 70) is computed and by varying the pattern of government expenditures, the impact on the whole economic system is estimated. The main conclusion suggested by the results was that the Indonesian government,

when faced by with unexpected deteriorating conditions, preferred a policy which mitigated the short term income losses for the population at large.

Secondly, Hidayat (1992) builds a two-region SAM of Indonesia for 1980. The two regions are the strong Center region and the Outer Islands, between which exists a dramatic contrast. The SAM consists of a total of 45 sectors, 40 endogenous and 5 exogenous. Thus, the multiplier matrix constructed includes the 20 x 20 intraregional transactions and the 20 x 20 interregional flows. It is found that the Center region shows stronger intraregional multipliers than does the Outer region. The interregional multipliers, however, are larger in the Outer region than the corresponding ones in the Center region. Finally, the total impact on the whole economy of an exogenous change is seen to be greater when the change is originated in the Outer region than in the Center region.

CHAPTER 3

A REGIONALIZATION OF TURKEY

With the accession process to European Union (EU), Turkey's territory was classified based on the Nomenclature of Territorial Units for Statistics (NUTS) in 2002. The study of identifying the level regions of Turkey was conducted by State Planning Organization (SPO) and Turkish Statistical Institution (TURKSTAT) and "The Classification of Regional Units for Statistics" was published. In this study; provinces are defined as "level 3"; by grouping socioeconomically and geographically similar neighbor provinces, 26 "level 2" regions and by grouping "level 2" regions, 12 "level 1" regions are defined.[4]

The 26 NUTS 2 regions defined in this study forms the basis of regionalization of Turkey. The two regions, on which this study will be predicated, are identified by grouping these NUTS 2 regions. During regionalization process, socioeconomic status, demographic characteristics and locations of the regions are taken into account. In case of determining the socioeconomic development levels of regions, there exist a considerable number of variables needed to be analyzed.[5]

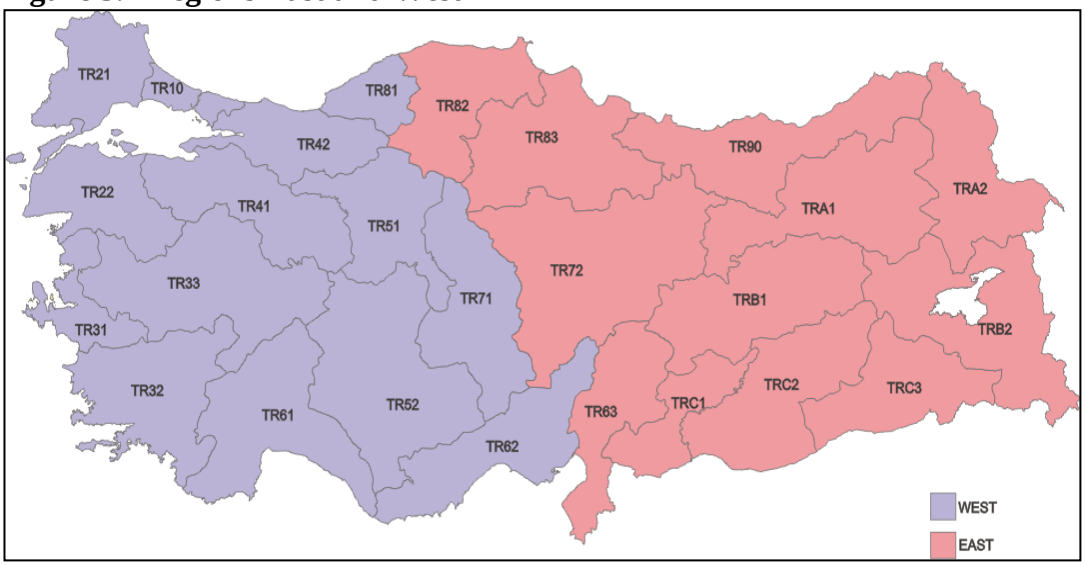
In this respect, results of "The Study on the Socio-Economic Development Levels of the Provinces and Regions", measuring the development levels of the regions, conducted by SPO in 2003 are used. This study uses 58 different indicators which can be classified in two groups as social and economic, comprising the fields of demography, education, health, rural infrastructure, industry, construction, agriculture, finance and banking. An integrated socio-economic development index

[4] The list of the level regions is given in Appendix.
[5] Haller (1982) presents a study of regionalization for Brazil.

(SEGE) was formed from these 58 indicators and the provinces were classified in 5 main development groups according to SEGE values.

The two regions, identified with respect to the SEGE values and locations of the NUTS 2 regions, are named as the East and the West. NUTS 2 regions composing the two regions are shown in Figure 3.1. Also, the list of NUTS 2 regions composing the regions East and West are given in Table 3.1. With this regionalization, the region West consists of 14 NUTS 2 regions whereas the East consists of 12 NUTS 2 regions. Similarly, 48 of the 81 provinces are contained in the region East and the remaining 33 are in the region West.

Figure 3.1 Regions East and West



Source: Prepared by the author

The West constitutes 47.3 % of the total area, whereas it contains 66.1 % of the population. Similarly, the East constitutes 52.7 % of the total area containing 33.9 % of the population.

Table 3.2 and Table 3.3 represent the demographic and socioeconomic properties of the two identified regions, West and East. Gross value added per capita takes a minimum value of $4,654 in the West and a maximum value of $4,862 in the East.

Population density in the West and the East are 131.7 and 60.7, respectively. On the other hand, the two regions show similarity according to labor force indicators.

Table 3.1 List of NUTS 2 Regions in West and East

WEST		EAST	
Region Code	**Provinces**	**Region Code**	**Provinces**
TR10	İstanbul	TR63	Hatay, Kahramanmaraş, Osmaniye
TR21	Tekirdağ, Edirne, Kırklareli	TR72	Kayseri, Sivas, Yozgat
TR22	Balıkesir, Çanakkale	TR82	Kastamonu, Çankırı, Sinop
TR31	İzmir	TR83	Samsun, Tokat, Çorum, Amasya
TR32	Aydın, Denizli, Muğla	TR90	Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane
TR33	Manisa, Afyon, Kütahya, Uşak	TRA1	Erzurum, Erzincan, Bayburt
TR41	Bursa, Eskişehir, Bilecik	TRA2	Ağrı, Kars, Iğdır, Ardahan
TR42	Kocaeli, Sakarya, Düzce, Bolu, Yalova	TRB1	Malatya, Elazığ, Bingöl, Tunceli
TR51	Ankara	TRB2	Van, Muş, Bitlis, Hakkâri
TR52	Konya, Karaman	TRC1	Gaziantep, Adıyaman, Kilis
TR61	Antalya, Isparta, Burdur	TRC2	Şanlıurfa, Diyarbakır
TR62	Adana, Mersin	TRC3	Mardin, Batman, Şırnak, Siirt
TR71	Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir		
TR81	Zonguldak, Karabük, Bartın		

Source: Prepared by the author

As seen from Table 3.2, West contains populous and relatively developed NUTS 2 regions and contrarily, East is composed of sparsely populated and relatively less developed NUTS 2 regions. However, each region contains a few provinces differing from the region they belong to. Firstly and most importantly, the provinces Kayseri and Gaziantep, being in the second of the five development groups of provinces according to SEGE, are taken in the region East. Main reason for these exceptions of Kayseri and Gaziantep is their geographical position in the sense that their neighbor provinces are all less developed and contained in the East.

Table 3.2 Population Density and per capita Gross Value Added (GVA), 2004					
NUTS2 Regions (WEST)	**Population Density**	**Per Capita GVA ($)**	**NUTS2 Regions (EAST)**	**Population Density**	**Per Capita GVA ($)**
TR10	2,486	10,352	TR63	127	3,907
TR21	81	8,680	TR72	39	4,639
TR22	67	5,725	TR82	28	4,794
TR31	322	8,398	TR83	73	4,716
TR32	84	6,850	TR90	72	4,862
TR33	66	5,586	TRA1	26	3,760
TR41	123	9,377	TRA2	38	2,684
TR42	158	9,622	TRB1	45	3,876
TR51	190	9,056	TRB2	48	2,355
TR52	47	4,938	TRC1	155	3,539
TR61	72	7,712	TRC2	93	2,904
TR62	126	5,318	TRC3	76	2,887
TR71	48	7,113			
TR81	108	4,654			

Source: TURKSTAT

Similarly, the TR71 NUTS 2 region seems to carry the characteristics of the region East. However, when the provinces constituting TR71 are examined, one would see that three provinces (Kırıkkale, Nevşehir and Kırşehir) are in the second and two (Niğde and Aksaray) are in the third of the five development groups identified with SEGE. In view of the fact that the three provinces shows similarity with the provinces in the West and that NUTS 2 borders are taken as basis, TR71 is contained in the West.

There would be other provinces which seem to be relatively less developed (relatively developed) on their own but taken in West (East). Since the aim of this study is to identify two geographically homogenous regions, such provinces are grouped according to the location of the NUTS 2 region they belong to.

Table 3.3 Labor Force Indicators for Regions West and East, 2004*							
NUTS 2 Region (WEST)	**LFPR (%)**	**UR (%)**	**ER (%)**	**NUTS 2 Region (EAST)**	**LFPR (%)**	**UR (%)**	**ER (%)**
TR10	46.7	16.8	38.8	TR63	46.6	18	38.2
TR21	54	13.0	47.0	TR72	40.6	13.2	35.2
TR22	48.4	8.5	44.3	TR82	51.5	9.4	46.7
TR31	46.6	16.2	39.0	TR83	55.1	6.9	51.3
TR32	53.9	14.2	46.3	TR90	60.7	6.0	57.0
TR33	45.6	11.0	40.6	TRA1	52.1	7.7	48.1
TR41	48.4	13.9	41.7	TRA2	51.1	9.4	46.3
TR42	49.2	15.0	41.8	TRB1	46.4	16.8	38.6
TR51	44.9	13.6	38.8	TRB2	41.5	16.4	34.6
TR52	52.8	10.1	47.4	TRC1	42.0	17.2	34.8
TR61	55.8	11.4	49.4	TRC2	34.4	18.8	27.9
TR62	51.6	22.0	40.2	TRC3	31.5	15.1	26.8
TR71	44.3	14.9	37.7				
TR81	56.1	7.3	52.0				
WEST	**48.7**	**14.7**	**41.6**	**EAST**	**46.1**	**12.5**	**40.3**

Source: TURKSTAT

*LFPR: Labor Force Participation Rate; UR: Unemployment Rate; ER: Employment Rate

To sum up, with taking socioeconomic status, demographic characteristics and locations of the regions into account, Turkey is regionalized into two regions and named as West and East. The two regions seems similar with respect to the labor force data, however, shows difference with respect to the GVA and population density values. Thus, the regions West and East can be classified as relatively developed and less developed, although both regions contains provinces differing from the region they belong to.

CHAPTER 4

A TWO-REGION SAM OF TURKEY

One aim of this study is to construct a two-region SAM of Turkey. In this chapter, a general overview of social accounting matrices and multiregional social accounting matrices is presented firstly. Then, the construction of a two-region I-O table and a two-region SAM of Turkey for 2002 is explained.

4.1 Social Accounting Matrices

Formulated first by Pyatt and Thorbecke (1976), a SAM forms a data and classification system that includes both economic and social dimensions of a given economy. It describes the structure of an economy as it captures the transfers and transactions between economic agents within a socioeconomic system. The main features of SAM are threefold. First, it is comprehensive in that it portrays all transactions among sectors, institutions and economic agents. Second, it is consistent, since there should be an equivalent expenditure for every income. Third, the SAM is complete, as the receiver and sender of all transactions are classified (Thorbecke, 1998). As a comprehensive, consistent and complete data system, it provides a snapshot of the economy during a given period (generally a year).

As all transactions in a socioeconomic system appear in the SAM, it comprises crucial relationships among variables such as the mapping of the factorial income distribution from the structure of production and the mapping of household income from the factorial income distribution (Thorbecke, 1998). Thus, SAM can be used as a diagnostic tool to understand and analyze the socioeconomic structure of an economy. In this respect, a SAM can be seen as a conceptual framework or a basis

for policy analysis and modeling as the transformations represented in a SAM have to be explained by structural and behavioral relationships.

The fundamental use areas of the SAM are multiplier analysis, structural path analysis and computable general equilibrium (CGE) models. Through multiplier analysis, SAM can be used for estimating the effects of such exogenous changes as an increase in exports or government expenditure on the whole economic system. Identifying the sectors through which the effect is transmitted, structural path analysis can also be used in the same respect. On the other hand, SAM can provide a database for CGE models which analyze main policy changes simultaneously to capture their combined effects, based on empirical data (Bandara, 1991). Thorbecke (2000) notes that SAM provides the "navigation table" for a CGE as the initial condition values are taken from the base-year SAM as well as the parameters and coefficients of equations of CGE are calibrated on the base-year SAM.

Technically, the SAM is a square matrix where the receipts are listed in rows and the expenditures are shown in columns. Each account is recorded in a row and a column. Row sums and column sums should be equal for each account since total expenditure should equal the total receipt for each account. A schematic SAM is depicted in Table 4.1.

In the schematic SAM presented in Table 4.1, five accounts are distinguished: production activities, commodities, institutions, capital account and rest of the world (ROW). The total value of output produced which amounts to Y (i.e gross national product) constitutes the column of the production activities account whereas the domestic consumption (DC) and exports (X) compose the row sum. In economic terms, gross national product is either sold in domestic market or exported. Thus, the equivalence of row and column sums for the production activities account gives the following mathematical equation:

$$Y = DC + X \qquad 4.1$$

Table 4.1 A Schematic SAM					
	Production Activities	Commodities	Institutions	Capital Account	Rest of the World
Production Activities		DC			X
Commodities			C	I	
Institutions	Y				
Capital Account			S		M-X
Rest of the World		M			

Source: Telli (2004)

Gross national product (*Y*) becomes the income of institutions which can be viewed as households (and firms and government, if included). *Y* is then either consumed (*C*) or saved (*S*), giving:

$$Y = C + S \tag{4.2}$$

The commodities that come from either DC or imports (*M*) are either consumed (C) or added to capital stock (*I*). This is given by the row-column equivalence of the market activities account, whose mathematical expression is as follows:

$$DC + M = C + I \tag{4.3}$$

Investment expenditures may not equal to domestic savings. The difference between I and S is met by foreign borrowing which is equal to (*M-X*) in magnitude, i.e.,

$$I - S = M - X \tag{4.4}$$

Hence, the equivalence of row and column sums for each account in the SAM is satisfied.

The SAM structure presented here is highly aggregated. In fact, there is no unique way of organizing a SAM in terms of classification and disaggregation. The aggregation to be chosen differs with the questions that SAM framework is expected to answer. For instance, SAM could be disaggregated with respect to sectors in production and market activities if a detailed sectoral analysis is to be carried out. Similarly, if income distribution is going to be studied then households account should be disaggregated into smaller homogenous socioeconomic groups or if flow of funds among financial institutions and households, a financial SAM should be constructed.

Thorbecke (2000) lists the key issues in deciding on a SAM classification scheme as level and extent of disaggregation, the degree of homogeneity and regionalization. Citing from Alarcon Rivero et al., (1986), he emphasizes that

> A SAM taxonomy should a) correctly reproduce the socioeconomic and structural (production) stratification within the society and economy; b) distinguish relatively homogenous groups and categories; c) be composed of socioeconomic groups that are recognizable for policy purposes; d) be based on comparatively stable characteristics that can be measured relatively easily and reliably and e) be derivable from (a combination of) existing data sources (p. 12).

SAM presents a consistent structure gathering a variety of data from different sources. The data requirement in compiling a SAM also depends on the objectives of the SAM construction. Hence, it is not possible to identify a unique and general set of required data either. Nevertheless, the I-O tables and national statistics constitute the main data sources for SAM compilation. In fact, SAM can be regarded as an extension of I-O table. Köse and Yeldan (1996), citing from Hanson and Robinson (1991), notes that SAM is built upon the input-output accounts which constitutes the starting point for the consistency between micro and macro data. Besides national

accounts and I-O data, supplementary data in public finance, data from national income accounts etc. are used to complete a SAM.

The SAM structure used in this study is depicted in Table 4.2. Seven accounts are distinguished in the SAM: production activities, commodities, factors of production, households, government, capital account and rest of the world. Factors are taken to be formed by labor and capital whereas capital account is distinguished for private and public institutions. Households are taken as a unique account.

The column of production activities account is composed of expenditures beard during production process, i.e. intermediate goods and services bought by production activities, indirect taxes paid to the government and value added distributed to factors of production. The output produced during this process is either sold in domestic market or exported.

The total value of the goods and services in the market is composed of the domestic sales of the goods and services produced in the domestic market, imports and taxes. This total absorption is used as intermediate input in the production process or becomes either (private and public) consumption or (private and public) investment. Hence the row sum of the commodities account gives the total domestic demand.

Factors of production, namely labor and capital, receive income in the form of wages and profits. These incomes, net of social security premiums and corporate taxes, are distributed to households and the equivalence of row and column sums is satisfied for the factors of production account as well.

Households earn income from the factors of production and receive transfers from government and abroad. Transfers from abroad are mainly the remittances of Turkish workers abroad. In turn, households account allocates its expenditures on

Table 4.2 Structure of the Social Accounting Matrix for Turkey

		Production Activities	Commodities	Factors of Production		Households	Government	Public Investment	Private Investment	ROW	Total
				Labor	Capital						
Production Activities			Supply for Domestic Market							Exports	Gross Production
Commodities		Intermediate Input Demand				Private Consumption	Government Consumption	Public Investment	Private Investment		Aggregate Demand
Factors of Production	**Labor**	Wages									Labor Income
	Capital	Profits									Capital Income
Households				Wage Income (Net)	Profit Income (Net)		Transfers			Transfers from Abroad	Private Income
Government		Indirect Taxes on Inputs	Tariffs	Social Security Premiums	Corporate Taxes	Direct Taxes & Non-tax Payments				Foreign Saving	Public Income
Public Investment						Investment-Saving Deficit/Surplus	Public Savings				Public Investment
Private Investment						Private Saving					Private Investment
ROW			Imports				Interest Payments				Foreign Exchange Expenditures
Total		Production Expenditures	Total Absorption	Total Wages	Total Profits	Total Private Expenditures	Total Public Expenditures	Public Investment	Private Investment	Foreign Exchange Earnings	

Source: Prepared by the author

private consumption, direct tax and non-tax payments to government, public sector income and the household savings. The amount of savings corresponding to private investment is recorded in the private investment account with the residual savings, namely saving-investment difference, transferred to public investment account.

Income of the government account consists of (direct and indirect) tax revenues, social security premium and non-tax payments from households and transfers abroad. Government account's expenditures are consumption on goods and services provided by the production activities, transfers to households and interest payments on foreign borrowing. The remaining savings are transferred to capital account.

The value of private investment presented in the row of private investment account is taken equal to the private investment values in the column. Similarly, the row of the public investment consists of public savings transferred from government account and saving-investment difference transferred from households account. This row sum is used as public investment and shown in the column of public investment account.

Finally, the row of ROW account shows the income earned by ROW in domestic economy whereas the column shows the expenditures transferred by ROW. ROW earns income from imports and interest payments on foreign borrowing. Corresponding to this income, ROW's expenditures are exports and remittances and the residual foreign savings is transferred to government.

Thus, all the transformations shown in SAM are presented. The production activities and commodities accounts each is taken as aggregate accounts. They may be disaggregated with respect to sectors. Two sectors will be used in this study, namely rural and industry & services sectors, details of which are explained in the following chapters.[6]

[6] See page 30.

The data required to construct the SAM is taken mainly from the I-O table. Besides, data provided by public sector general equilibrium, national income accounts, balance of payments are used.

4.2 Multiregional Social Accounting Matrices

In regional economics, one needs a detailed view of a small regional economy. In this respect, the data provided by I-O tables are useful for tackling a wide variety of questions. Thus, most of the research in regional economics relies on I-O accounts because of the sectoral detail they offer.[7]

However, the application of I-O techniques to regional economic issues is hindered firstly by the fact that most statistical offices provide only national tables but not regional and that the data needed for compiling a regional I-O data generally does not exist. Also, its usefulness is limited due to its failure to provide sufficiently detailed information on functional relationships among major institutional transactors of the economy such as the households sector and the government sector, which an information system for regional economic planning requires (Barnard, 1969). In this respect, SAM at the regional level provides a more detailed and sufficient information for regional economic analysis.

According to Thorbecke (2000), "…distinguishing regions within a country SAM can enhance both its realism and its usefulness. If the economy displays significant regional differences in the types of goods produced, structure of production and technology, these differences could affect the standards of living of different household groups"(p. 13). Thorbecke also mentions the fact that a large number of policy means (e.g. investment projects, current government expenditures on health or education) are location-specific as another advantage of having a regional dimension in SAM.

[7] On the use of input-output accounts and analysis, see Isard et.al. (1998), Chapter 3.

Construction of regional SAMs can be handled in different ways. SAM can be compiled only for one region or multi-regions. Single region models are composed of a single region and rest of the region. In this case, the ROW account in a national SAM is divided into two, being 'rest of the nation' and 'rest of the world'. This would enable to differentiate the transactions with the rest of the nation and rest of the world. For the construction process, one has to study the same issues as national SAM but at a lower level of geographical aggregation.

On the other hand, multiregional models can trace out the effects of national and regional policies as well as interregional or region-nation feedbacks. For a two-region SAM, for instance, one can take a specific region and rest of the nation as the two regions to be studied. Alternatively, two or more regions constituting the whole country can be selected for SAM construction and hence economic analyses.

Usually, the main bottleneck in constructing a regional or multiregional SAM is the absence of data at the regional level. As the main data source of a SAM is I-O table, a regional/multiregional I-O table is needed first. However, for the same reason of the absence of regional data, one needs to compile a regional I-O table, details of which will be discussed in Chapter 4.3.[8]

The construction of a regional SAM entails the estimation of regional I-O tables first, then regional final demands and supply, regional household savings and tax payments and lastly, exports to and imports from the rest of the world (OECD, 2003). Kuhar et. al (2009) indicates that to build a regional SAM, the national I-O tables should be regionalized and other entries of the SAM should be provided with data at regional level.

Table 4.3 depicts the structure of a two-region SAM used in this study. As seen from Table 4.3, in construction of a two-region SAM, the accounts of production

[8] See page 28.

activities, commodities and factors of production are distinguished for the regions West and East. Accordingly, intermediate input demands, wage and profit incomes, foreign export and final demand values will be computed for the regions separately.

The activities account will be distinguished for the two sectors of rural and industry & services. Public and private investment, households and government accounts are taken as unique since regional breakdowns of the data for transfers (from government to households or from rest of the world to households) and savings (private, public and foreign) are absent.

4.3 A Two-Region Input-Output Table of Turkey

An interregional or multiregional I-O table enables the measurement of economic interconnections among regions and between regions and the rest of the world. In a single region model, interregional spillover effects and interregional feedback effects will be absent (Miller, 1998). Interregional spillover effects are the effects of changes in one region on the economy of other regions. The subsequent effects, which affect the first region in turn as a result of the changes in other regions, are named as the feedback effects. Thus, these relations can be studied with a multiregional I-O table. The structure of a two-region I-O table is given in Table 4.4.

In constructing a multiregional input output (MRIO) table, one can use two methods: survey and non-survey. Survey methods, which are using primary data for the regional intra-sectoral transactions, are known to be time consuming and contain the risk of non-sampling errors. The detailed data required to construct a regional or multiregional MRIO table is often not available as one needs both sectoral and spatial information about the origin of an interindustry transaction and also about the destination (Miller, 1998). Thus, constructing a MRIO table with survey data becomes very difficult.

Table 4.3 Structure of the 2-Region Social Accounting Matrix for Turkey

			WEST				EAST			
			Activities	Commodities	Factors of Production		Activities	Commodities	Factors of Production	
					Labor	Capital			Labor	Capital
WEST	Activities			Supply for Domestic Market (W)						
	Commodities		Intermediate Input Demand (W)				Interregional Input Demand (E)			
	Factors of Production	Labor	Wages (W)							
		Capital	Profits (W)							
EAST	Activities							Supply for Domestic Market (E)		
	Commodities		Interregional Input Demand (W)				Intermediate Input Demand (E)			
	Factors of Production	Labor					Wages (E)			
		Capital					Profits (E)			
Households					Wage Income (Net) (W)	Profit Income (Net) (W)			Wage Income (Net) (E)	Profit Income (Net) (E)
Government			Indirect Taxes on Inputs (W)	Tariffs (West)	Social Security Premiums (W)	Corporate Taxes (W)	Indirect Taxes on Inputs (E)	Tariffs (E)	Social Security Premiums (E)	Corporate Taxes (E)
Public Investment										
Private Investment										
ROW				Imports (West)				Imports (E)		
Total			Production Expenditures (W)	Total Absorption (W)	Total Wages (W)	Total Profits (W)	Production Expenditures (E)	Total Absorption (E)	Total Wages (E)	Total Profits (E)

Source: Prepared by the author

Table 4.3 Structure of the 2-Region Social Accounting Matrix for Turkey (cont'd)

			Households	Government	Public Investment	Private Investment	ROW	Total
WEST	**Activities**						Exports (W)	Gross Production (W)
	Commodities		Private Consumption (W)	Government Consumption (W)	Public Investment (W)	Private Investment (W)		Aggregate Demand (W)
	Factors of Production	**Labor**						Labor Income (W)
		Capital						Capital Income (W)
EAST	**Activities**						Exports (East)	Gross Production (East)
	Commodities		Private Consumption (E)	Government Consumption (E)	Public Investment (E)	Private Investment (E)		Aggregate Demand (East)
	Factors of Production	**Labor**						Labor Income (E)
		Capital						Capital Income (E)
Households				Transfers			Transfers from Abroad	Private Income
Government			Direct Taxes				Foreign Saving	Public Income
Public Investment			Investment-Saving Deficit/Surplus	Public Savings				Public Investment
Private Investment			Private Saving					Private Investment
ROW				Interest Payments on Foreign Borrowing				Foreign Exchange Expenditures
Total			Total Private Expenditures	Total Public Expenditures	Public Investment	Private Investment	Foreign Exchange Earnings	

Source: Prepared by the author

Contrarily, non-survey methods, which are going to be used in this study, rely on applying various techniques for the regionalization of the NIOT.

Thus, the 2002 NIOT, taken from TURKSTAT database, is aggregated to be composed of two sectors, namely "rural" and "industry & services" (ind. & serv.). The first three sectors in NIOT (agriculture, hunting and related service activities; forestry, logging and related service activities; fishing, operating of fish hatcheries and fish farms; service activities incidental to fishing) are taken as rural and the remaining 56 sectors are aggregated to form industry & services. The aggregated I-O table of Turkey for 2002 is given in Table 4.5. Then, using various estimates for components of the NIOT, a two-region I-O table is constructed. The table includes intraregional estimates as well as interregional commodity flows. In other words, it can be said that it contains two regional I-O tables and an interregional commodity flow table.

For the construction of a MRIO table with non-survey techniques, one needs an interregional flow matrix and the estimates of the final demand elements. In this study, for the estimation of the transactions table, simple location quotient method (SLQ) and for other components of the two-region I-O table, weighting techniques (use of regional weights (employment, value added or output) to disaggregate the national values into regional estimates) are used. The estimation procedures are described in detail below.

The Transactions Table

As discussed before[9], for estimating the regional intermediate demands and interregional flows there exist several non-survey methods: use of unadjusted national coefficients, location quotient (LQ), commodity balance (CB), supply-

[9] See Chapter 2.

Table 4.4 Structure of a 2-region I-O Table

		WEST		EAST		Total	WEST		EAST		Exports, fob	Government Consumption	Total Use at Basic Prices
		Rural	Ind. & Serv.	Rural	Ind. & Serv.		Private Consumption	Gross Fixed Capital	Private Consumption	Gross Fixed Capital			
WEST	Rural												
	Ind. & Serv.												
EAST	Rural												
	Ind. & Serv.												
Total													
Net Taxes on Production													
Compensation of Employees													
Operating Surplus													
Consumption of Fixed Capital													
Value Added at Basic Prices													
Imports													
Supply at Basic Prices													

Source: Prepared by the author

Table 4.5 2002 Aggregated Input Output Table for Turkey

	Rural	Ind. & Serv.	Total	Private Consumption	Government Consumption	Final Consumption Expenditure	Gross Fixed Capital Formation (Investment)	Changes in Inventories and Valuables	Exports, fob	Final Uses at Basic Prices	Total Use at Basic Prices
Rural	7,330,347	22,644,120	29,974,467	20,698,655	93,616	20,792,271	22,979	1,291,221	2,336,786	24,443,257	54,417,724
Ind. & Serv.	9,844,144	290,099,906	299,944,050	209,612,790	44,278,727	253,891,517	57,986,496	1,834,131	62,201,582	375,913,725	675,857,775
Total	17,174,491	312,744,026	329,918,517	230,311,445	44,372,342	274,683,788	58,009,474	3,125,352	64,538,368	400,356,982	730,275,499
Net Taxes on Production	2,145,817	10,400,851	12,546,668								
Compensation of Employees	5,103,158	87,327,936	92,431,093								
Operating Surplus	25,287,800	160,373,932	185,661,733								
Consumption of Fixed Capital	2,235,647	22,991,962	25,227,609								
Value Added at Basic Prices	32,626,605	270,693,830	303,320,435								
Imports, fob	2,470,811	82,019,067	84,489,878								
Supply at Basic Prices	54,417,724	675,857,775	730,275,499								

Source: Author's calculations from TURKSTAT

demand pool (SDP), RAS techniques. Among these methods, SLQ technique is used in this study. In this study, LQ technique is used for derivation of regional intermediate demands and interregional flows. There exist some modified versions of SLQ (purchases-only LQ, cross-industry LQ, semilogarithmic LQ etc.) but these modifications seem to have slight effects on the results (Morrison and Smith 1974, Bonfiglio 2005, Riddington et al. 2006).

Location quotients are used to convert the matrix of national direct input coefficients A^N into an intraregional matrix A^R. Thus, first A^N is computed from the aggregated NIOT according to the formula

$$a_{ij}^N = {}^{z_{ij}}/_{x_j} \qquad 4.5$$

where z_{ij} denotes the interindustry sales and x_j denotes sector j's gross output and N stands for 'national'.

The matrix of national direct input coefficients (A^N) computed is given in Table 4.6.

Table 4.6 National Direct Input Coefficients (A^N)

	Rural	I & S
Rural	0.135	0.034
I & S	0.181	0.429

Source: Author's calculations from TURKSTAT

LQ's are computed using RGVA data with the following formula:

$$LQ_i^R = \frac{{}^{GVA_i^R}/_{\sum_i GVA_i^R}}{{}^{GVA_i^N}/_{\sum_i GVA_i^N}} \qquad 4.6$$

where *i* stands for sectors, *R* for regions and N for 'national'.

If a sector's location quotient is one than the region is viewed as self-sufficient with respect to output i. On the other hand, if a sector's location quotient is larger than one then the sector is assumed to be able to supply all inputs needed and exports some of its industry's output. Thus, the intraregional direct input coefficient is taken to be equal to its national counterpart. Conversely, if a sector's location quotient is less than one then it is assumed that the region can supply that proportion of the input requirements and imports some of product i elsewhere from other regions. That is,

$$a_{ij}^{R} = \begin{cases} a_{ij}^{N} & if\ LQ_i^R \geq 1 \\ LQ_i^R . a_{ij}^{N} & if\ LQ_i^R < 1 \end{cases} \qquad 4.7$$

where i, j stands for sectors, R for regions and N for 'national'.

Table 4.7 depicts the simple location quotients (SLQs) computed.

Table 4.7 Simple Location Quotients

	Rural	I & S
West (W)	0.776	1.027
East (E)	1.920	0.890

Source: Author's calculations from TURKSTAT

Location quotients of region West is greater than one for industry & services sector and less than one for rural sector. Thus, regional direct input coefficients are taken to be equal to their national counterpart for industry & services sector and computed to be product of LQ and national input coefficient for rural sector.

Similarly, location quotients of region East is less than one for industry & services sector and greater than one for rural sector. Thus, regional direct input coefficients

are taken to be equal to their national counterpart for rural sector and computed to be product of LQ and national input coefficient for industry & services sector.

Table 4.8 Intraregional Direct Input Coefficients (A^W and A^E)					
West (W)	R	I & S	**East (E)**	R	I & S
R	0.105	0.026	R	0.135	0.034
I & S	0.181	0.429	I & S	0.161	0.382

Source: Author's calculations from TURKSTAT

The regional gross output values are estimated according to the regions' shares in RGVA. Using these estimated regional input coefficients, shown in Table 4.8, the estimated regional intermediate demands and interregional flows are computed.

Location quotients are also computed with respect to employment data and the results are very similar with those computed using GVA data:

Table 4.9 Simple Location Quotients (employment)		
	Rural	I & S
West (W)	0.710	1.119
East (E)	1.636	0.739

Source: Author's calculations from TURKSTAT

Table 4.10 Intraregional Direct Input Coefficients (employment)					
West (W)	R	I & S	**East (E)**	R	I & S
R	0.096	0.024	R	0.135	0.034
I & S	0.181	0.429	I & S	0.134	0.317

Source: Author's calculations from TURKSTAT

Gross Output

National gross output values are disaggregated according to the regions' shares in the Regional Gross Value Added taken from TURKSTAT for the year 2004.

Final Demand

Government expenditure statistics are not available at regional level. In estimating its regional distribution, first, the ratio of government consumption to total use values for each sector are computed. Then, these ratios are used to calculate regional government consumption for the two regions (i.e it is assumed that its total value as a share of sectoral regional GDP is the same as its share in sectoral national GDP).

For private consumption data, results of the study "Consumption Expenditure Statistics" conducted by TURKSTAT could also be used. But when we look at the results of the study, we see that sectoral composition of national private consumption becomes highly different from that computed from the NIOT. Thus, in order to achieve consistency with NIOT, the above mentioned method used for disaggregating government consumption is used instead.

Investment values are computed as residual for each row as the total use values were disaggregated according to GVA values at the beginning.

International Trade

Regional export and import values in the NIOT are disaggregated according to regions' shares in the 2002 import and export data taken from TURKSTAT.

Value Added

Expenditures to labor are disaggregated to regions according to regions' shares in sectoral employment. Employment data are taken from TURKSTAT for the year 2004. For this disaggregation, 'wages and salaries by economic activities' published

by TURKSTAT could also be used but since there exist hidden data, it was not taken into account.

Depreciation values and net taxes are estimated with respect to regions' shares in the GDP.

The value added of capital is computed as residual i.e estimated regional gross value added net of depreciation and value added of labor.

The two-region I-O table constructed is given in Table 4.11.

Table 4.11 Two-Region I-O Table for Turkey (2002)

		WEST		EAST		Total	WEST		EAST		Exports, fob	Government Consumption	Total Use at Basic Prices
		Rural	Ind. & Serv.	Rural	Ind. & Serv.		Private Consumption	Gross Fixed Capital Formation (Investment)	Private Consumption	Gross Fixed Capital Formation (Investment)			
WEST	Rural	3,554,726	14,522,939			18,077,666	12,928,471	1,254,229			1,670,710	58,473	33,989,549
	Ind. & Serv.	6,148,695	239,645,924	407,856	5,568,465	251,770,940	173,157,073	37,767,610			59,039,618	36,577,800	558,313,042
EAST	Rural	1,023,840	4,182,930	2,751,780	3,938,250	11,896,801			7,770,185	59,970	666,076	35,143	20,428,175
	Ind. & Serv.			3,287,592	44,885,517	48,173,109			36,455,717	22,053,017	3,161,964	7,700,927	117,544,733
Total		10.727.262	258,351,794	6,447,229	54,392,232	329,918,517	186,085,544	39,021,839	44,225,901	22,112,987	64,538,368	44,372,342	730,275,499
Net Taxes on Production		1.340.287	8,591,942	805,530	1,808,909	12,546,668							
Compensation of Employees		2.490.341	67,155,183	2,612,817	20,172,753	92,431,093							
Operating Surplus		16.056.288	126,216,591	9,231,512	34,157,342	185,661,733							
Consumption of Fixed Capital		1.396.395	18,993,216	839,252	3,998,747	25,227,609							
Gross Value Added		19.943.024	212,364,989	12,683,581	58,328,842	303,320,435							
Imports		1.978.975	79,004,317	491,836	3,014,750	84,489,878							
Supply at Basic Prices		33.989.549	558,313,042	20,428,175	117,544,733	730,275,499							

Source: Author's calculations from TURKSTAT

4.4 A Two-Region Social Accounting Matrix of Turkey

The two-region social accounting matrix, structure of which was given in Table 4.3, is constructed utilizing the data from two-region I-O table constructed, SPO, Central Bank of the Republic of Turkey (CBRT), Republic of Turkey Ministry of Finance (RTMF) and TURKSTAT.

The intermediate input demand data are taken from two-region I-O table constructed in the preceding part. The final demand values, which are given in basic prices in two-region I-O table, are converted to producer's prices by using net taxes (taxes less subsidies) table of TURKSTAT and aggregated (Table 4.12).

For the households account; labor and capital income, transfers from the government and from the rest of the world are taken as income. Transfers from abroad include remittances of Turkish workers abroad and taken from Balance of Payments statistics published by CBRT. Transfers from government include the payments to social security deficits ('funds' account in PSGE by SPO) and the interest payments on domestic debt. Interest payment on domestic debt is computed with the help of data from SPO and CBRT. Expenditures of households are composed of private consumption, direct tax and non-tax payments to government, public sector public income and private savings. Private consumption is taken from two-region I-O table as mentioned. Non-tax payments to government and public sector factor income data come from PSGE, whereas the direct tax payments data is taken from Consolidated Budget statistics of Ministry of Finance. The residual savings, i.e. saving-investment deficit of households is computed as residual and recorded in the SAM as a transfer to public investment account. Table 4.13 shows the income and expenditures of the household account.

Table 4.12 Net Taxes

		Private Consumption	Government Consumption	Final Consumption Expenditure	Gross Fixed Capital Formation (Investment)	Changes in Inventories and Valuables	Exports, fob	Final Uses at Basic Prices	Total Use at Basic Prices
WEST	**Rural**	856,422	87	856,509	45	0	-11,569	844,985	922,888
	Ind. & Serv.	22,946,042	200,594	23,146,636	492,721	0	-21,241	23,618,116	33,879,644
EAST	**Rural**	514,721	52	514,774	27	0	-6,953	507,847	554,668
	Ind. & Serv.	4,830,957	42,232	4,873,189	103,735	0	-4,472	4,972,453	7,132,869

Source: Author's calculations from TURKSTAT

Table 4.13 Households Account (at Current Prices, Thousand TRL)	
A. RECEIPTS	**340,874,151**
Labor Income	75,871,574
Capital Income	204,826,419
Transfers from Government	57,263,252
Social Funds	8,836,903
Interest Payments on Domestic Borrowing	48,426,349
Foreign Transfers	2,912,906
Remittances of Turkish workers abroad	2,912,906
B. EXPENDITURES	**288,007,307**
Private Consumption	259,459,588
Direct Taxes	14,322,426
Non-tax Payments	8,359,284
Public Sector Factor Income	20,174,112
C. PRIVATE SAVINGS (A-B)	**38,558,741**
D. PRIVATE INVESTMENT	**45,707,726**
E. PRIVATE SECTOR SAVING-INVESTMENT DIFFERENCE (C-D)	**-7,148,985**

Source: Author's calculations from TURKSTAT, SPO, CBRT, RTMF

The row of Rest of the World (ROW) account is composed of imports and interest payment on foreign debt. Value of imports is taken from two-region I-O table whereas the data for interest payment on foreign debt is provided by SPO and CBRT statistics. Exports, remittances of Turkish workers abroad and foreign deficit constitute the column of the account ROW. The foreign deficit is computed as residual and transferred to government. Table 4.14 shows the details of the ROW account.

Table 4.14 Rest of the World Account (at Current Prices, Thousand TRL)	
A. RECEIPTS FROM ABROAD	**67,407,038**
Exports	64,494,133
Transfers to Households	2,912,906
Remittances of Turkish workers abroad	2,912,906
B. EXPENDITURES TO ABROAD	**90,367,701**
Imports	84,489,878
Interest Payments on Foreign Borrowing	5,877,823
C. FOREIGN SAVINGS (A-B)	**-22,960,663**

Source: Author's calculations from TURKSTAT, SPO, CBRT, RTMF

Direct (income and corporate) and indirect (production and sales) taxes, social security premium payments, non-tax payments from households and transfers from abroad constitute the total income of the government account. Indirect tax values are taken from two-region I-O table, while direct tax revenue is taken from RTMF. Source of the data on social security payments is SPO. Also, foreign savings, computed from the account of ROW, is taken as a transfer to government from ROW. On the other hand, government expenditures are composed of government consumptions taken from two-region I-O table, transfers to households -payments to social security deficits and the interest payments on domestic debt as mentioned above, interest payments on foreign debt, which is computed from SPO and CBRT statistics. Public savings are computed as residual and are taken as a transfer to public investment account. Details of data on government account are given in Table 4.15.

Table 4.15 Public Sector Account (at Current Prices, Thousand TRL)	
A. RECEIPTS	**110,754,884**
Tax Income	62,875,418
Direct Taxes	20,385,349
Indirect Taxes	42,490,069
Social Security Premium Payments	16,559,519
Non-Tax Revenues	8,359,284
Foreign Savings	22,960,663
B. EXPENDITURES	**107,756,382**
Government Consumption	44,615,308
Transfers to Households	57,263,252
Social Funds	8,836,903
Interest Payments on Domestic Borrowing	48,426,349
Interest Payments on Foreign Borrowing	5,877,823
C. PUBLIC SAVINGS	**2,998,502**
D. PUBLIC INVESTMENT	**16,023,629**
E. PUBLIC SECTOR SAVING-INVESTMENT DIFFERENCE (C-D)	**-13,025,127**

Source: Author's calculations from TURKSTAT, SPO, CBRT, RTMF

The investment values are disaggregated into public and private investment, assuming the share of public and private investments are the same as in the gross domestic product. The values in private investment column come from two-region I-O table and the private investment row is arranged to cover this expenditures. Similarly, the row of the public investment consists of public savings transferred from government account and saving-investment difference transferred from households account. This row sum is used as public investment and shown in the column of public investment account.

Factors of production receive income in the form of wages and profits. These incomes, net of social security premiums and corporate taxes, are distributed to households. Social Security premium values are taken from the statistics of SPO as aggregate and broken down for the two regions with respect to their shares in employment. Similarly, corporate tax values are given in Consolidated Budget statistics as aggregate. These values are computed for regions with respect to their shares in Gross Value Added.

The 2002 two-region Social Accounting Matrix constructed is presented in Table 4.16.

Table 4.16 Two-Region Social Accounting Matrix of Turkey (2002)

			WEST						EAST					
			Activities		Commodities		Factors of Production		Activities		Commodities		Factors of Production	
			Rural	Ind. & Serv.	Rural	Ind. & Serv.	Labor	Capital	Rural	Ind. & Serv.	Rural	Ind. & Serv.	Labor	Capital
WEST	Activities	Rural			30,351,432									
		Ind. & Serv.				420,290,348								
	Commodities	Rural	3,554,726	14,522,939										
		Ind. & Serv.	6,148,695	239,645,924					407,856	5,568,465				
	Factors of Production	Labor	2,490,341	67,155,183										
		Capital	17,452,683	145,209,806										
EAST	Activities	Rural									19,277,217			
		Ind. & Serv.										111,372,491		
	Commodities	Rural	1,023,840	4,182,930					2,751,780	3,938,250				
		Ind. & Serv.							3,287,592	44,885,517				
	Factors of Production	Labor							2,612,817	20,172,753				
		Capital							10,070,764	38,156,088				

Source: Author's calculations from TURKSTAT, SPO, CBRT, RTMF

Table 4.16 Two-Region Social Accounting Matrix of Turkey (2002) (cont'd)												
	WEST						**EAST**					
	Activities		**Commodities**		**Factors of Production**		**Activities**		**Commodities**		**Factors of Production**	
	Rural	**Ind. & Serv.**	**Rural**	**Ind. & Serv.**	**Labor**	**Capital**	**Rural**	**Ind. & Serv.**	**Rural**	**Ind. & Serv.**	**Labor**	**Capital**
Households					58,274,350	157,781,836					17,597,224	47,044,583
Government	1,340,287	8,591,942	844,985	23,618,116	11,371,173	4,880,653	805,530	1,808,909	507,847	4,972,453	5,188,346	1,182,270
Public Investment												
Private Investment												
ROW			1,978,975	79,004,317					491,836	3,014,750		
Total	32,010,573	479,308,725	33,175,393	522,912,781	69,645,524	162,662,490	19,936,340	114,529,983	20,276,900	119,359,694	22,785,570	48,226,852

Source: Author's calculations from TURKSTAT, SPO, CBRT, RTMF

Table 4.16 Two-Region Social Accounting Matrix of Turkey (2002) (cont'd)

			Households	Government	Public Investment	Private Investment	ROW	Total
WEST	Activities	Rural					1,659,141	32,010,573
		Ind. & Serv.					59,018,377	479,308,725
	Commodities	Rural	13,784,893	58,560	325,572	928,702		33,175,393
		Ind. & Serv.	196,103,115	36,778,394	9,931,247	28,329,084		522,912,781
	Factors of Production	Labor						69,645,524
		Capital						162,662,490
EAST	Activities	Rural					659,123	19,936,340
		Ind. & Serv.					3,157,492	114,529,983
	Commodities	Rural	8,284,906	35,195	15,573	44,424		20,276,900
		Ind. & Serv.	41,286,674	7,743,159	5,751,236	16,405,516		119,359,694
	Factors of Production	Labor						22,785,570
		Capital						48,226,852
Households				57,263,252			2,912,906	340,874,151
Government			22,681,710				22,960,663	110,754,885
Public Investment			13,025,127	2,998,502				16,023,629
Private Investment			45,707,726					45,707,726
ROW				5,877,823				90,367,701

Source: Author's calculations from TURKSTAT, SPO, CBRT, RTMF

CHAPTER 5

SAM MULTIPLIER ANALYSIS

As mentioned in previous chapters, one of the use areas of SAM is that it provides a basis for multiplier analysis. The simple economy-wide multipliers developed from SAM can be used for analyzing the effects of macroeconomic policies or exogenous shocks on the whole system, for instance on the structure of input, outputs of production activities or income distribution.

Multiplier analysis can also be performed based on a multiregional SAM. The regional dimensions contained in SAM add new features. One would be able to estimate the effects of policies or external shocks on regional output values. Also, the effects of changes in regional policy means or regional external shocks can be studied. A change in government expenditures, for example, may have different effects on different regions of a country. In some circumstances, it may be more rational to apply different policy means to different regions in order to have a greater increase in output. Therefore, regional effects of policies or effects of regional policies can be estimated through multiplier process.

In this chapter, firstly, derivation of SAM multipliers is explained. Accordingly, the multipliers generated by the two-region SAM of Turkey are computed and main findings are presented.

Derivation of SAM Multipliers

The first step in determining SAM based multipliers is to compute column coefficients analogous to I-O coefficients. In computing these coefficients, one has to decide which accounts should be exogenous and which are to be endogenous. It has been customary to regard transactions in the government account, the capital account and the rest of the world to be exogenous. (Thorbecke, 1998) Since the

government expenditures are mostly policy determined, the external sector generally stay out of domestic control and the SAM based multiplier model has no dynamic features, these three accounts are taken as being exogenous (Round, 2003).

So, the endogenous accounts include production activities, commodities, household and factors. For simplicity, exogenous accounts are aggregated into a single account as shown in Table 5.1.

Table 5.1 Structure of the Simplified Social Accounting Matrix

		Endogenous Accounts				Exogenous Accounts	Total
		Activities (1)	Commodities (2)	Factors of Production (3)	Households (4)	Sum of Other Accounts (5)	
Endogenous Accounts	Activities (1)		T_{12}			x_1	y_1
	Commodities (2)	T_{21}			T_{24}	x_2	y_2
	Factors of Production (3)	T_{31}				x_3	y_3
	Households (4)			T_{43}		x_4	y_4
Exogenous Accounts	Sum of Other Accounts (5)	l_1	l_2	l_3	l_4		
Total		y_1	y_2	y_3	y_4		

Source: Prepared by the author using Thorbecke (1998)

In Table 5.1, x_i represent the exogenous demand for production activities, commodities and factors for i=1,2,3 respectively and x_4 represents the total income accruing to households. Similarly, l_i represent the corresponding leakages. There exist five endogenous transformations shown as T_{ij}, through which the effects of exogenous changes (x_i's) can be determined.

From the part of endogenous accounts in Table 5.1, the matrix A is computed by dividing elements in each column of endogenous accounts by the column total:

$$a_{ij}^{N} = {}^{z_{ij}}/_{x_j} \tag{5.1}$$

$$A = \begin{bmatrix} 0 & A_{12} & 0 & 0 \\ A_{21} & 0 & 0 & A_{24} \\ A_{31} & 0 & 0 & 0 \\ 0 & 0 & A_{43} & 0 \end{bmatrix} \tag{5.2}$$

The component submatrices A_{11} and A_{12} are the technical coefficients and share of domestic demand in total demand, respectively. A_{43} is the share of factor income distributed to households and A_{31} shows the share of value added or factor income of each production activity. Lastly, A_{24} represents the household consumption expenditure shares. Some submatrices are shown as zero as there is no corresponding transaction in the SAM.

From Table 5.1, we have,

$$y = A.y + x \tag{5.3}$$

where y and x are the vectors representing y_i's and x_i's, respectively.

From equation (5.3), one can derive:

$$\begin{aligned} y &= (I - A)^{-1}.x \\ &= M.x \end{aligned} \tag{5.4}$$

where $M = (I - A)^{-1}$ is the SAM multiplier matrix.

The matrix M explains the results obtained from a SAM but not the process they are generated. For the process to be explained, one would need a dynamic model specification including different SAM accounts and variables. Therefore, the matrix is referred as the accounting multiplier matrix (Thorbecke, 1998).

The SAM framework can provide a basis for analysis using the multiplier matrix shown above but one needs to make several assumptions beforehand. First, excess

capacity and unused resources should exist for the effects of exogenous shocks to be studied. Secondly, the distinction between exogenous and endogenous accounts ignores the possibility of the fact that exogenous accounts may be affected as a result of the initial shock, directly or indirectly. Thirdly, the prices are assumed to be fixed and this assumption can result in an overestimation of multipliers. Overall, it is hard to generalize the validity of SAM multipliers in all settings. In this respect, Round (2003) claims that "At best, SAM multipliers provide us with a first-cut estimate of the effects of a policy or external shock, relying only on the SAM structure" (p. 8).

In this way, the effects of external shocks such as a reduction in government expenditure on outputs of activities or on incomes of households or how the total output may change due to an investment decision may be estimated.

The construction of a multiplier matrix for the two-region SAM is similar to that of national. Firstly, the exogenous accounts of the two-region SAM constructed are aggregated into a single account. The structure of a simplified 2-region SAM is given Table 5.2.

From the part of endogenous accounts in Table 5.2, the matrix $\hat{A}$ is computed by dividing elements in each column of endogenous accounts by the column total:

$$\hat{A} = \begin{bmatrix} 0 & A_{12}^{W} & 0 & 0 & 0 & 0 & 0 \\ A_{21}^{W} & 0 & 0 & A_{21}^{E,W} & 0 & 0 & A_{24}^{W} \\ A_{31}^{W} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & A_{12}^{E} & 0 & 0 \\ A_{21}^{W,E} & 0 & 0 & A_{21}^{E} & 0 & 0 & A_{24}^{E} \\ 0 & 0 & 0 & A_{31}^{E} & 0 & 0 & 0 \\ 0 & 0 & A_{43}^{W} & 0 & 0 & A_{43}^{E} & 0 \end{bmatrix} \qquad 5.5$$

The component submatrices are divided with respect to the regions' shares in SAM.

Now, we have,

$$\hat{y} = \hat{A}.\hat{y} + \hat{x} \qquad 5.6$$

where $\hat{y}$ is composed of y_i^W, y_i^E and y_4; $\hat{x}$ is composed of x_i^W, x_i^E and x_4. Thus,

$$\begin{aligned} \hat{y} &= (I - \hat{A})^{-1}.\hat{x} \\ &= \widehat{M}.\hat{x} \end{aligned} \qquad 5.7$$

where $\widehat{M}$ is the accounting multiplier matrix for the two-region SAM.

Table 5.2 Structure of a Simplified 2-Region Social Accounting Matrix

			Endogenous Accounts							Exogenous Accounts	Total
			WEST			EAST			Households (4)	Sum of Other Accounts (5)	
			Activities (1)	Commodities (2)	Factors of Production (3)	Activities (1)	Commodities (2)	Factors of Production (3)			
Endogenous Accounts	WEST	Activities (1)		T_{12}^{W}						x_1^W	y_1^W
		Commodities (2)	T_{21}^{W}			$T_{21}^{E,W}$			T_{24}^{W}	x_2^W	y_2^W
		Factors of Production (3)	T_{31}^{W}							x_3^W	y_3^W
	EAST	Activities (1)					T_{12}^{E}			x_1^E	y_1^E
		Commodities (2)	$T_{21}^{W,E}$			T_{21}^{E}			T_{24}^{E}	x_2^E	y_2^E
		Factors of Production (3)				T_{31}^{E}				x_3^E	y_3^E
	Households (4)				T_{43}^{W}			T_{43}^{E}		x_4	y_4
Exogenous Accounts	Sum of Other Accounts (5)		l_1^W	l_2^W	l_3^W	l_1^E	l_2^E	l_3^E	l_4		
Total			y_1^W	y_2^W	y_3^W	y_1^E	y_2^E	y_3^E	y_4		

Source: Prepared by the author

Application for Turkish Economy

The simplified version of 2002 two-region SAM constructed for Turkey is given in Table 5.3. [10]

Table 5.4, derived from Table 5.3, presents the matrix $\hat{A}$ showing average expenditure propensities. As seen from Table 5.4, in region West, out of total rural production, labor receives 8% and capital receives 55%. Similarly, labor receives 14% and capital receives 30% out of total ind. & serv. production. In region East, 13% of total rural production and 18% of total ind. & serv. production is received by labor; whereas these proportions are 51% and 33%, respectively, for capital.

In turn, total intermediate inputs used in rural activities in region West amount to 33%, 3% of which is received from region East. Similarly, 54% of total ind. & serv. production is the intermediate inputs used and 1% of this is received from region East. For region East, total intermediate inputs used in rural activities add up to 32% and 2% of this comes from region West. Similarly, 47% of total ind. & serv. production is the intermediate inputs used, 5% of which is received from region West.

Households spend 6% of their total income on rural commodities, 2% of which in East and 4% in West. Similarly, 70% of total income is spent on ind. & serv. commodities, %58 of which is spent in West and 12% in East. Hence, one can claim that the consumption of commodities mostly takes place in region West rather than in region East.

Labor in region West transfers 84% of their income to households and capital transfers 97%. These proportions are 77% for labor and 98% for capital in region East.

[10] SAM is simplified by aggregating the exogenous accounts into one, see page 47.

Table 5.3 Simplified Two-Region Social Accounting Matrix of Turkey (2002)

				Endogenous Accounts											
				WEST						EAST					
				Activities		Commodities		Factors of Production		Activities		Commodities		Factors of Production	
				Rural	Ind. & Serv.	Rural	Ind. & Serv.	Labor	Capital	Rural	Ind. & Serv.	Rural	Ind. & Serv.	Labor	Capital
Endogenous Accounts	WEST	Activities	Rural			30,351,432									
			Ind. & Serv.				420,290,348								
		Commodities	Rural	3,554,726	14,522,939										
			Ind. & Serv.	6,148,695	239,645,924					407,856	5,568,465				
		Factors of Production	Labor	2,490,341	67,155,183										
			Capital	17,452,683	145,209,806										
	EAST	Activities	Rural									19,277,217			
			Ind. & Serv.										111,372,491		
		Commodities	Rural	1,023,840	4,182,930					2,751,780	3,938,250				
			Ind. & Serv.							3,287,592	44,885,517				
		Factors of Production	Labor							2,612,817	20,172,753				
			Capital							10,070,764	38,156,088				

Source: Author's calculations from TURKSTAT, SPO, CBRT, RTMF

Table 5.3 Simplified Two-Region Social Accounting Matrix for Turkey (2002) (cont'd)				
		Endogenous Accounts	**Exogenous Accounts**	**Total**
		Households	**Sum of Other Accounts**	
Endogenous Accounts	**Households**		60,176,157	340,874,151
Exogenous Accounts	**Sum of Other Accounts**	81,414,563	31,836,988	262,853,940
Total		340,874,151	262,853,940	

Source: Author's calculations from TURKSTAT, SPO, CBRT, RTMF

Table 5.4 The Matrix $\widehat{A}$

			WEST						EAST						Households
			Activities		Commodities		Factors of Production		Activities		Commodities		Factors of Production		
			Rural	Ind. & Serv.	Rural	Ind. & Serv.	Labor	Capital	Rural	Ind. & Serv.	Rural	Ind. & Serv.	Labor	Capital	
WEST	Activities	Rural			0.91	0.00									
		Ind. & Serv.			0.00	0.80									
	Commodities	Rural	0.11	0.03					0.00	0.00					0.04
		Ind. & Serv.	0.19	0.50					0.02	0.05					0.58
	Factors of Production	Labor	0.08	0.14											
		Capital	0.55	0.30											
EAST	Activities	Rural									0.95	0.00			
		Ind. & Serv.									0.00	0.93			
	Commodities	Rural	0.03	0.01					0.14	0.03					0.02
		Ind. & Serv.	0.00	0.00					0.16	0.39					0.12
	Factors of Production	Labor							0.13	0.18					
		Capital							0.51	0.33					
Households							0.84	0.97					0.77	0.98	

Source: Author's calculations

Table 5.5 depicts the matrix of accounting multipliers $\widehat{M}$ derived from Table 5.3. This matrix can be interpreted using both intraregional and interregional multipliers contained.

A first glance to Table 5.5 indicates that both intraregional multipliers and the interregional multipliers of the region West are stronger than the corresponding ones of region East. The fact that region West shows larger intraregional multipliers can be interpreted as that an exogenous change would have greater effects within the region West than it would have within the region East. Likewise, the interregional multipliers of the region West being larger than that of region East means that a change undertaken in region East would have larger effects on region West than vice versa.

Effects of an Injection of Export Demand

Alternatively, as shown with equation 5.7, the matrix $\widehat{M}$ is used to estimate the effects of policies or exogenous changes on the whole system. For instance, an injection of exogenous demand, say export demand, which amounts to %1 of gross domestic product (GDP), for the ind. & serv. product in region West would increase the income of households by an amount of 1.14% of GDP. The injection would affect, first, the production activities and the distribution of the value added among factors before the influence is transmitted to the households. Income of labor would increase by an amount corresponding to 0.33% of GDP and income of capital by 0.75% in region West. The same values for region East are 0.05% and 0.11%, respectively. On the other hand, the production activities for rural and ind. & serv. commodities would increase by an amount of 0.12% of GDP and 2.27% of GDP, respectively, in the region West. However, in the region East, an increase of only 0.06% in rural production and 0.22% in ind. & serv. production would be seen.

In order to make a comparison between regions, the effects of the same injection in region East should also be studied. An amount of exogenous demand, corresponding

Table 5.5 The Matrix $\widehat{M}$

			WEST						EAST						Households
			Activities		Commodities		Factors of Production		Activities		Commodities		Factors of Production		
			Rural	Ind. & Serv.	Rural	Ind. & Serv.	Labor	Capital	Rural	Ind. & Serv.	Rural	Ind. & Serv.	Labor	Capital	
WEST	Activities	Rural	1.23	0.15	1.12	0.12	0.11	0.12	0.11	0.11	0.10	0.10	0.10	0.12	0.13
		Ind. & Serv.	1.56	2.83	1.43	2.27	1.30	1.51	1.36	1.37	1.29	1.28	1.20	1.51	1.55
	Commodities	Rural	0.25	0.16	1.23	0.13	0.12	0.14	0.12	0.12	0.11	0.11	0.11	0.14	0.14
		Ind. & Serv.	1.94	2.28	1.77	2.83	1.62	1.87	1.69	1.71	1.61	1.59	1.49	1.88	1.93
	Factors of Production	Labor	0.31	0.41	0.29	0.33	1.19	0.22	0.20	0.20	0.19	0.19	0.18	0.22	0.23
		Capital	1.14	0.94	1.04	0.75	0.45	1.52	0.47	0.47	0.45	0.44	0.42	0.53	0.54
EAST	Activities	Rural	0.11	0.08	0.10	0.06	0.07	0.08	1.23	0.13	1.17	0.12	0.07	0.08	0.08
		Ind. & Serv.	0.31	0.27	0.28	0.22	0.31	0.35	0.59	1.89	0.56	1.76	0.28	0.36	0.36
	Commodities	Rural	0.12	0.08	0.11	0.07	0.07	0.09	0.25	0.14	1.23	0.13	0.07	0.09	0.09
		Ind. & Serv.	0.33	0.29	0.30	0.24	0.33	0.38	0.63	0.95	0.60	1.89	0.30	0.38	0.39
	Factors of Production	Labor	0.07	0.06	0.06	0.05	0.06	0.07	0.27	0.35	0.25	0.33	1.06	0.07	0.08
		Capital	0.16	0.13	0.15	0.11	0.14	0.16	0.82	0.69	0.78	0.65	0.13	1.16	0.16
Households			1.58	1.42	1.44	1.14	1.62	1.87	1.63	1.58	1.55	1.47	1.49	1.89	1.93

Source: Author's calculations

to 1% of GDP, for the ind. & serv. commodities in region East would increase the income of households by 1.47% of GDP. The income of labor would increase by 0.19% of GDP in region West and by 0.33% of GDP in region East. Similarly, there would be an increase in income of capital by 0.44% in region West and by 0.65% in region East. Also, in region West, an increase of 0.10% of GDP in rural production and 1.28% of GDP in ind. & serv. production would be realized. In region East, rural production would increase by 1.28% whereas ind. & serv. production increases by 1.76%.

Thus, an injection of exogenous demand gives better results when it is originated in region East. Firstly, its effects on household income, factorial income and production values are larger in absolute values when applied in region East. The total increase in factorial income of labor is 0.38% of GDP and in factorial income of capital is 0.86% for the first case. However, the increases observed in second case are 0.52% and 1.09%, respectively. Similarly, the total increase in rural and ind. & serv. production is 0.18% and 2.49% in the first case; 0.22% and 3.04% in the second.

Secondly, the distribution of the increase among regions is more even when the injection is put on in region East. Out of 1.24% of GDP increase in factorial income, 1.08% is gone to region West whereas East could only get 0.16% in the case where the injection is put on in region West. However, in the second case where the injection originated in region East, the distribution is 0.63% to West and 0.98% to East. Similarly, an injection to region West would create an increase of 2.67% of GDP in production activities, 2.39% of which is realized in region West. Nevertheless, an amount of 1.38% of GDP of increase in region West and 1.88% in region East would be seen as a result of an injection in region East. Overall, an injection of exogenous demand for ind. & serv. sector would have better effects on the whole economy if it occurs in region East than in region West.

As seen above, the matrix of accounting multipliers yields the global influences of an exogenous demand for production activity of ind. & serv. on income of factors

and households. The increase in income of factors may be interpreted as a rise in the employment of factors. But multipliers alone do not identify in which sector the additional employment or in which household groups the highest income growth is to occur.[11]

Effects of an Increase in Transfers to Households

The impact of exogenous changes in income of the households on the economy can also be illustrated. The exogenous change can be in the form of transfers to households. An amount of 1% of GDP increase in the income of households would result in an increase amounting to 0.13% of GDP in rural and an increase amounting to 1.55% of GDP in the ind. & serv. production activities in region West. The same increases would be 0.08% and 0.36%, respectively, in region East. These increases in production activities result mostly from the increases in demand for commodities: The consumption of rural commodities by households would increase by 0.14% of GDP in region West and by 0.09% of GDP in region East. For ind. & serv. commodities, the demand increases are 1.93% of GDP in region West and 0.39% of GDP in region East. So, increases in production activities and demand for commodities following an exogenous increase in income of households are greater in region West, especially for ind. & serv. sector.

Effects of an Increase in Government Subsidies

If, for example, the rural production in one of the regions is stimulated by the government via subsidies how will the production activities, factors of production and households be affected? A comparison can be made between the cases of an amount of %1 of GDP increase in rural production taking place in region West and in region East. Firstly comparing the income of households, the region West will experience an increase of 1.58% of GDP, whereas the region East experiences 1.63%.

[11] For identifying these, additional analysis, such as *structural path analysis*, is needed. Such a detailed analysis can be performed if the SAM used in this study is disaggregated to contain more than two sectors, two types of factor of production and one household.

When the increase in rural production takes place in region West, the income of labor would increase by 0.31% of GDP and income of capital by 1.14% of GDP in region West. The same values for region East are 0.07% and 0.16%, respectively. On the other hand, the demands for rural and ind. & serv. commodities would increase by 0.25% and 1.94% of GDP, respectively, in the region West. In the region East, however, an increase of 0.12% in demand for rural commodities and 0.33% in demand for ind. & serv. commodities would be observed. An increase in rural production will influence the production activities back, through factors and households. Finally, the production activities would increase by 1.23% and 1.56% for rural and ind. & serv. sectors in region West. Production activities would experience an increase of 0.11% of GDP for rural and 0.31% of GDP for ind. & serv. in the region East.

If the increase in rural production takes place in region East, the income of labor would increase an amount of 0.20% of GDP and income of capital by 0.47% of GDP in region West. In region East, on the other hand, increases in the incomes of factors are 0.27% for labor and 0.82% for capital. Increase by 0.12% and 1.69% would be observed in the demands for rural and ind. & serv. commodities, respectively, in the region West. In the region East, demand for rural commodities would increase by 0.25% and demand for ind. & serv. commodities by 0.63%. Lastly, the production activities would increase by an amount of 0.11% of GDP and 1.36% of GDP for rural and ind. & serv. sectors in region West. In the region East, these values would be 1.23% for rural and 0.59% for ind. & serv production.

Thus the consequences of an increase in production activities are similar to that of a demand injection. The effect of the increase on household income, factorial income, and production and demand values is slightly larger in absolute values when it is originated in the region East. There exists a 33% difference between the changes in production activities but the changes observed in factorial income, household income and demand values are similar.

The distribution of the increase among regions is more even, again, when the exogenous change occurs in region East. Out of 1.68% of GDP increase in factorial income, 1.45% is gone to region West whereas East could only get 0.23% in the first case. However, in the second, the distribution is 0.67% to West and 1.09% to East. Similarly, an increase in the production activities of region West would create an increase of 2.64% of GDP in demand for commodities, 2.19% of which is realized in region West. On the other hand, an amount corresponding to 1.81% of GDP increase in region West and 0.88% in region East would be seen as a result of an increase in production in region East. The change in production activities shows a similar trend: out of 3.21%, 2.79% units change happens in region West in the first case whereas 2.46% units out of 4.28% is gone to West in the second. Overall, an increase in rural production activities would have better effects on the whole economy if it occurs in region East than in region West.

CHAPTER 6

CONCLUSION

As the regions and their economies have become important with the globalization process, the methods and tools of regional economic analysis have gained attention. Firstly developed by Wassily Leontief, input-output analysis is one of the mostly used techniques in regional economic analysis. Social accounting matrices, on the other hand, can be seen as an extension of I-O tables and are also used in regional or interregional analysis. Being a comprehensive, consistent and complete data system, it provides a snapshot of the economy during a given period. SAM is used a basis for multiplier analysis which enables to explore the impact of exogenous changes in such variables as exports and government expenditures.

In this respect, the main aim of this thesis is to construct a two-region SAM of Turkey for the year 2002 and to provide an application of a SAM multiplier analysis. To this end, this thesis first presents an overview on social accounting matrices and regional dimensions in a SAM framework. As SAM can be regarded as an extension of an I-O table, a two-region I-O table is constructed beforehand. In construction of multiregional I-O tables, one has to choose between survey and non-survey methods. Survey methods, relying on collecting primary data for the interindustry transactions, poses high time and data requirements and thus, is not preferred by most researchers. Hence, non-survey methods are used in this study, too. Through non-survey methods, location quotient technique is applied for the regionalization of the national I-O table of Turkey, provided by TURKSTAT.

Following the construction of a two-region I-O table, a two-region SAM is compiled. In addition to the data contained in the two-region I-O table, data from SPO, CBRT, RTMF and TURKSTAT is used.

Finally, accounting multiplier matrix is computed for the two-region SAM of Turkey and interpreted. According to the matrix of accounting multipliers, first, it was found that both intraregional and interregional multipliers of the region West is greater than that of region East. The region West showing larger intraregional multipliers means that an exogenous change would have greater effects within the region West than it would have within the region East. Similarly, the greater interregional multipliers of the region West is interpreted as that a change observed in region East would have larger effects on region West than vice versa.

The two cases of an injection of exogenous demand for ind. & serv. commodities and an increase in rural production are studied. The effects of changes are analyzed and compared when they are originating in region West and in region East. For both cases, i.e exogenous demand injection and rural production increase, it is found that originating the changes in region East seems to give better results. The effects of changes on production activities, incomes of households and factors are larger in absolute terms when the exogenous changes takes place in region East. Also, the distribution of the increases in production, incomes of households and factors of production among regions seems to be fairer. When the change occurs in region West, the big portion of the resulting increases occurs again in region West. If it happens in region East, on the other hand, the portion of increase occurring in region East is greater than that occurring in region West but there does not exist such big differences. These results also confirm the interpretation on the fact that intraregional and interregional multipliers of region West are larger than that of region East.

Hence, it is seen that a change or policy implication has a greater effect on region West if it is implemented in region West. If it is implemented in region East, however, it will again have large effects in region West, but this time the effects seem to be more fairly distributed among regions. This situation can be stated by the argument that most of the value added created in region East is transferred to region West at the end whereas the value added created in region West stays in region

West. At this point, policy makers may have to work on the factors behind and long-term consequences of this situation.

The policy implications of these observations are very important particularly if these findings can be confirmed on the basis of more sectoral and micro evidence. The SAM used in this study is highly aggregated and the interpretations done are limited accordingly. More detailed and diverse cases would be studied if sectors, factors of production and households could be divided into more disaggregated groups. This leads to high data requirements which already pose a problem in constructing a multiregional SAM, as mentioned in previous chapters. Still, additional analysis can be performed on the multiregional SAM and the validity of the inferences can be supported.

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APPENDIX

REGIONAL UNITS FOR STATISTICS

Level 1	Level 2	Provinces
TR1	TR10	İstanbul
TR2	TR21	Tekirdağ, Edirne, Kırklareli
	TR22	Balıkesir, Çanakkale
TR3	TR31	İzmir
	TR32	Aydın, Denizli, Muğla
	TR33	Manisa, Afyon, Kütahya, Uşak
TR4	TR41	Bursa, Eskişehir, Bilecik
	TR42	Kocaeli, Sakarya, Düzce, Bolu, Yalova
TR5	TR51	Ankara
	TR52	Konya, Karaman
TR6	TR61	Antalya, Isparta, Burdur
	TR62	Adana, Mersin
	TR63	Hatay, Kahramanmaraş, Osmaniye
TR7	TR71	Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir
	TR72	Kayseri, Sivas, Yozgat
TR8	TR81	Zonguldak, Karabük, Bartın
	TR82	Kastamonu, Çankırı, Sinop
	TR83	Samsun, Tokat, Çorum, Amasya
TR9	TR90	Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane
TRA	TRA1	Erzurum, Erzincan, Bayburt
	TRA2	Ağrı, Kars, Iğdır, Ardahan
TRB	TRB1	Malatya, Elazığ, Bingöl, Tunceli
	TRB2	Van, Muş, Bitlis, Hakkâri
TRC	TRC1	Gaziantep, Adıyaman, Kilis
	TRC2	Şanlıurfa, Diyarbakır
	TRC3	Mardin, Batman, Şırnak, Siirt