



# Regional Economic Impact Analysis: SÜTAŞ Investment of Aksaray Integrated Production Facilities EXECUTIVE SUMMARY







**Regional Economic Impact Analysis:  
SÜTAŞ Investment of  
Aksaray Integrated Production Facilities**

**EXECUTIVE SUMMARY**

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**June 2012  
SÜTAŞ Research Paper Series  
2012/06/002**

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# FOREWORD

The very first food of human beings, the milk is the most natural, most balanced and most economical source of basic nutrients we need, proteins, carbohydrates and vitamins. Hence, a decent amount of milk and dairy products is essential for a healthy diet. As the quality, sufficiency, and sustainability of the nutrition are development indicators for a society, so is the level of consumption of milk and dairy products. Per capita consumption of milk and dairy products in Turkey has reached to 180 liters but this is still about half of the 350 liters, the average consumption in developed countries. Therefore, I believe that the consumption of milk and dairy products should be doubled for the future of our country and for the healthy development of our future generations. This must be among our 2023 targets. Production of this valuable nutrient is an important economic activity. The process through which the vegetable production starting from natural resources such as water, earth and sun, is transformed by a milking animal -a means of production producing itself- to an extremely valuable food, a process involving a surge of value added, stimulates many sectors of industry and service, even the energy production.

Milk production activities create many employment opportunities, from the farmer in the village to the retailer in the city. Furthermore the revenue stream originating in these activities are shared by a variety of social group, and thus it creates an exemplary income distribution effect and spreads prosperity among broader masses.

Furthermore, dairy husbandry is the only source of regular monthly revenue in agriculture, and it is an investment with high financial elasticity which can be easily converted to cash. Thus the social repercussions of dairy husbandry are as important as its economic consequences.

Besides the production of milk, dairy husbandry induces real wealth increase and capital accumulation, and consequently it helps local development and prevents migration from the rural area.

Once the agricultural enterprises become widespread in the sector and collaboration with industry develops, integration of the agriculture with the industrial society advances, and an effect of total development emerges. In the context of the integrated business model of SÜTAŞ "From the Green Grass to the Tables" which guarantees the "Naturally Tasty" milk and dairy products, the "SÜTAŞ South Marmara Dairy Project, Karacabey Integrated Production Facilities" and the "SÜTAŞ Central Anatolia Dairy Project, Aksaray Integrated Production Facilities" are examples for combining agriculture, husbandry and industry, and managing these sectors together. They are furthermore exemplary models of regional development for the sector. Our investments examined in this reports are "the Educational Center, the Experimental Farm, the Stud Farms, the Fodder Factory, and the Recycling and Energy Plants".

When the Aksaray Integrated Production Facilities reaches its full capacity, we will be able to provide indirect employment for thousands of families of milk producers, fodder growers, agricultural engineers, veterinaries, milk collectors, haulers and distributors. The results of the project will affect the revenues of the people in the sector, not only in Aksaray, but also in the counties and villages of 17 provinces including Niğde, Nevşehir, Kayseri, Kırıkkale, Kırşehir, Konya, Ankara, Karaman, Çankırı, and Yozgat. Spreading in Central Anatolia the blessing of milk will create regular incomes and wealth, and will promote the stock raisers to the status of small business owners.

We believe that the success of this project will be a fine example of regional development strategies in action, a successful model of university - industry collaboration, a shared achievement of the agricultural producers and industry rowing in the same boat.

We take great pleasure and pride in presenting this "Economic Impact Analysis Report" which assesses the economic, social, cultural and environmental impact of "SÜTAŞ Central Anatolia Dairy Project, Aksaray Integrated Production Facilities" to Aksaray Province and its neighborhood, using a scientific methodology and concrete data, and which also displays by the same token, the effects of the dairy activities carried on for years honestly, persistently and passionately by SÜTAŞ, whose mission is to spread the benefits and the blessing of the milk.

We express our gratitude to Mr. Cevdet Yılmaz, Minister of Development, and we thank to the authors of the report, Prof. Dr. Erineç Yeldan from the Bilkent University, and the talented experts of the Ministry of Development, Mr. Kamil Taşçı, Director of the Monitoring, Evaluation and Analysis Department and Mr. Mehmet Emin Özsan, Planning Expert.

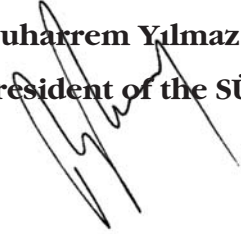
We are also grateful to Mr. Mehdi Eker, Minister of Food, Agriculture and Animal Husbandry and Mr. Nihat Ergün, Minister of Science, Industry and Technology and the staff of their ministries, for the successful work they have done to develop our sector and to insure the much needed stability; and also for their participation in the opening ceremony of our Aksaray Integrated Production Facilities.

We sincerely thank to all our teammates who labored in the implementation of our Aksaray Project, in the building up and efficient operation of our integrated production facilities, to my fellows from all quarters of Turkey working with the love of milk, spreading its benefits and its blessing, to our partners, to our suppliers, and to the people of Aksaray who embraced SÜTAŞ as one of their own.

We are proud of our collaboration with producers and the public authorities of the Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir (NUTS2-TR 71) provinces and of the whole region.

Respectfully yours,

**Muharrem Yılmaz**  
**President of the SÜTAŞ Group**





# AUTHORS

## **A. Erinç YELDAN**

Prof. Yeldan received his Ph.D. from University of Minnesota, USA, and joined the Department of Economics at Bilkent in 1988. He served as Chair to the Economics Department between 1998 and 2003. During 1994/95 he was a visiting scholar at the University of Minnesota where he taught Applied General Equilibrium Analysis. He later visited International Food Policy Research Institute, Washington, D.C. and worked as a research associate. During 2007/2008 he was a Fulbright scholar at University of Massachusetts, Amherst and at Amherst College. Dr. Yeldan's recent work focuses on development macroeconomics and on empirical, dynamic general equilibrium models with emphasis on the Turkish economy. He is one of the executive directors of the International Development Economics Associates (IDEAs), New Delhi. He was a recipient of Young Scientist Award of the Turkish Academy of Sciences (TÜBA) in 1998. His works were cited among the list of Top 500 Economists by a research conducted by the European Economic Association in 2001.

## **Kamil TAŞCI**

Kamil TAŞCI was born in Ankara in 1978. He started working in the Undersecretariat of State Planning Organization as an assistant planning expert in 2001. He became planning expert in 2007. He completed his master degree in Cornell University (MPA - International Development Policy) in 2009 and wrote a thesis on "Impacts of Global Crisis on Turkish Economy: Vulnerability Analysis, Structural Path Analysis and Computable General Equilibrium Modeling." Taşci concentrates his studies on technology policies, regional analysis and structural modeling. He is the head of Monitoring, Evaluation and Analysis Department of Ministry of Development in Turkey.

## **Mehmet Emin ÖZSAN**

Mehmet Emin ÖZSAN was born in Ankara in 1980. He graduated from Middle East Technical University (METU) - Department of Political Science and Public Administration in 2002. He began to work as an assistant customs expert at the Undersecretariat of Customs. He started to work for the Undersecretariat of State Planning Organization in 2003. He completed his master degree in Cornell University (MPA - International Development Policy). He interned in an Italian Institute (FormezItalia) providing research, consultancy and training services for Italian Public Institutions. His studies focus on regional development, analytical/modeling issues and public policy. At present, he is working as a planning expert in Monitoring, Evaluation and Analysis Department of Ministry of Development in Turkey.



# EXECUTIVE SUMMARY



## **EXECUTIVE SUMMARY**

### **General Assessment**

Development can be defined as the increase in the welfare level and the quality of life of the people living in a certain region. This increase can manifest itself in different ways at different paces according to political, economic and social dynamics of the country, its geographical position, natural resources and development policies. The basic difference between developed countries and others is that the developed countries enter the industrialization process relatively earlier; agriculture becomes a mass-production sector and markets expand on account of the development of transport and communication infrastructure making access to farther markets easier, and as a consequence of all these, capital accumulation creates new production and consumption relations through a cyclical flow via the financial system. In the almost developed and fast developing countries, this process causes the transition from the primary sectors, basically agriculture and mining, first to the light industries such as food or household furniture production, and then upper-middle technology requiring industries such as manufacture of chemicals or motor vehicles. At the last stage knowledge based industries such as biotechnology, information and communication technologies, and nanotechnology develop and act as a catalyst for all the other sectors.

Certainly, in the large countries such as Turkey this process does not follow a unique linear course. To follow different development processes we can classify the regions of Turkey in three main groups according to their levels of economic development and their economic and social weight on the national scene: Core Provinces, Semi-central Provinces and Peripheral Provinces (developing peripheral provinces and stagnant peripheral provinces). In addition to Istanbul, a city progressing rapidly on the fast track to become a global economic center, Ankara a regional center in politics, science and technology, and Izmir an economic, social and cultural center, more than ten of our provinces converging to perfect competition market have made significant progress in the integration to the national and global system. The rest of the peripheral provinces can be classified as the provinces with an economic structure displaying problems of inefficient market in production, employment and consumption, and the stagnating provinces with an economic structure based on the consumption of labor revenues.

Within this framework, a prescription for the development of these peripheral provinces with market inefficiency problems and the stagnant provinces can be to deliver them a rather strong external shock. The external shock can be public infrastructure investments in the transport, energy, education or health sectors; or it can be large scale investments of the private sector. A large scale private sector investment causes knowledge spillovers and effects on the employment, social security, wages, tax revenues, either directly or indirectly through its production-supply chain. But alongside with these direct or indirect effects, another dimension of the impact of

a large scale private sector investment is its contribution to the social transformation of the region. This social transformation paves the way to the change of economic mindset, and leads to increase the awareness of producers and consumers in the region.

The separation of the dwelling and the working places, the gathering of individuals at a location different from the other places of social activities in order to work and produce, their employment for a limited and well defined function within the chain of production is a fundamental dynamics of the development and it is one of the most important factors of post-Industrial Revolution productivity increase. Moreover to commute between the residence and the work stimulates also transport, construction and motor vehicles industries, all among the basic dynamical elements of the development. This triggers sectoral activities and helps the market to expand. When the dwelling and the working places are at the same location the consumption levels of individuals are rather reduced. There is a positive correlation between the average daily mileage of individuals in a region and the regional development level. Daily mobility of the individuals spreads the demand throughout the area. Mobility accelerates the circulation of the goods and the money. This, in turn, increases the multiplier effect of the revenue. As the money change hands faster, trade and business prosper.

### **SÜTAŞ's investment in Aksaray**

The purpose of this study is to lay the ground for the analysis of the investments of SÜTAŞ Group in Aksaray - 56th in 2003 and 55th in 2011 among the 81 provinces of Turkey, according to Socio-Economical Development ranking- as an external shock, triggering and supporting not only economic, but also social and cultural development.

The study uses “*Regional Computable General Equilibrium Model*” Based on Input Output Tables as its structural economic analysis method. 2-sectors (SÜTAŞ Group and Other Sectors), 2-regions (Aksaray and Other Regions) input output tables are derived for Aksaray, and the first 2-regions Computable General Equilibrium Model of Turkey allowing structural analysis and policy simulation, is build on these tables. Computable General Equilibrium Model based on the 2-regions, 2-sectors SAM, requires first algebraic separation of regional flows. The model assumes production processes are regional, while expenditure processes are at the national level. In line with this structure, production-employment-income distribution and export activities of the national economy are constructed at the regional level. The external shock on the Aksaray province is determined after the existing production data of the SÜTAŞ Group for the 2006-2011 period and the projections of the Group for the 2012-2020 period. The study is also first in its kind in terms of its use of micro data at a meso-economic sectoral and regional level, by adapting a technique commonly used in macroeconomic analysis to regional economic analysis and policy simulations.

## **Economic Impact**

### **2006 - 2011 Period**

The activities of SÜTAŞ Group started in 2006 with the construction investment amounting to TL 2.7 million, and they increased from year to year with a considerable contribution to the regional economy. In the following five years SÜTAŞ employing more than 18,000 people, 1,000 of them directly, contributed approximately TL 2.100 million to the economy of Aksaray and neighboring provinces.

While GDP of Aksaray is in the range of TL 3,5-4 billion during the period, gross output of the plants, in operation since 2008, has risen from TL 94 million in that year, to TL 539 million (with constant prices) in 2011.

Value added created by SÜTAŞ Group, which was TL 2.7 million with current prices in 2006 has reached TL 539 million in 2011. So the total gross output of SÜTAŞ Group is TL 1.400 million with constant 2012 prices, or TL 1.230 million with current prices. 70 % of the value added created is generated by sales to out of Aksaray province. SÜTAŞ Group's milk and dairy products consumed within Aksaray province constitutes 15 % of the gross output. The remaining 15 % is the value added generated by the investments of the company.

One of the key points for SÜTAŞ Group besides the fodder input is to increase the milk quality. During the last three years 2,456 calves are bred and distributed to the producers as pregnant heifer. Following the livestock improvement and productivity enhancement efforts of TARFAŞ, daily milking per animal has reached 29 liters in 2011. And so TL 42,3 million worth of milk has been produced in Aksaray SÜTAŞ farms and transformed to dairy product in the Aksaray milk processing plant of the group.

While GDP of Aksaray remained in the band of TL 3.5-4 billion, gross output of SÜTAŞ increased considerably.

The share of SÜTAŞ Group in the economy of Aksaray was around 0.08 % in 2006. In 2008, when the production of milk and dairy product took start, this figure climbed to 1.9 % and reached 6.6 % in the year of 2009. As the value produced by the company kept increasing, the share of the SÜTAŞ Group in the economy of Aksaray in 2010 and 2012 has been 9 % and 13.8 % respectively. While the impact of the SÜTAŞ Group on the per capita income was rather limited during the first three years, it has been substantial in the last three years. The contribution to the per capita income was TL 612 million in 2009, and it increased to TL 894 million in 2010 and TL 1.422 million in 2011.

In the five years period, overall economic impact of SÜTAŞ Aksaray facilities to the economy of Aksaray and neighboring provinces has been TL 2.094 millions. 67 % of the total impact results from direct effects, 26 % from the indirect effects and the remaining 7 % from the induced effects. Total direct effects in the 2006 - 2011 period has amounted to TL 1,233 million, indirect effects to TL 497 million and induced effects to TL 124 million.

### **2012-2020 Period**

The impact of SÜTAŞ Group on the economy of Aksaray was analyzed with the 2-sectors, 2-regions Aksaray - SÜTAŞ General Equilibrium Model, using SÜTAŞ Group's production projections for the period 2012 - 2020. During the period 2012 - 2020, the gross output of the SÜTAŞ Group is expected to increase step by step. According to these projections, gross output of the SÜTAŞ Group will increase from approximately TL 538 million in 2011 to TL 1,500 million in 2020. Direct contribution of the SÜTAŞ Group to the economy of Aksaray is expected to be TL 10,7 billion during this ten-year period. Indirect effect of the company for this period is calculated to reach TL 3,4 billion and the induced effects is estimated to be about TL 878 million. Therefore, overall impact of SÜTAŞ Group on the economy of Aksaray and neighboring provinces in the period from 2012 to 2020 is expected to be over TL 15 billion.

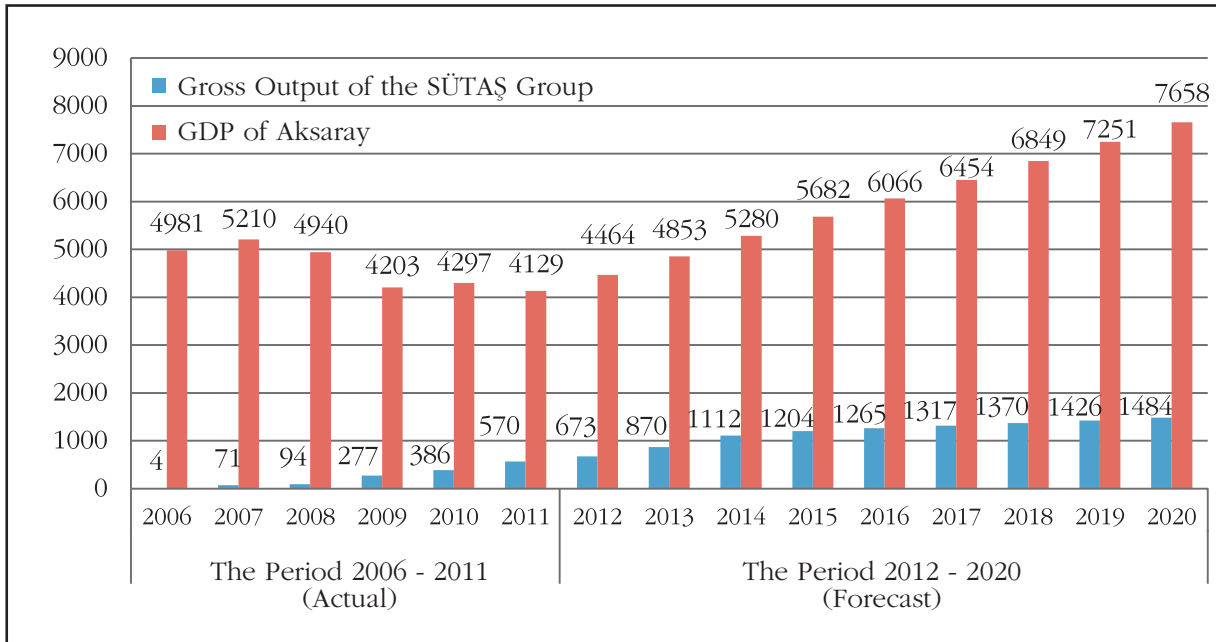
GDP of Aksaray for the year of 2012 is expected to be nearly TL 4.5 billion. The economic development of Aksaray will boost with the three-fold production increase of SÜTAŞ Group. If the planned production increase of SÜTAŞ will be realized, the real GDP of Aksaray is anticipated to reach to TL 7.7 billion by the year of 2012. In this case GDP increase of Aksaray for the ten-year period will be 71.5 %

The share of the SÜTAŞ Group in the economy of Aksaray is 14 % in 2011. In the period 2012 - 2020, the share of Süttaş Group in the economy of the province is expected to increase in parallel with the production activities of the Group. The share of the SÜTAŞ Group is expected to reach 15 % in 2012, and to attain its peak level of 21.2 % by the year of 2015. As Süttaş Group's production in Aksaray approaches to full capacity levels, and the GDP of Aksaray increases with the help of the positive externalities of these production activities, the share of the SÜTAŞ Group in the economy of Aksaray will possibly decrease by a certain amount in the period from 2015 to 2020.

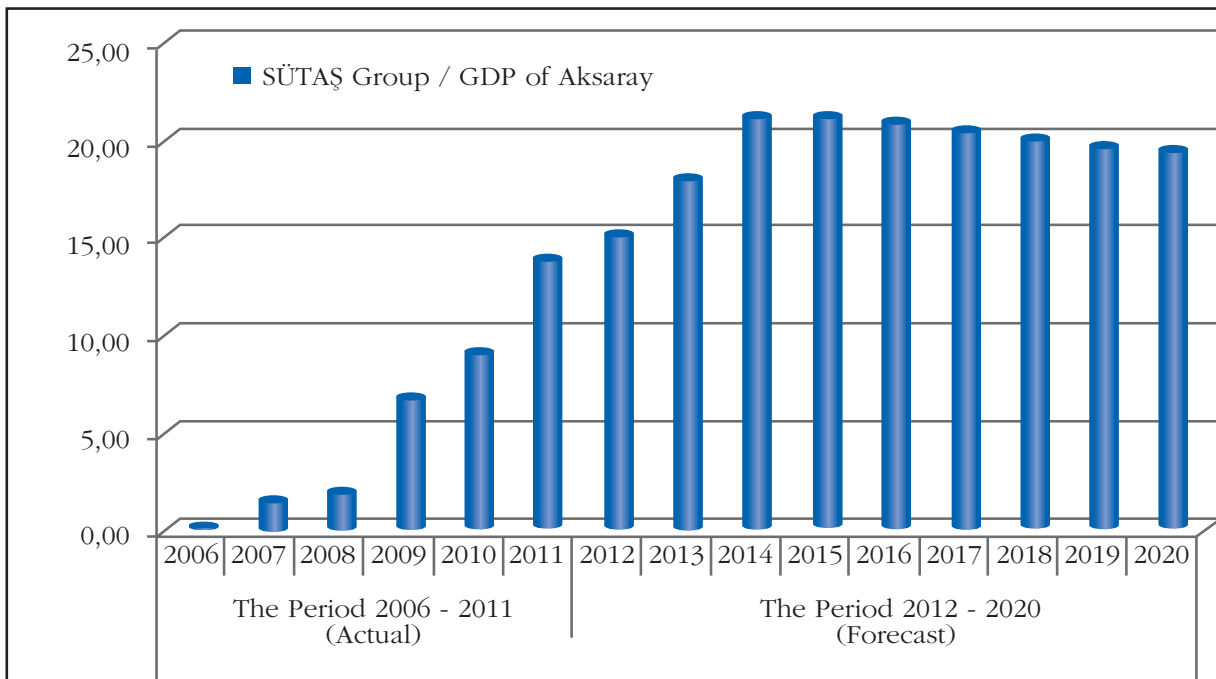
In 2011, the gross output of the SÜTAŞ Group has been TL 570 million (with 2012 constant prices), representing a share of 14 % of the GDP of Aksaray. In 2020, the gross output of the SÜTAŞ Group is estimated to reach TL 1,484 million (with constant prices), with a share of 19.4 % of the GDP of Aksaray. The GDP of Aksaray, the gross output of the SÜTAŞ Group and the share of the Group in the economy of Aksaray, over the years, are presented in the following figures.



**Figure 1: Gross Output of the SÜTAŞ Group and the GDP of Aksaray (2012 Constant Prices)**



**Figure 2: The Share of the Gross Output of the SÜTAŞ Group in the GDP of Aksaray (%)**



The summary table on the impact of SÜTAŞ Group on the economy of Aksaray is as follows:

<b>The Impact of SÜTAŞ Group on the Economy of Aksaray (Summary Table)</b>						
TL million with the 2012 constant prices						
	1	2	3	4	5	6
	Primary Impact Value added	Secondary Impact Supply Chain	Tertiary Impact Consumption	Cumulative Total Over the Period	Yearly Average	Impact Multiplier (4) / (1)
Period	Direct Effect	Indirect Effect	Induced Effect	Total Effect	Total Effect	Coefficient
2006-2011	1.400	554	139	2.093	349	1,49
2012-2020	10.700	3.400	878	14.978	1.664	1,40

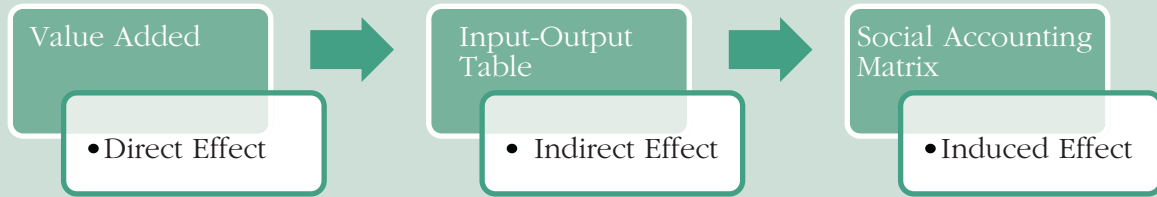
According to calculations, a unit of value added produced creates one and a half unit of indirect and induced effects in the regional economy, meaning that its beneficial effects is magnified by 50 %. In general, at the level of national economy, the multiplier effect of the public investment on the overall economy used to be about 1.6. Hence, it is possible to maintain that the multiplier effect of the investment of the SÜTAŞ Group is quite high. It is also apparent that an agricultural sector with such a high regional economic multiplier coefficient is strategically important in terms of its contribution to the welfare of the country.

SÜTAŞ Group organizes educational programs with the purpose of raising awareness among the farmers, spreading good practices, and improving the efficiency in milk production. In this context, in the years of 2010 and 2011, 708 people participated to 3- or 4-day education programs, and more than 20,000 hours of educational activities has been realized. The indirect employment provided consists mostly of independent sales agents and milk producers. Indirect employment is also created in the transport, security, services, landscape architecture and project implementation sectors. Total indirect employment is over 17.000 people.

As the dams hold water back, so these large scale production facilities built to meet international standards hold qualified human resources in their region. Employment of highly qualified labor is a crucial contribution to the regional stock of the human capital. Accumulation of knowledge in the region, development of human resources (human capital) and production technologies, increasing returns and economies of scale, externalities, specialization, market expansion, and spillover effects, all contribute to the regional growth and development to a great extent.

Therefore, in addition to the consumption effects due to the fact that qualified human resources form a high income group in this kind of regions, positive externalities and knowledge spillovers will contribute to the change of production culture in the region, especially in the middle and long run. The new business ecosystem built by and around SÜTAŞ and TARFAŞ according to the international quality standards in Aksaray, contributes considerably to the transformation of milk production from the level of subsistence farming to an important economic activity, and to the propagation of the economic culture and mindset.

**BOX 1:**  
**ECONOMIC IMPACT ANALYSIS:**  
**DECOMPOSITION OF THE DIRECT, INDIRECT AND INDUCED EFFECTS.**

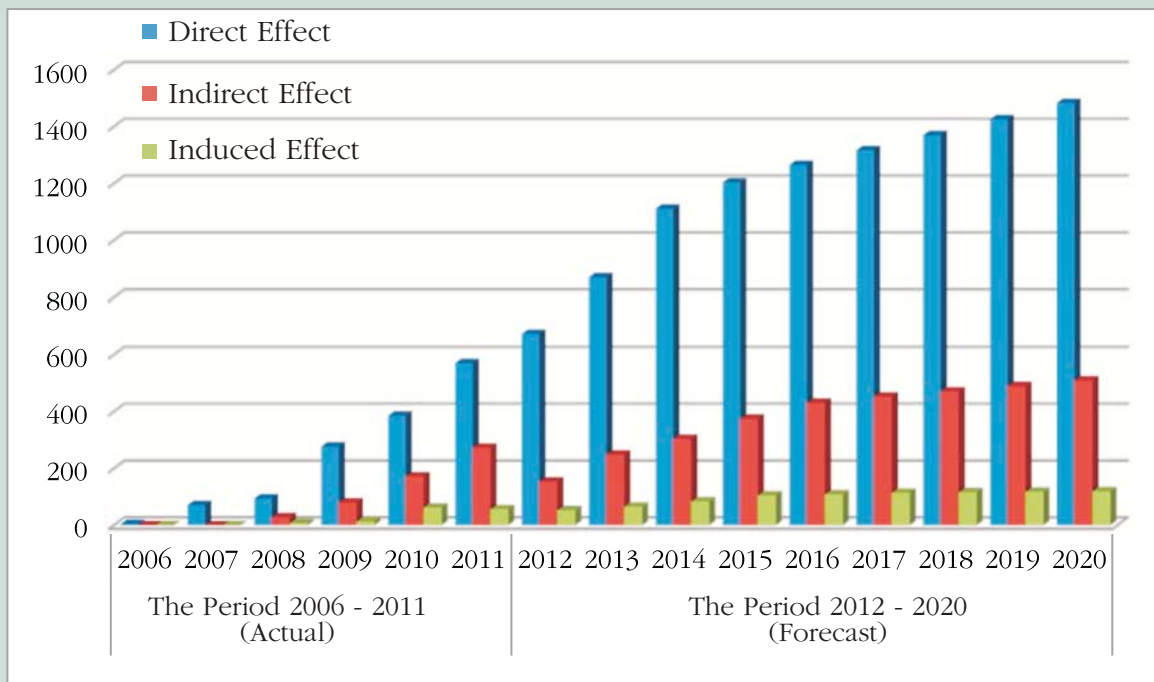


**Direct Effect:** Producers raise the production level of this product to meet the demand when the demand for the final consumption of a certain product or service increases. Consequently the level of final demand of this product or service will be increased. The changes in the production directly related to the final demand are the direct effects.

**Indirect Effect:** As the producers raise the production level, the flow of intermediate goods in the supply chain and required to produce the final production will increase as well. The additional economic activities in the links of the input supply chain (in the backward linkage sectors) emerging in parallel with the increase in the elements of final demand constitute the indirect effects.

**Induced Effect:** Direct and indirect effects will stimulate the economy and this will result in an increase of the household income. Spending this additional income for the final consumption will produce induced effects.

**Direct Effect, Indirect Effect and Induced Effect  
of the SÜTAŞ Investment of Aksaray  
(2012 Constant Prices)**



**BOX 2:**  
**ECONOMIC IMPACT ANALYSIS TOOLKIT**

**Input-Output Model**

Macroeconomic models analyses of three sector-economy are unable to provide detailed information about agriculture, industry and service sectors -and particularly about the subsectors of the industrial sector. However, the planners focus on the general equilibrium of the economy and attach great importance to the mutual relationship and dependencies among these sectors. Models developed to answer these requirements are assembled together with the keyword of inter-industry interdependence. Inter-industry interdependence requires the assemblage of the information about the structural properties of the national economy and raw data in a specifically designed table known as Input-Output Table. Various coefficient matrices and inverse matrices derived from this Input-Output Table are used to analyze the economic structure. The gist of the analysis is to measure the structural inter-industry interdependency.

(Kızıltan Alaattin, Ersungur Mustafa (2004) "Changing Effects of Turkish Economic Sectors on Employment: An Input-Output Model Approach", University of Atatürk)

**Social Accounting Matrix**

Social Accounting Matrix (SAM) is a database and accounting system developed to expose economy-wide relations and to organize in a table, the structural properties of the totality of the economy in the largest sense. SAM aims at adjusting and putting in a coherent framework, various accounts and financial records, such as national accounts, consolidated public sector balance, flow of funds accounts, balance of payments and other general economic outlook data produced by different institutions and organizations. Using SAM, the researcher can investigate and observe the consequences of the economic relationships and implications of the economic and social interactions at a national level or at the level of social strata.

(Telli, Çağatay (2004), "Methodology of Social Accounting Matrix Elaboration: The Turkish Case", SPO)

**Computable General Equilibrium Model**

Computable General Equilibrium Models (CGE), are Walrasian equilibrium systems consistently and simultaneously displaying production, distribution and accumulation dynamics of an economy. CGE approach revealing fundamental structural characteristics of an economy, constitute a powerful analytic toolkit, almost economic laboratory which can be used in a range of economic investigation, from the analysis of socio-economic policies and the construction of alternative roadmaps, to the decomposition of the dynamics of the recent economic history

Methodologically, various uses of CGE models are as follows: Controlled experimentation with model simulation, decomposing the effects of dependent and independent variables on the economy, determining the implications of current policies, policy design under stable conditions, exploring efficiency of policies against internal and external shocks, assessing bad, good and optimal policies, economic estimation and forecasting, creating and comparing alternative history scenarios and roadmaps, empirically establishing important relationships and developing focus points, solving the indirect (general equilibrium) effects and links among the variables, creating synergy between different policies in one field or cross boundary synergy between policies in different fields, selecting good policy under dynamic and changing conditions, etc.

(Telli, Çağatay (2004), "Methodology of Social Accounting Matrix Elaboration: The Turkish Case", SPO)

Regional Economic Impact Analysis:  
SÜTAS Investment of  
Aksaray Integrated Production Facilities

TECHNICAL APPENDIX



**Technical Appendix - 1**  
**SÜTAŞ Group - Aksaray Input - Output Table (TL, 2011)**

	SÜTAŞ GROUP		AKSARAY			
	Flow of Inputs			Flow of Inputs		
	1. Agriculture	2. Others	1. Agriculture	2. Others	3. Total (1+2)	
1. Agriculture	189.244.773	1.911.563	174.841.112	536.139.684	902.137.132	
2. Others	0	0	80.181.861	2.410.266.897	2.490.448.758	
<b>3. Total (1+2)</b>	<b>189.244.773</b>	<b>1.911.563</b>	<b>255.022.973</b>	<b>2.946.406.581</b>		
4. Indirect Taxes	-3.600.287	200.435	27.178.737	154.133.500		
5. Labor	54.521.946	3.316.318	275.466.160	723.822.215		
6. Capital	24.075.669	243.189	905.785.887	1.922.833.051		
<b>7. Total (4+5+6)</b>	<b>74.997.327</b>	<b>3.759.942</b>	<b>1.208.430.785</b>	<b>2.800.788.766</b>		
<b>8. Total Demand</b>	<b>264.242.100</b>	<b>5.671.505</b>	<b>1.463.453.758</b>	<b>5.747.195.347</b>		

**SÜTAŞ Group - Aksaray Input - Output Table (TL, 2011) (cont.)**

	4. Private Consumption	5. Government Expenditure	6. Investment	7. Import	8. Export	9. Net Final Demand (4+5+6+7-8)	Total Domestic Supply
1. Agriculture	676.789.093	97.326.651	48.424.448	3.723.019	704.487	825.558.726	1.727.695.858
2. Others	2.684.752.530	399.237.897	151.807.200	158.837.981	132.217.513	3.262.418.094	5.752.866.853
<b>3. Total (1+2)</b>							
4. Indirect Taxes							
5. Labor							
6. Capital							
<b>7. Total (4+5+6)</b>							
<b>8. Total Demand</b>							

**Technical Appendix - 2**  
**SÜTAŞ Group - Aksaray Social Accounting Matrix (TL 2011)**

		SÜTAŞ						AKSARAY			
		Activities		Factors of Production		Activities		Factors of Production			
		Agricultural	Non-Agricultural	Labor	Capital	Agricultural	Non-Agricultural	Labor	Capital		
SÜTAŞ	Activities										
			Non-Agricultural								
	Factors of Production	54.521.946	3.316.318								
		Capital	24.075.669	243.189							
AKSARAY	Activities										
			Non-Agricultural								
	Factors of Production					275.466.160	723.822.215				
		Capital				905.785.887	1.922.833.051				
Goods and Services		187.352.325	1.892.448			174.841.112	536.139.684				
		Non-Agricultural	1.892.448	19.116			80.181.861	2.410.266.897			
Households					57.838.264			999.288.376			
Non-Financial Institutions						24.318.858					2.828.618.937
Government (Social Security included)		-3.600.287	200.435			27.178.737	154.133.500				
Capital Account											
Total investment											
Rest of the world											
Total Expenditure		264.242.100	5.671.506		57.838.264	24.318.858	1.463.453.758	5.747.195.347	999.288.376		2.828.618.937



**SÜTAŞ Group - Aksaray Social Accounting Matrix (TL 2011) (cont.)**

	Goods and Services				Capital Account				Total Income		
	Agricultural		Non-Agricultural		Households		Non-Financial Institutions			Government (Social Security included)	Rest of the World
	Agricultural	Non-Agricultural	Agricultural	Non-Agricultural	Agricultural	Non-Agricultural	Agricultural	Non-Agricultural			
<b>SÜTAŞ</b>	Activities	261.686.515								2.555.585	264.242.100
		Non-Agricultural		5.671.505						0	5.671.505
	Factors of Production										57.838.264
		Labor									
	Capital										1.463.453.758
<b>AKSARAY</b>	Activities	1.459.730.739								3.723.019	1.463.453.758
		Non-Agricultural		5.588.357.367						158.837.981	5.747.195.347
	Factors of Production										999.288.376
		Labor									
	Capital										1.721.853.222
Goods and Services					693.693.840				97.326.651		1.721.853.222
	Agricultural										30.607.162
	Non-Agricultural				2.632.445.754				399.237.897		151.807.200
Households							2.775.616.365		89.299.790	22.116.772	3.944.159.567
Non-Financial Institutions									254.485.060		3.107.422.855
Government (Social Security included)					490.856.221		284.090.540		158.246.743		1.111.105.890
Capital Account					127.163.753				55.250.610		182.414.362
	Total investment										
	Rest of the world	435.969		81.822.301			47.715.949		57.259.139		187.233.357
<b>Total Expenditure</b>		<b>1.721.853.222</b>		<b>5.675.851.173</b>		<b>3.944.159.567</b>	<b>3.107.422.855</b>		<b>1.111.105.890</b>		<b>187.233.357</b>

## Technical Appendix - 3

### DETAILS OF THE COMPUTABLE GENERAL EQUILIBRIUM MODEL

#### General Structure of the Model

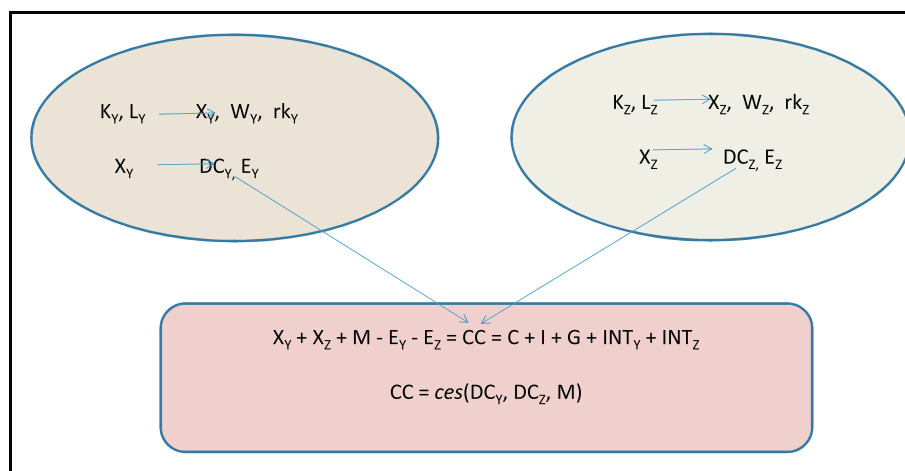
The Computable General Equilibrium Model based on the two-region and two-sector Social Accounting Matrix, requires firstly algebraic decomposition of the regional flows. The model treats production processes at the regional level, while consumption processes are treated at the national level. In parallel with this structure, the production-employment-income distribution and export activities of the national economy are constructed regionally. The definitions and equations of the model can be found in Technical Appendix - 2.

Within this framework, the value added created in the two regions are aggregated at the national level and once the import supply is added, this gives total supply (absorption) at the national level. In the CGE literature, the amount of the total supply corresponds to the concept of the composite commodity. According to this concept constructed by Armington (1969), domestically produced commodity (DC) and import (M) are imperfect substitutes, and can be defined functionally through an elasticity of substitution:

$$CC = \overline{AC} [\delta M^{-\rho} + (1 - \delta) D^{-\rho}]^{-1/\rho} \quad (1)$$

In the algebraic expression (1), CC is the amount of total absorption (supply) over the country; DC, the amount of domestic production; and M is the level of imports. The elasticity of substitution between DC and M is given by  $\sigma = 1 / (1 - \rho)$ . This relationship at the national level is defined at the regional level in our model, as the production is assumed regionally differentiated. Instead of a unique domestic commodity production, our model considers DCR production activity in two different regions. Therefore, the total domestic absorption is determined by the inter-substitution of DCY, DCZ and M.

The following figure describes symbolically the relationships among domestic production, import and absorption:



In the regions Y and Z, capital K and labor L inputs used yield in regional production activities factor inputs X; the generated regional wages W and regional profit rates rk, and domestic commodity production DC, and regional import level E are accounted for with the absorption level. The absorption CC is then disaggregated to the component of the total demand: private consumption C, investment expenditures I, government expenditures G, and regional expenditures in intermediate goods INTr.

The price of the composite good basket is determined by the total domestic price and import price augmented by the sales taxes.

$$PC_i = \left[ P_i^D \left( \frac{DC_i}{CC_i} \right) + P_i^M \left( \frac{M_i}{CC_i} \right) \right] \cdot [1 + saltax_i] \quad (2)$$

$$P_i^M = P_i^{WM} \cdot \varepsilon (1 + tm_i) \quad (3)$$

$$P_{i,r}^E = P_{i,r}^{WE} \cdot \varepsilon (1 - tx_{i,r}) \quad (4)$$

The prices of the imported goods do not vary among the regions; imports are realized over a single import price. However exports allow price variation among the regions. The equilibrium in the labor market is treated within the framework of unemployment rate determined for each region by the difference between the total labor supply and the sum of sectoral labor demands.

$$UNEMP_r = LSUP_R - \sum_i LD_{i,r} \quad (5)$$

$$\sum_i K_{i,r} = KSUPP_r \quad (6)$$

The household income is obtained for Aksaray and Other regions as the sum of payments to the employed labor in the SÜTAŞ Group and Other sectors, net regional profits after the corporate tax, government transfers to the households, domestic debt interest payments, factor incomes transferred from abroad, minus foreign debt interest payments.

$$Y_r = \sum_i ((W_r \cdot WFDIST_{i,r} LD_{i,r} + (1 - corptax_r) \cdot RK_r \cdot RKDIST_{i,r} \cdot K_{i,r})) + GOVTRANS + r^D DomDebtG + NPFI - r^F ForDebtG \quad (7)$$

In the above formulation;

$W_r$  is the regional nominal wage level;  $WFDIST_{i,r}$ , the coefficient of the regional and sectoral wage differentiation;  $RK_r$ , regional nominal profit level;  $RKDIST_{i,r}$ , regional and sectoral margin of profit differentiation;  $K_{i,r}$ , regional and sectoral demand for capital;  $GOVTRANS$ , government transfers to the households;  $DOMDEBT^G$ , government domestic debt stock,  $NPFI$ , factor incomes transferred from abroad; and  $ForDebt^G$ , foreign debt interest payments.

In the model, the totality of the revenue of the government is originates in tax revenues. The government revenue is the sum of the production taxes (TOTPRODTAX), sales taxes (TOTSALTAX), tariffs (TARIFF), corporate taxes (TOTCORPTAX), income taxes (TOTHHTAX) and export taxes (EXTAX).

$$GREV = TOTPRODTAX + TOTSALTAX + TARIFF + TOTSSTAX + TOTCORPTAX + TOTHHTAX + EXTAX \quad (8)$$

To determine public finance equilibrium, the ratio of transfer payments to the public revenue net of interest payments is taken as a policy variable, chosen beforehand, and public investment expenditures is calculated residually, following the fiscal rule<sup>1</sup>. Under this rule, borrowing requirement of the public sector PSBR takes the following form:

$$PSBR = GREV - GCON - GINV - r^f ForDebt^G - r DomDebt^G - GOVTRANS \quad (9)$$

PSBR is financed either by domestic borrowing  $\Delta DomDebt^G$  or by borrowing from abroad  $\Delta eForDebt^G$ .

Private households save a constant portion  $s^P$  of their income. The remaining income is distributed among the sectors as the consumption demand.

$$CD_i = cles_i \cdot PRIVCON / PC_i \quad (10)$$

In this expression,  $PC_i$ - is the composite price of the commodity  $i$ - meaning the average of the price of the domestically produced commodity and the price of imported commodity.

Consumption expenditures of the government are determined in a similar way:

$$GD_i = gles_i \cdot GOVCON / PC_i \quad (11)$$

Total consumption demand of the government is considered as a policy tool, and it is predetermined as a fraction of the total revenue of the government.

$$GOVCON = gcrGREV \quad (12)$$

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<sup>1</sup> Fiscal rule is considered as a constraint for the public finance to be implemented in the years following 2010, and it is assumed that the fiscal rule will define the path of Turkish fiscal policy during these years. To update our model, we use the fiscal rule constraint in parallel with the primary budget surplus target.

## General Equilibrium and the Dynamic Structure

Macroeconomic general equilibrium model is balanced through the internal adjustment of the commodity prices, profit rates and real exchange rate to clear commodity markets, labor and capital markets and balance of payments. In each period, formal real wages are fixed for the regional labor markets and labor market equilibrium is achieved by means of adjustment in employment.

Therefore, in the commodity markets, for each sectoral commodity total supply should be equalized to the total demand:

$$CC_i = CD_i + GD_i + IDP_i + IDG_i + INT_i \quad (13)$$

The macroeconomic general equilibrium condition requires the equality of the total savings to the total investment.

$$PSAV + GSAV + e CAdef = PINV + GINV \quad (14)$$

The term CAdef in the savings - investment equilibrium denotes current account deficit of the national economy and equals to the difference between the sum of export revenues, workers' remittances and borrowing from abroad and the sum of imports, profit transfer to abroad and foreign debt interest payments.

$$CAdef = P_i^W E_i + ROWtrHH + ForBor^E + ForBor^G - \left[ \sum P_i^W M_i + (trrow \sum (1 - t_{Corp}) r K_i) / e + r^F ForDebt^E + r^F ForDebt^G \right] \quad (15)$$

Foreign capital inflow of the balance of payments is assumed external (on a fixed path) in foreign currencies. Real market value of exchange rate determines the balance of payments. The dynamic structure of the model updates yearly values of externally determined variables and policy variables in a way aiming at characterizing the economic growth trend of 2005 - 2015. In the interim periods, we first update capital stocks adjusted for the depreciation with the new investment expenditures. Labor qualities increase with the population growth. Similarly, technological factor productivity changes are specified in a Hicks-neutral way.

Finally, we took into account the debt dynamics as well. Public sector borrowing requirement was obtained as PSBR. It is obvious that this amount will be financed partly from abroad and the rest will be covered as domestic borrowing. Hence, foreign debt stock of the government will be (in Turkish Lira):

$$aForBor^G = (gfborrat) PSBR \quad (16)$$

Under these conditions domestic borrowing will be determined as:

$$Dombor = (1 - gfborrat) PSBR \quad (17)$$

Once the foreign and domestic borrowing decision of the government is calculated in this manner, debt stocks dynamics will yield the following paths:

$$DomDebt_{t+1} = DomDebt_t + DomBor_t \quad (18)$$

$$ForDebt^G_{t+1} = ForDebt^G_t + ForBor^G_t \quad (19)$$

And similarly the private foreign debt stock will be.

$$ForDebt^P_{t+1} = ForDebt^P_t + ForBor^E_t \quad (20)$$

## Technical Appendix - 4 MODEL EQUATIONS

### PRICE SYSTEM

Import price  $P_i^M = P_i^{WM} \cdot \varepsilon(1 + tm_i)$

Export price  $P_{i,r}^E = P_{i,r}^{WE} \cdot \varepsilon(1 - tx_{i,r})$

Composite price  $PC_i = \left[ P_i^D \left( \frac{DC_i}{CC_i} \right) + P_i^M \left( \frac{M_i}{CC_i} \right) \right] [1 + saltax_i]$

Domestic price  $PDC_i = \sum_r P_{i,r}^D DC_{i,r} / DCC_i$

Regional price  $PX_{i,r} = \left[ P_{i,r}^D \left( \frac{DC_{i,r}}{XS_{i,r}} \right) + P_{i,r}^E \left( \frac{E_{i,r}}{XS_{i,r}} \right) \right]$

Regional value added  $PVA_{i,ry} = (1 - protax_{i,ry}) \cdot (PX_{i,ry}) - \sum_j PC_j IORY_{j,i}$

Price Index:  $PIINDEX = \sum_i PWTS_i PC_i$

### Products and Factor Markets

Regional output supplies  $XS_{i,r} = (A_{xxr} K_{i,r})^{B_{xir}} d_{i,r}^{(1-B_{xir})}$

Regional Wage Rates  $W_r = \frac{(1 - B_{xir}) \cdot PVA_{i,r} \cdot XS_{i,r}}{WDIST_{i,r} \cdot LD_{i,r} \cdot (1 + sstax_r)}$

Regional Profit rates  $RK_r = \frac{B_{xir} \cdot PVA_{i,r} \cdot XS_{i,r}}{RKDIST_{i,r} \cdot K_{i,r}}$

Formal labor market equilibrium  $UNEMP_r = LSUP_R - \sum_i LD_{i,r}$

Capital market equilibrium  $\sum_i K_{i,r} = KSUPP_r$

## TRADE BLOCK

CES Production Technology:  $XS_{i,r} = A_{tir} \left[ \beta_{tir} E_{ir}^{\rho_{tir}} + (1 - \beta_{tir}) DC_{ir}^{\rho_{tir}} \right]^{\frac{1}{\rho_{tir}}}$

Armingtonian Composite product:

$$CC_{ir} = A_{cir} \left[ \beta_{cir} M_{ir}^{-\rho_{cir}} + (1 - \beta_{cir}) DC_{ir}^{-\rho_{cir}} \right]^{\frac{1}{\rho_{cir}}}$$

Profit maximization equation:

$$\frac{E_{ir}}{DC_{ir}} = \left[ \frac{P_{ir}^E}{P_{ir}^D} \cdot \frac{(1 - \beta_{tir})}{\beta_{tir}} \right]^{\frac{1}{\rho_{tir}-1}}$$

Import cost minimization equation:

$$\frac{M_{ir}}{DC_{ir}} = \left[ \frac{P_{ir}^D}{P_{ir}^M} \cdot \frac{\beta_{cir}}{(1 - \beta_{cir})} \right]^{\frac{1}{\rho_{cir}+1}}$$

## INCOME GENERATION

Private Household Sector

$$Y = \sum_i ((W_r \cdot WFDIST_{ir} LD_{ir} + (1 - corptax_r) \cdot RK_r \cdot RKDIST_{i,r} \cdot K_{i,r})) + GOVTRANS + INTDOM * GDOMDEBT + NPFI - INTFORP * PFORDEBT$$

Public Sector Revenues:

$$GREV = TOTPROTAX + TOTSALTAX + TARIFF + TOTSSTAX + TOTCORPTAX + TOTHHTAX + EXTAX$$

Total production tax revenues:  $TOTPROTAX = \sum_i prot_i \cdot PX_i \cdot XS_i$

Total sales tax revenues:  $TOTSALTAX = \sum_i salt_i (P_i^D \cdot DC_i + P_i^M \cdot M_i)$

Import taxes and levies:  $TARIFF = \sum_i tm_i \cdot P_i^{WM} \cdot \varepsilon \cdot M_i$

Corporate Tax revenues:  $TOTCORPTAX = \sum_i corpt \cdot (PROFP_i + PROFG_i)$



Income Tax revenues  $TOTHHTAX = htax \cdot YHH$

Export tax revenues:  $EXTAX = \sum_i te_i \cdot P_i^{WE} \cdot \varepsilon \cdot E_i$

Public Consumption Expenditures  $GOVCON = gcr \cdot GDP$

Public Investment expenditures:  $GINV = GCTRINV + GRINV$

Public Transfers to enterprises  $GtrEE = rtGtrEE \cdot GREV$

Total transfers  $GOVTRANS = GtrSSI + GtrHH + GtrEE$

### **SAVING INVESTMENT BALANCE**

Private savings  $PRSAV = mps \cdot YHH \cdot (1 - htax)$

Public Savings:  $GSAV = GREV - GOVCON - GOVTRANS - ir_{FG} \cdot \varepsilon \cdot GFD - ir_{DOM} \cdot GDD$

Public Saving Investment balance:  $PISB = GINV - GSAV$

Public sector borrowing requirement:  $PSBR = PISB - rtPSBR \cdot GDP$

PSBR Financing  $PSBR = DOMBOR + \varepsilon \cdot FORBOR^G$

Public foreign debt  $\varepsilon \cdot FORBOR^G = rtFORBOR \cdot PSBR$

National saving- investment balance  $PRSAV + GSAV + \varepsilon \cdot FSAV = PRINV + GINV$

### **Demand Components**

Public consumption by sectors

$$GD_i = \frac{gles_i \cdot GOVCON}{PC_i}$$

Private consumption by sectors

$$CD_i = \frac{cles_i \cdot (1 - mps) \cdot YHH \cdot (1 - htax)}{PC_i}$$

Intermediate demands

$$INT_i = \sum_j a_{ij} \cdot XS_j$$

Domestic interest rate

$$ir_{DOM} = rtir_{DOM} \frac{GFD + GDD}{GDP}$$

Private Investment demand by sectors

$$ID_i = \frac{idles_i \cdot PRINV}{PC_i}$$

Public Investment demand by sectors

$$GID_i = \frac{gidles_i \cdot GINV}{PC_i}$$

GDP

$$GDP = \sum_i [PC_i(CD_i + GD_i + GID_i + ID_i) + P_i^{WE} \cdot \varepsilon \cdot E_i - P_i^{WM} \cdot \varepsilon \cdot M_i]$$

## Product Market Equilibrium

$$CC_i = INT_i + CD_i + GD_i + ID_i + GID_i$$

Balance of Payments

$$\sum_i P_i^{WM} M_i + ir_{FP} \cdot PFD + ir_{FG} \cdot GFD + \frac{EERPtrROW}{\varepsilon} = \sum_i P_i^{WE} E_i + ROWtrEE + ROWtrHH + FSAV$$

## Technical Appendix - 5

### VARIABLES

#### Price System

$PINDEX$	Price Index
$PC_i$	Composite price
$P_i^D$	Total domestic good price
$P_{i,r}^D$	regional price
$P_{i,r}^E$	regional export price
$P_i^M$	import price
$PVA_{i,r}$	Regional value added price
$PX_{i,r}$	Regional output price

#### Production block

$CC_i$	Domestic absorption
$DC_i$	Domestic good
$DC_{i,r}$	Regional good
$E_{i,r}$	Regional exports
$M_i$	Import
$XS_{i,r}$	Regional product supplies
$GDP$	Gross domestic product

#### FACTORS BLOCK

$LD_{i,r}$	Regional labor demand by sectors
$LSUP_r$	Regional labor supplies

$K_{i,r}$	Regional capital demand by sectors
$KSUP_r$	Regional capital supplies
$W_r$	Regional wage rates
$WFDIST_{i,r}$	Regional wage difference factors across sectors
$RKDIST_{i,r}$	Regional profit rate difference factors across sectors
$RK_r$	Regional profits by sectors
$UNEMP_r$	Regional unemployment

### **COMPONENTS of DEMAND**

$CD_i$	Private consumption expenditures
$GD_i$	Public consumption expenditures
$ID_i$	Sectoral investment demand
$INT_{i,r}$	Sectoral intermediate demands by regions

### **MACRO BALANCES and FISCAL ACCOUNTS**

$EXTAX$	Export tax revenues
$TOTPROTAX$	Production tax revenues
$TOTSALTAX$	Consumption tax revenues
$TOTSSTAX$	Social security tax revenues
$TOTCORPTAX$	Corporate tax revenues
$TARIFF$	Import tax revenues
$TOTHHTAX$	Total income tax revenues
$GREV$	Total tax revenues

<i>GOVCON</i>	Public consumption expenditures
<i>GOVTRANS</i>	Public transfer expenditures
<i>GSAV</i>	Public savings
<i>FSAV</i>	Foreign deficit (Foreign savings)

### **DEBT DYNAMICS**

<i>GFORDEBT</i>	Public foreign debt stock
<i>GDOMDEBT</i>	Public domestic debt stock
<i>PFORDEBT</i>	Private foreign debt stock
<i>INTFORP</i>	Private borrowing interest rate
<i>INTFORG</i>	Public borrowing interest rate
<i>INTDOM</i>	Domestic interest rate
<i>GOVFBOR</i>	Public foreign borrowing

### **PRIVATE HOUSEHOLD SECTOR**

<i>Y</i>	Private income
<i>NPFI</i>	Net factor income abroad
<i>MPS</i>	Private savings rate
<i>PRSAV</i>	Total private savings
<i>TOTINV</i>	Total private investment

## Technical Appendix - 6

### MODEL PARAMETERS

$A_{ci}$	Armington function parameter
$A_{dci}$	Domestic good shift parameter
$A_{tir}$	CET function shift parameter
$A_{xir}$	Production function shift parameter
$B_{ci}$	Armington function shift parameter
$B_{dci}$	Domestic good aggregation share parameter
$B_{tir}$	CET function shift parameter
$B_{xir}$	Cobb - Douglas production function share parameter
$cles_i$	Sectoral private consumption shares
$gles_i$	sectoral public consumption shares
$idles_i$	Sectoral investment demand shares
$P_{i,r}^{WE}$	World export price
$P_i^{WM}$	World import price
$PWTS_i$	Price index weights
$rhoc_i$	Armington function elasticity parameter
$rhot_{i,r}$	CET function elasticity parameter
$rhodc_i$	domestic function elasticity parameter
$rrp_{i,r}$	Profit rates by regions and sectors
$shrp_{i,r}$	Profit shares by regions and sectors

$dk_{i,r}$	private investment share parameter
$protax_{i,r}$	Regional production tax rate
$saltax_i$	Consumption tax rate
$tm_i$	Import tax rate
$te_{i,r}$	Export tax rate
$corptax_r$	Regional corporate income tax rate
$sstax_r$	Regional sales tax rates





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**<http://www.scotland.gov.uk/Topics/Statistics/Browse/Economy/Input-Output/Multipliers>**

“If there is an increase in final demand for a particular product, we can assume that there will be an increase in the output of that product, as producers react to meet the increased demand; this is the direct effect. As these producers increase their output, there will also be an increase in demand on their suppliers and so on down the supply chain; this is the indirect effect. As a result of the direct and indirect effects the level of household income throughout the economy will increase as a result of increased employment. A proportion of this increased income will be re-spent on final goods and services: this is the induced effect. The ability to quantify these multiplier effects is important as it allows economic impact analyses to be carried out on the Scottish economy.

Type I and Type II multipliers are presented in the downloads section of this website. In summary, Type I multipliers sum together direct and indirect effects while Type II multipliers also include induced effects.”

**<http://corpslakes.usace.army.mil/employees/economic/mullook.cfm>**

“Economic Multipliers for Regions Surrounding 108 CE Projects  
The following graphs show the distribution and range of multiplier values across 108 CE projects. Multipliers are based on IMPLAN-generated economic impact models constructed for 108 of CE’s 456 projects. Click here to download the Excel file for the complete set of multipliers. Capture rate is the percentage of visitor spending captured as direct sales within the region. Type I multipliers include direct and indirect effects, while Type III multipliers also include induced effects. Direct effects are changes in the industries associated directly with the final demand changes. For instance, tourists’ stays in hotels will directly increase sales and number of jobs in the hotel sector. Indirect effects are the changes in backward-linked industry sectors within the region that supply goods and services to industries directly affected by the changes in final demand. Examples of these indirect effects would be motels and hotels purchasing linen supplies from other industries to maintain the services. Induced effects are changes in economic activity resulting from household spending of the income earned from changes in final demand. For instance, employees of hotels and linen suppliers spend their wages and salaries in the same region, resulting in more sales, income, and jobs in this region.”







**SÜTAŞ Aksaray Integrated Production Facilities**  
**Applied Training Center / Dairy Stud Farm**  
**Fodder Factory / Dairy Factory**  
**Water Treatment, Biogas and Energy Production Facilities**

