CHAPTER I - Introduction

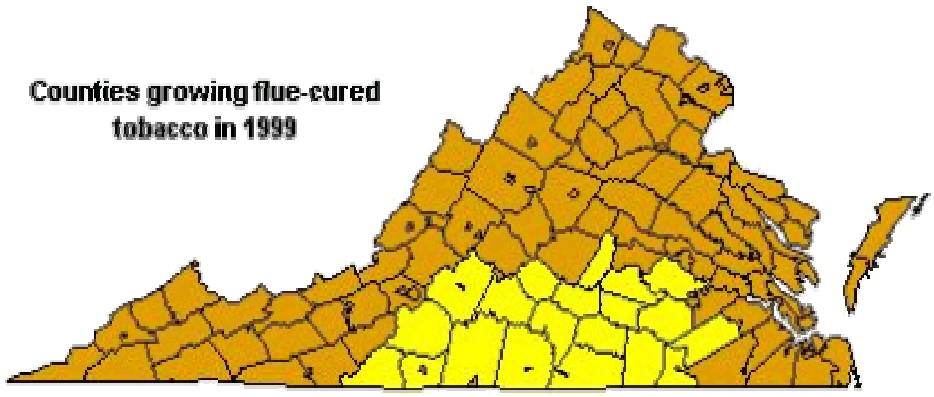
I.1 Introduction

Tobacco farming has historically constituted a significant share of income for some counties in Virginia. Reductions in tobacco acreages over the last few years have led to the need for alternative sources of income. Policies that encourage more value added in farming activities may be effective in providing extra earning opportunities. One such example is the canning of food products. This study will determine the economic impact of two alternative canning plant sizes in Scott County: (1) for a small sized facility for community members to utilize for canning food products for home use, and (2) for a commercial sized facility for marketing commodities in the wholesale, retail and food service industries.

I.2 Tobacco Production and its Importance in Scott County and Virginia

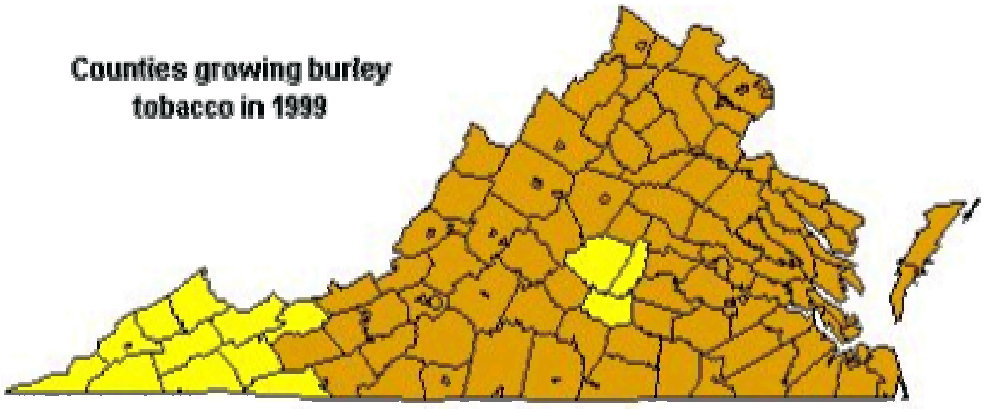
Tobacco production is very concentrated geographically; 90 percent of total tobacco production in the US is produced in seven states. Virginia was ranked fourth in the US in tobacco production both in 1992 and 1997 (US, NASS, 2002). There are two main varieties of tobacco produced in Virginia, flue cured and burley tobacco. Flue cured tobacco is mainly produced in Southside, Virginia while burley tobacco is mainly produced in the southwestern part of Virginia. Figures 1.1 and 1.2 illustrate the counties in Virginia that grow flue cured and burley tobacco, respectively.

Figure 1.1



Source: Tobacco in Virginia, http://www.virginiaplaces.org/agriculture/tobacco.html.

Figure 1.2



Source: Tobacco in Virginia, http://www.virginiaplaces.org/agriculture/tobacco.html.

Scott County is ranked second in Virginia by acres harvested of burley tobacco, after Washington County (Virginia Agricultural Statistics Service, 2003). Burley tobacco is the main

source of farm income in Scott County constituting 51 percent of total farm income with sales of more than 5 million dollars annually (Virginia Agricultural Statistics Service, 1935 – 1997). Tobacco cash receipts in Scott County constituted 38 percent of total farm income in 1987, 53 percent of total farm income in 1992, 51 percent of total farm income in 1997 and 34 percent of total farm income in 2002 (Table 1.1). Income earned from tobacco sales accounted for 92 percent of all crop sales in 1987, 89 percent of all crop sales in 1992, 88 percent of all crop sales in 1997 and 63 percent of all crop sales in 2002. These statistics show that tobacco is the most important crop in terms of income for Scott County farmers. Table 1.1 shows that tobacco cash receipts for Virginia accounted for 7 percent of total farm income in 1987, 9 percent of total farm income in 1992, 8 percent of total farm income in 1997 and 5 percent of total farm income in 2002. Tobacco cash receipts for Virginia as a percent of cash receipts from all crops were 23 percent in 1987, 24 percent in 1992, 22 percent in 1997 and 16 percent in 2002. The data suggests that even within Virginia, some localities, such as Scott County, are more dependent on income from tobacco than others. Thus, while the documented recent decline in tobacco production may have moderate effects on the overall economy of the state, some localities such as Scott County may be significantly affected.

Table 1.1 - Cash Receipts for Scott County and Virginia

	1987	1992	1997	2002
Scott County				
Cash receipts from tobacco (1000)	2,257	6,294	5,330	4,280
Crops cash receipts (1000)	2,442	7,088	6,068	6,820
All commodities cash receipts (1000)	5,911	11,977	10,377	12,693
Aggregate income				
Tobacco sales as a percent of total farm income	38%	53%	51%	34%
Tobacco sales as a percent of total income from crops	92%	89%	88%	63%
Virginia				
Cash Receipts from Tobacco (1000)	112,933	189,667	190,781	112,503
Crops cash receipts (1000)	485,657	778,690	864,475	718,219
All commodities cash receipts (1000)	1,737,156	2,140,278	2,409,584	2,360,911
Aggregate Income				
Tobacco sales as a percent of total farm income	7%	9%	8%	5%
Tobacco sales as a percent of total income from crops	23%	24%	22%	16%

Source: Virginia Agricultural Statistics Service, Virginia County Brochures, Historic Census County Data for Virginia, 1935 – 2002.

In recent years, there has been a decrease in the use of tobacco in the US and a subsequent decrease in the production of tobacco in Virginia and Scott County. This decrease has come mainly from governmental changes in the tobacco policy (decline in quotas), changes in consumption trends for cigarettes, and changes in policies for smoking in public or private facilities (Purcell, 1996). Since the decline in tobacco demand has been caused by long run consumption trends, as well as changes in government regulations, such decline in tobacco consumption is likely to persist, and will continue to have the same economic impact for years to come.

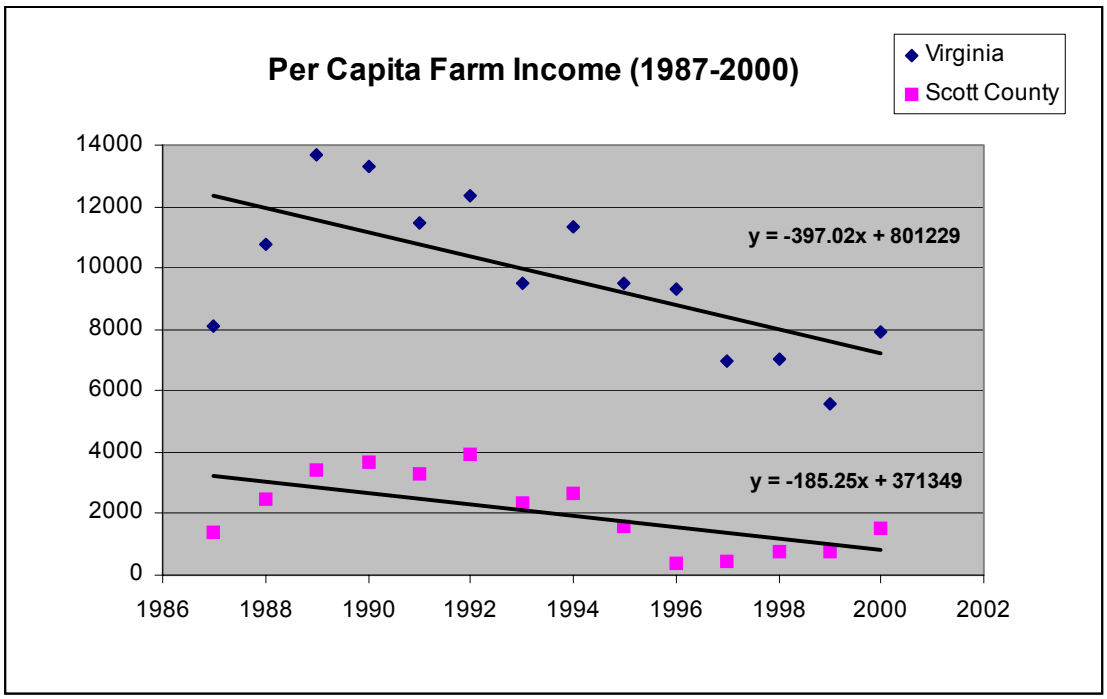
Tobacco is an important source of income in Scott County, thus the decrease in tobacco demand has had a negative impact on the local economy, and especially the farm sector of this area. Crop farmers are the group that has been affected the most. Table 1.1 shows that tobacco

sales still constitute a significant portion of income available to crop farmers in Scott County in 1997 as they did in 1992. There has only been 1 percentage point decline in the fraction of crop sales that comes from tobacco (89 percent in 1992 compared to 88 percent in 1997). At the same time, cash receipts from tobacco in Scott County have declined by 18 percent. The decline in tobacco revenues persists between 1997 and 2002, however it appears to be accompanied by an almost equal decline in the share of crop income that comes from tobacco. In 2002, tobacco still comprises over half of total income from crops. These figures show that there has been a substantial loss of income from tobacco, and there has been little substitution of income sources to compensate for lost revenues from tobacco.

The situation demands policy attention for two primary reasons: (1) as shown, the effect of tobacco revenue losses is highly concentrated geographically, thus it has had a very significant effect on some localities; and (2) equity considerations should play a role as the areas that are most affected, such as Scott County, are located in rural Virginia, and already tend to have lower per capita incomes and higher poverty rates compared to statewide or national averages.

Per capita farm income in Scott County and in Virginia from 1987 to 2000 are shown in Figure 1.3. From the beginning of the observation period, there exists a gap in per capita farm income of Scott County compared to the state of Virginia (shown by the different intercepts in figure 1.3). Furthermore, the per capita farm income is declining both in Virginia and Scott County over this period (shown by the down sloping trendlines).

Figure 1.3 – Per Capita Farm Income for Scott County and Virginia (1987 – 2000)[1]



Source: Virginia Agricultural Statistics Service, Virginia County Brochures, Historic Census County Data for Virginia, 1935 – 1997.

Scott County needs to readjust the structure of its agricultural sector if it is to achieve long-term economic growth under conditions of decreasing income from tobacco production.

I.3 Policies Influencing Tobacco Farmer Income

In recent years there has been a decline in the consumption of tobacco and tobacco products. This decline has come mainly from certain government policy changes. Some of these policies were intended to reduce the consumption of tobacco directly such as laws that prohibit

[1] Data is inflated to the year 2000 using inflation rates from Bureau of Labor Statistics http://www.bls.gov.

smoking and advertising in public places and excise taxes on tobacco products (Gale, Foreman and Capehart, 2000). Since the 1964 Surgeon General's Tobacco and Health Report, tobacco advertising was restricted and label warnings in tobacco products were adopted. The effort was continued by further restrictions in advertising and prohibition of smoking in public and work places in 1998. As a result, smoking and the demand for tobacco products decreased. The decrease had a negative effect on the income of tobacco retailers, wholesalers, manufacturers and producers (farmers). Excise taxes on tobacco include state and federal taxes. These taxes are usually applied to manufacturers, wholesalers and retailers. In the past, Virginia had the lowest state tax at 2.5 cents per pack of 20 cigarettes (Gale, Foreman and Capehart, 2000). However as of January 1 of 2005, Virginia ranks 45th in the nation with respect to state tax per pack of cigarettes (Federation of Tax Administration, 2005). Both federal and state taxes have been increasing in recent years in an attempt to cause further decline in smoking and tobacco consumption. Increases in excise taxes are generally passed on from manufacturers to consumers, resulting in higher prices and a decline in demand. However, Gale, Foreman and Capehart (2000) comment that the decline in demand for tobacco because of higher cigarette prices is not very significant considering cigarette consumers have an inelastic demand.

Other policy actions that may have a negative impact on tobacco farmer income include elimination of price supports and quotas, FDA regulations and settlement payments (Gale, Foreman and Capehart, 2000). Price supports and quotas served the purpose of controlling the quantity of tobacco grown in the US, therefore increasing the price per unit. They played an important role in determining the structure of the tobacco industry, as well as production of tobacco. Quotas were allocated to farmers based on their historical tobacco production. Quota owners could use the quotas to grow tobacco or could rent them to other growers. Tobacco

quotas could also be bought or sold. The elimination of quotas decreased the number of farms growing tobacco and allowed only the most efficient ones to expand (Gale, Foreman and Capehart, 2000). However, the reduction in quotas resulted in a significant loss of income for quota owners who lost the income from the quota rents.

Furthermore, FDA regulations can drive down profits from tobacco. Increased regulations related to manufacturer labeling and levels of nicotine and tar will increase the cost for manufacturers. Also, cost increases for tobacco manufacturers arise from possible legal claims and settlement payments (Gale, Foreman and Capehart, 2000). This increase in prices will affect the consumers' demand for cigarettes. Further, mandatory warnings and reduced advertising increases the awareness of the health risk of smoking having a direct impact on consumer preferences.

All the policies mentioned above will decrease the demand for tobacco and tobacco products and will affect the tobacco industry. The decline in demand will affect the retailers, wholesalers, manufacturers and tobacco farmers through a decline in jobs and income. Tobacco farmers have more difficulties adjusting to this decline in demand, because they have invested in specialized equipment and human capital in tobacco production and it is hard to find alternative sources of income that utilize such investments (Gale, Foreman and Capehart, 2000).

I.4 Tobacco Indemnification and Community Revitalization Commission (TICRC)[2]

The Tobacco Commission is an organization created to assist tobacco communities in the transition from tobacco to non-tobacco related businesses. It offers grants and loans (the Tobacco Region Opportunity Fund, TROF) for economic development and special projects that will help

[2] The Source for this paragraph is the Tobacco Indemnification and Community Revitalization Commission http://www.vatobaccocommission.org/index.asp

in job creation and regional investment. These grants and loans are allocated on a regional basis (more specifically the Southside and Southwestern regions of Virginia) rather than based on individual counties. Part of the compensation fund is used to compensate tobacco producers and quota holders. Grants and loans are offered for special projects based on estimated effects on rural development, community facilities, job creation and competitiveness[3]. More specifically, a project is eligible for TROF if there is a minimum private capital investment of 1 million dollars and leads to the creation of at least 25 jobs. If the project involves job savings, this will influence the amount of the grant, but it will not count towards job creation. Also, investments made in acquiring existing facilities will not be counted towards the minimum capital investment amount. The Tobacco Commission may evaluate both the capital investment and the jobs created on a sliding scale, giving flexibility to those projects promising more jobs but less investment capital, or vice versa. The number of grants is limited to three grants per year for each county (Tobacco Indemnification and Community Revitalization Commission).

I.5 The Impact of a Cannery in the Economic Development of Scott County

The Scott Farmers Cooperative in Scott County has proposed that the establishment of a cannery might be the appropriate investment under the mandate described by the Tobacco Commission. The project will help in creating additional demand for other crops and vegetables currently grown in the county and could serve to replace income for tobacco farmers. Furthermore it could help in the process of adjusting the agricultural sector from decreasing demand for tobacco. The cannery will allow Scott County residents to have products that can be marketed year around in farmers markets and elsewhere and minimize losses from perishable

[3] Competitiveness refers to the ability of a project to have larger effects on development and incomes, for the least amount of funds required.

produce that is not sold fresh. Many consumers may choose to preserve their own food. Farmers themselves may engage in processing the extra produce not used fresh for personal consumption.

The cannery will also have an impact on investment and employment in the county. This impact will depend on whether the cannery will just be used for community purposes or be approved for commercial use. Unlike the community cannery, a commercial use cannery will provide more employment, will have a greater impact in increasing production of produce and therefore generate more income. A commercial use cannery may also create opportunities for Scott County to export agricultural products to nearby markets, further expanding the potential of Scott County's agricultural sector. The effects of both a community and a commercial use cannery will be analyzed in this paper using an input-output framework. A commercial use cannery is expected to have a larger impact on the county's economic growth. However it is significantly more costly and more difficult to start and operate a commercial use cannery than a community cannery.

Both costs and benefits should be taken into account by the county when making a decision between investing in a community versus a commercial use cannery or not investing in either. It is not the purpose of this study to provide an analysis of the cost structures of each potential project. This study will focus on identifying the impacts of each potential project on the local economy.

I.6 Problem Statement

For over 300 years, the tobacco industry has been an important source of income for Virginia and US farmers. With the national concern over illnesses caused by tobacco and tobacco products, tobacco quotas and income opportunities for Virginia farmers have been

drastically reduced. Accordingly, community and business leaders, and government officials have been searching for ways and means to provide new sources of income and employment opportunities for the tobacco regions. In 1999, the Tobacco Indemnification and Community Revitalization Commission (TICRC) was formed with the goal of compensating farmers for the loss in tobacco income as well as promoting economic growth and development in Southside and Southwest Virginia. Scott County, located in Southwest Virginia, is one of the counties that was impacted more severely by the tobacco quota reduction and needs to readjust the economic opportunities for its agricultural sector. Processing and canning of local produce for home or commercial consumption may be one step forward towards a necessary adjustment of the local agricultural sector.

I.7 Objectives

The main objective of the study is to evaluate the economic impact of establishing a cannery in Scott County, Virginia.

The specific objectives are to:

- Provide a detailed descriptive analysis of the study area by presenting economic indicators such as output, income and employment figures for the sectors of the Scott County economy, using IMPLAN data and software.
- Estimate the impacts of (a) a community cannery and (b) a commercial-use cannery on Scott County, focusing on changes in output, employment and income.
- Estimate and compare the impact on the local economy of several alternative uses of a commercial cannery. Specifically assess the impact of a cannery specializing in the following

product categories: (1) Fruits and Vegetables; (2) Canned Specialties; (3) Pickles and Sauces; and (4) Sausages and Other Prepared Meats.

I.8 Methods and Procedures

This study begins by providing a demographic analysis of the county and an analysis of the county's economy. The IMPLAN software is used to generate study area reports and provide a description of the main sectors of industry, their importance in the local economy (with respect to the contribution in output, jobs and value added) and their linkages with other sectors. The data for the analysis is obtained from the IMPLAN database. Other sources of data are used to describe general demographic characteristics, as well as some economic indicators for Scott County, Virginia. Such sources include the Bureau of Economic Analysis, Virginia Agricultural Statistics Service, Virginia Department of Transportation, US National Agricultural Statistics Service, and US Census. The descriptive analysis also includes a discussion of the multipliers for the top twenty industries with respect to output, employment and value added. These multipliers help determine the relationship and the possible effects of sectoral changes in the regional economy and how these changes may affect other industries. Chapter IV provides more details on the input-output analysis and the scenarios developed in this study.

The economic impact of the cannery is analyzed using an input-output model and the IMPLAN program as a modeling tool. IMPLAN data are non-survey based and are used together with the software to build input-output models, derive different types of multipliers needed for the analysis, and perform impact analysis. The data provided through IMPLAN for Scott County are based on the year 2000. The impact data are inflated to the year 2004; therefore, the results from the analysis will be interpreted for 2004. The impact analysis will evaluate the changes in

the regional economy from a community cannery and a commercial cannery. For the community cannery, the impact will consist of two parts: the investment in construction and the operations. The total effects as well as the effects by industry and type (employment, output and value-added) will be evaluated in both cases. In the case of the commercial cannery, only the operation impact is evaluated. The construction costs of the commercial cannery may vary significantly depending on the size of the establishment and the specification of the building and building materials; therefore, given the lack of data, it is difficult to evaluate its impact quantitatively. However, it is reasonable to assume that the construction of the commercial cannery might have a larger impact in the county compared to the community cannery considering its larger size. The construction and operation of the commercial cannery may involve additional human capital, administrative and credit constraints. Thus, such a project may be considerably more difficult to implement.

Two scenarios are analyzed and compared for the commercial cannery. The commercial cannery may produce a mix of products or it may specialize in producing a particular product. The input data in the IMPLAN model for the community cannery are based on information from existing canneries in Virginia such as the Carroll County cannery and the Riner Cannery. The input data for the commercial cannery are based on the directory Judge's Peerless Food Processors North America 2004.

I.9 Overview of the Study

The first chapter provides an overview of the study and the reason it is conducted. It contains a background analysis, the objectives, and the methods to be used. The remaining chapters are arranged based on the objectives stated in Chapter I. Chapter II provides a detailed

descriptive analysis of the economy of the study area. The literature review of the theory and techniques used in the analysis are discussed in Chapter III. Also a description of the input-output model is provided in detail in this chapter. The specific methods and procedures of the input-output analysis and the different scenarios are described in Chapter IV. The results of the analysis, together with a discussion and conclusions, are presented in Chapter V.

CHAPTER II – Regional Descriptive Analysis

II.1 Introduction

This chapter provides a detailed descriptive analysis of the study area. First, a general description of the county's demographics is provided. Secondly, a detailed analysis of the structure of the economy and its most important sectors based on output, employment and value added is provided together with the linkages between sectors.

II.2 Demographic Characteristics of the Study Region

Scott County is located in the Southwestern part of Virginia. It has a surface area of 537 square miles and a population of 23,403 (IMPLAN Data, 2000). The municipalities of the county are Gate City, Weber City, Clinchport, Duffield, Dungannon and Nickelsville. About eighty percent of the county population lives in rural areas and less than twenty percent live in the above-mentioned municipalities. Gate City is the most populated area with 2,214 residents, followed by Weber City with 1,377 residents (Virginia Department of Transportation, 1997). The rural population lives in ninety-nine percent of the total surface area, while the cities and towns occupy only one percent of the area. The large share of rural population indicates that declines of revenues in the tobacco sector may impact a large share of the county population.

There were 9,851 households in Scott County in 2000 with an average per household income of 40,477 dollars (IMPLAN Data). Table 2.1 presents information on average income in Scott County, income classes, and the number of households that falls under each class[4]. About sixty-five percent of the households have an income between 10 thousand and 40 thousand

[4] Note that the income averages exceed the given range. Olson and Lindall (2000) comment that this results from controlling CES data for the CES income ranges when there is a large amount of underreported income especially in the lower income classes.

dollars. More than twenty-five percent of the total households earn less than 10 thousand dollars per year. The remaining ten percent of the households earn more than 40 thousand dollars a year.

Table 2.1 – Scott County Household Income (2000)

Income Class	Average Household Income	Households
< 5K	5,695	1,791
5-10K	14,237	852
10-15K	22,780	1,955
15-20K	34,169	1,437
20-30K	48,407	1,668
30-40K	79,728	1,480
40-50K	102,508	382
50-70K	142,372	213
70K+	199,321	73
Total	**398,739,008**	**9,851**

Source: IMPLAN, Report SA090 (General Model Information Report).

Table 2.2 presents information on the population age for Scott County compared to the state of Virginia. The median age of the population of Scott County is nearly six years older than the median for the state of Virginia. The percentage of population under 18 years of age is 4 percent lower for Scott County than for Virginia, and the percentage of population 65 years of age and over is significantly higher for Scott County compared to Virginia. These data suggest that the population of Scott County is older on average compared to the population of Virginia.

Table 2.2 – Population Age Indicators for Virginia and Scott County (2000)

	Virginia	Scott County
Median Age (years)	35.7	41.4
Population Under 18 Years of Age (%)	24.6	20.6
Population 18 Years of Age and Over (%)	75.4	79.4
Population 65 Years of Age and Over (%)	11.2	17.8

Source: US Census 2000 (State and County Data)

Table 2.3 provides information on the education characteristics of the region. Sixty four percent of the population in Scott County holds a high school degree or higher. This is significantly lower than the state of Virginia where high school graduates constitute 81.5 percent of the population. Further, only 8.3 percent of Scott County population holds a Bachelor's degree or higher, compared to 29.5 percent for the state of Virginia population. The table shows that Scott County has a much lower level of educational attainment compared to the state of Virginia in all levels of schooling.

Table 2.3 – Education Indicators for Virginia and Scott County (2000)

	Virginia	Scott County
Population High School Graduate or Higher (%)	81.5	64.4
Population Bachelor's Degree or Higher (%)	29.5	8.3

Source: US Census 2000 (State and County Data)

Table 2.4 presents some social and economic well being indicators for Scott County and the state of Virginia. The average per capita income in Scott County is significantly lower than

the average for the state of Virginia. The lower economic well being in Scott County is also evident from the much higher incidence of poverty in the county compared to Virginia as a whole. In Scott County nearly twice as many people lived under the poverty level in 1999 than did in the state of Virginia. Unemployment rates for Scott County are also higher than the Virginia rates.

Table 2.4 – Welfare Indicators for Virginia and Scott County

	Virginia	Scott County
1999 Individuals Below Poverty Level (%)	9.6	16.8
2000 Unemployment Rate (%)	4.1	5.9
2000 Per Capita Income ($)	23,975	15,073

Source: US Census 2000 (State and County Data)

It is obvious from the significantly lower per capita income and higher incidence of poverty in Scott County that the region is less developed when compared to overall Virginia. The situation is made worse by the drastic declines in tobacco sales during recent years. Furthermore, given the county's aging population, as well as the relatively low endowment of human capital, radical adjustments to the county's economy are relatively difficult. Thus, there is a disproportionate need in Scott County for projects that are related to agriculture, which may provide a positive shock to the local economy, and help replace some of the recent losses from the decline in tobacco revenues. Projects related to agriculture would be an easier transition for tobacco growing farmers than non-agricultural related projects considering that on average Scott County residents have a relatively low educational attainment and a relatively higher median age.

II.3 Industry Analysis

The following analysis provides a description of the local economy based on the main industries. IMPLAN software and 2000 IMPLAN data are used to derive this information. The sectors described in this section are aggregated by the first digit of the SIC (Standard Industrial Classification) code. Table 2.5 illustrates output, value added and employment statistics for nine different industries. The total industry output is a little over 444 million dollars and the portion of value added[5] for this output is close to 257.7 million dollars. The total number of people employed for the year is 7,403 and the total income from employment is around 130.5 million dollars.

Table 2.5 – Scott County Economy Aggregated by 1-Digit SIC (2000)

Sector No.	Industry	Industry Output*	Employment (Jobs)	Employee Compensation*	Proprietor Income*	Other Property Income*	Indirect Business Tax*	Total Value Added*
1	Agriculture	23.797	1,882.686	5.640	8.511	6.153	1.478	21.782
28	Mining	8.321	38.504	1.853	0.593	0.546	0.816	3.808
48	Construction	41.595	392.696	7.725	2.753	1.210	0.233	11.922
58	Manufacturing	84.457	541.043	18.887	0.910	11.383	0.652	31.832
433	TCPU (Transportation, Communications & Utilities)	35.978	318.867	7.815	1.857	6.065	1.209	16.946
447	Trade	57.907	1,454.601	25.011	1.734	7.828	7.917	42.490
456	FIRE (Finance, Insurance & Real Estate)	78.549	228.600	5.035	1.680	41.349	8.891	56.955
463	Services	68.524	1,385.902	22.556	5.893	2.784	0.952	32.185
510	Government	45.156	1,106.299	35.609	0.000	4.151	0.000	39.761
516	Other	0.011	53.800	0.439	0.000	-0.428	0.000	0.011
	Totals	**444.295**	**7,402.998**	**130.571**	**23.932**	**81.041**	**22.148**	**257.692**

*Millions of dollars
Source: IMPLAN Aggregation Report SA050

[5] Value Added includes employee compensation and other value added activities such as government services, capital, land etc. (Miller and Blair, 1985 pp.9).

Data from Table 2.5 are used to compare industries in terms of output, employment, value added and total income. Pie charts are created for each indicator. Figure 2.1 presents total industry output for each category. The largest sector is the manufacturing sector, producing 20 percent of the total output, followed by the finance, insurance and real estate sectors with 18 percent. The agricultural sector is the second smallest category producing only 5 percent of total output. There is no particular industry that provides a significantly large amount of output in the economy.

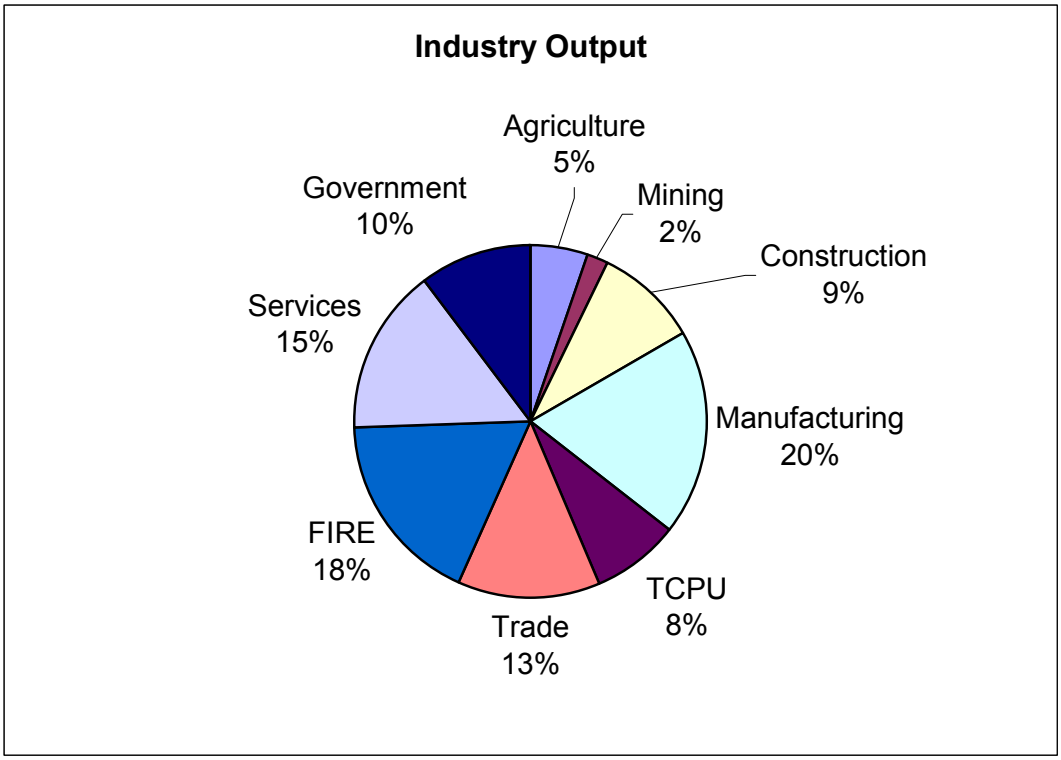


Figure 2.1[6] – Total Industry Output for Scott County

[6] FIRE stands for Finance, Insurance and Real Estate.
TCPU stands for Transportation, Communications and Utilities.

Figure 2.2 illustrates employment for each industry in Scott County. It is obvious from the data that employment shares are not proportional to output shares. For instance, the agricultural sector, while accounting for only 5 percent of total output, has the largest employment share, employing 25 percent of the labor force in Scott County. Similarly, manufacturing and finance, insurance and real estate, while accounting for 20 percent and 18 percent of total output, only employ 7 percent and 3 percent of the total work force. Overall the data indicates that while declines in tobacco revenues may have a moderate effect on total output, they affect a highly disproportionate share of county workers. The trade sector employs 20 percent of the work force, and ranks second after agriculture in terms of employment share.

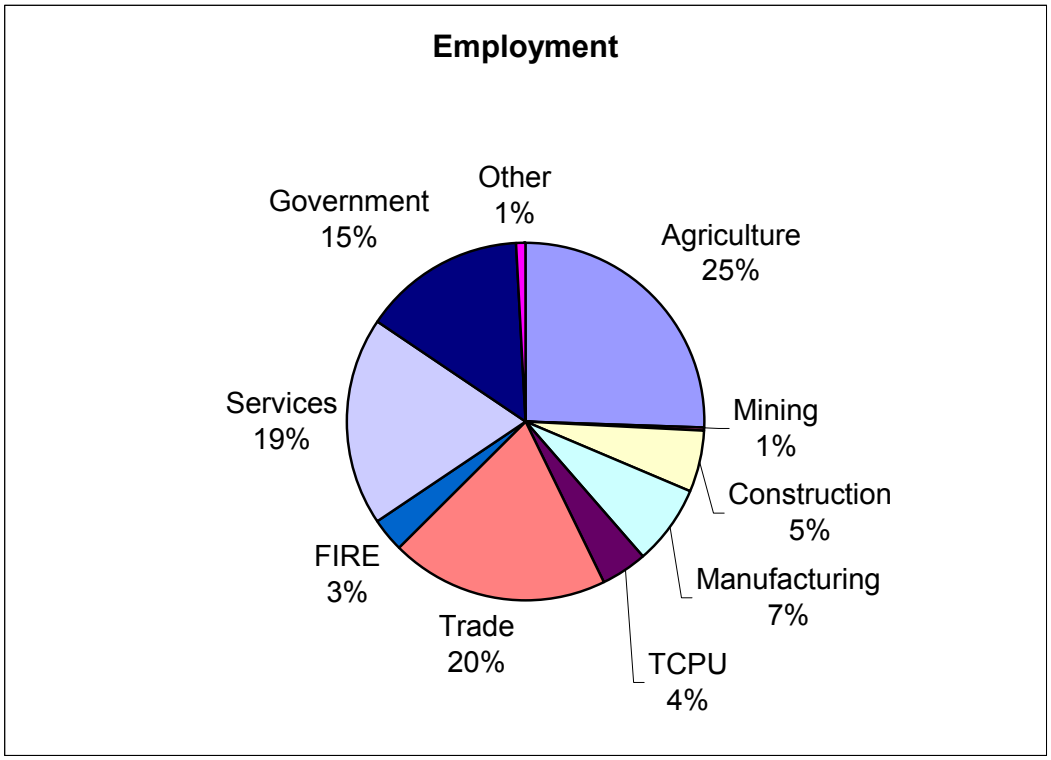


Figure 2.2[7] – Employment by Industry for Scott County

[7] FIRE stands for Finance, Insurance and Real Estate.

Figure 2.3 presents value added for each industry. Value added consists of four components: employee compensation, proprietary income, other property type income and indirect business taxes (illustrated in Table 2.5). Again, value added shares do not reflect output and employment shares. Specifically, the leading industry in the county with respect to value added is the finance, insurance and real estate industry with 23 percent of the total value. The second largest contribution to total value added is made by the trade sector with 17 percent. The agriculture sector has a share of 8 percent of the total value added. This figure is slightly greater than the share in industry output, but is considerably smaller that the sector's share in employment. The contribution of the manufacturing sector to value added is slightly higher than its contribution to total employment, accounting for 12 percent of value added.

TCPU stands for Transportation, Communications and Utilities.

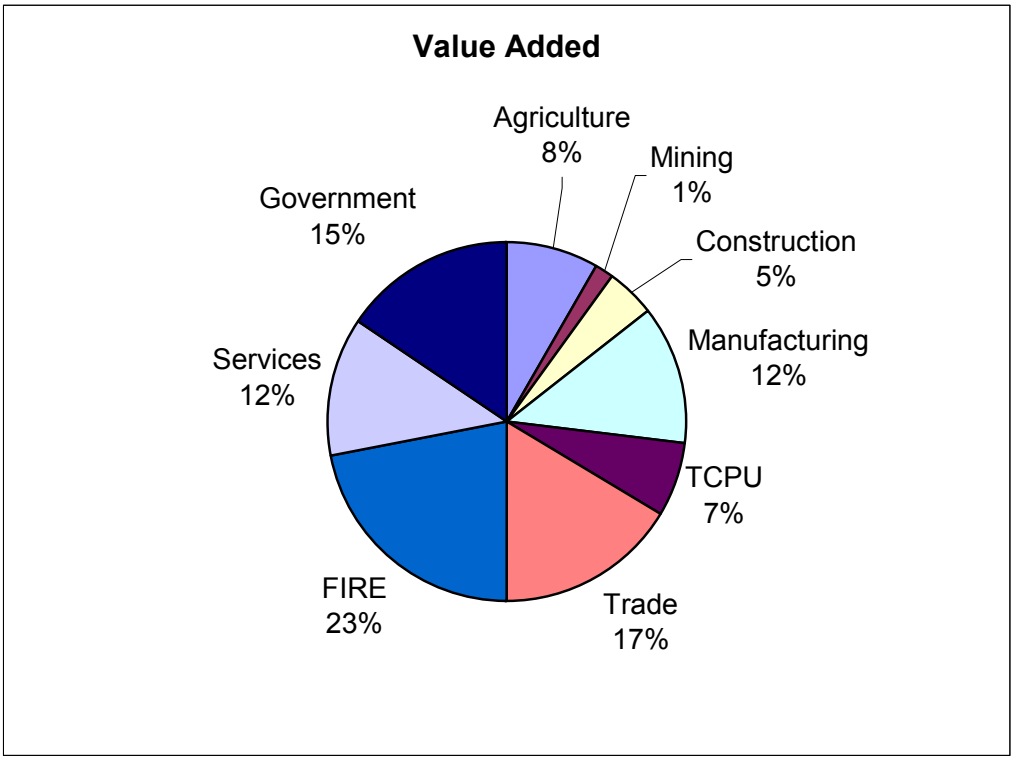


Figure 2.3[8] – Value Added by Industry for Scott County

Figure 2.4 provides an analysis of the different sources of demand for the locally produced commodities. The five major sources of demand are domestic exports, foreign exports[9], household demand, government demand and other. The "other" group is the sum of capital[10] and inventory. The government demand group includes federal government and state and local government demand. Households demand for the county is the largest share of local products constituting 39 percent of the total demand. Domestic exports comprise 34 percent of the total demand and foreign exports are the smallest share of demand for local output with only

[8] FIRE stands for Finance, Insurance and Real Estate.
TCPU stands for Transportation, Communications and Utilities.

[9] Domestic exports are exports out of Scott County to the rest of the US while foreign exports are exports made directly outside the US.
[10] Olson and Lindall define capital as the purchase of commodities for investment purposes by private parties.

5 percent of the total demand. Consumer demand, which is the sum of household and government demand, accounts for a little over half of the total demand, while total exports of local output constitute 39 percent of the total demand.

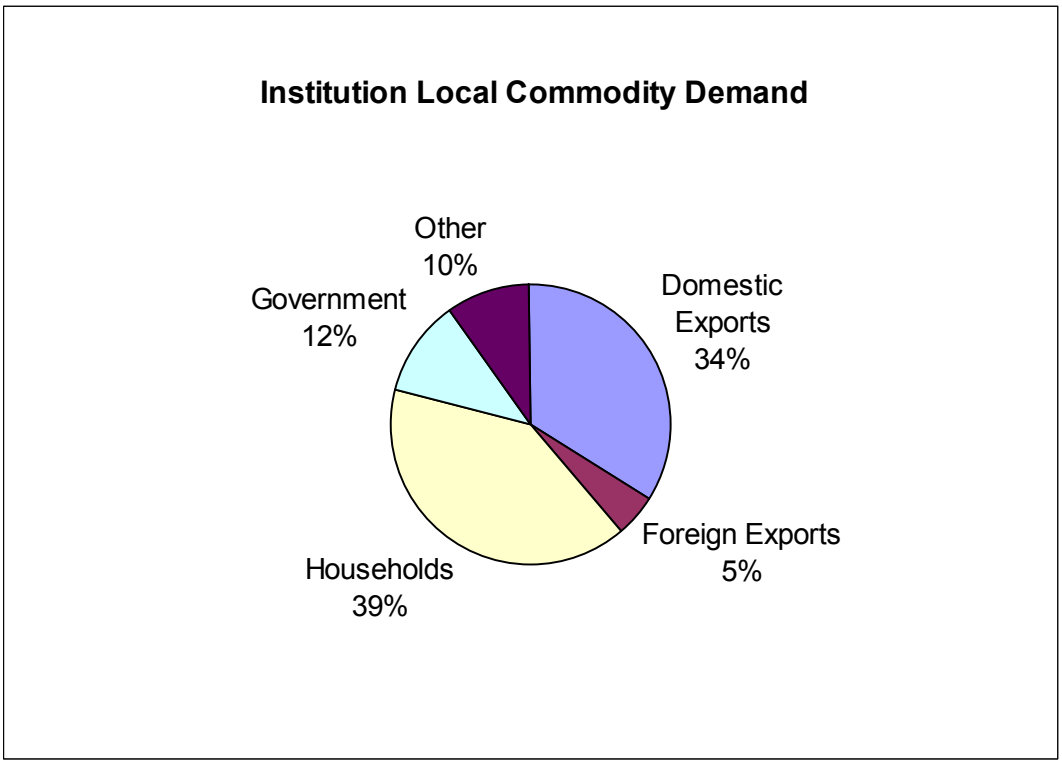


Figure 2.4 – Institution Demand for Regional Output

Total exports for Scott County are $158.2 million, of which $20.2 million are foreign exports and $137.9 million are domestic exports. Total commodity imports are $388.7 million, with $128.2 million as foreign imports and $260.5 million as domestic imports. Note that total imports are more than twice the dollar amount of total exports.

II.4 Industry Analysis at a Disaggregated Level

Section II.3 presented a short description of the regional economy of Scott County based on the aggregated industry reports from IMPLAN. This section provides a more detailed description of the industries in the county and the dependency of the local economy on these sectors for output, jobs and value added. There are 105 industries present in the regional economy of Scott County, compared to 528 sectors for the national economy. The tables in this section are derived from disaggregated reports from IMPLAN based on the 2-digit SIC code. The top twenty sectors are ranked in a descending order to illustrate their importance in the region.

Table 2.6 lists the top twenty sectors in the county ranked by their contribution to total industry output. The leading sector in output is Owner-occupied Dwellings, which is part of finance, insurance and real estate sector (FIRE). This sector estimates what owners would pay in rent if they did not own their homes (Olson and Lindall, 2000). The Real Estate sector ranks second in industry output and is also part of FIRE. It accounts for almost seven and a half percent of the total value.

Table 2.6 – Scott County Top Twenty Sectors by Total Industry Output (2000)

Sector No.	Industry	Industry Output*	Percentage of Total Output
461	Owner-occupied Dwellings	36.853	8.29
462	Real Estate	33.142	7.46
289	Screw Machine Products and Bolts, Etc.	27.163	6.11
522	State & Local Government - Education	21.057	4.74
48	New Residential Structures	17.667	3.98
505	Religious Organizations	16.239	3.65
385	Truck and Bus Bodies	16.018	3.61
455	Miscellaneous Retail	15.807	3.56
146	Reconstituted Wood Products	14.547	3.27
441	Communications, Except Radio and TV	13.628	3.07
490	Doctors and Dentists	13.167	2.96
435	Motor Freight Transport and Warehousing	12.637	2.84
447	Wholesale Trade	11.463	2.58
491	Nursing and Protective Care	11.271	2.54
450	Food Stores	10.938	2.46
454	Eating & Drinking	9.557	2.15
523	State & Local Government – Non-Education	8.599	1.94
451	Automotive Dealers & Service Stations	7.821	1.76
206	Explosives	6.932	1.56
512	Other State and Local Govt. Enterprises	6.726	1.51
	Subtotal	**311.232**	**70.1**
	Remaining 85 Industries		29.9
	Total	**444.295**	**100.0**

*Millions of dollars
Source: IMPLAN, Report SA050

The sector providing the most jobs in the county is the Hay and Pasture sector with 718 jobs or close to ten percent of the total employment (Table 2.7). State and Local Government – Education is ranked second with 667 jobs or nine percent of the total employment. The tobacco sector is ranked third in employment with 540 jobs or over seven percent of the total jobs in the county.

Table 2.7 – Scott County Top Twenty Sectors by Total Industry Employment (2000)

Sector No.	Industry	Industry Employment	Percentage of Total Employment
13	Hay and Pasture	718	9.70
522	State & Local Government - Education	667	9.01
15	Tobacco	540	7.29
450	Food Stores	433	5.85
491	Nursing and Protective Care	404	5.46
455	Miscellaneous Retail	324	4.37
454	Eating & Drinking	298	4.03
3	Ranch Fed Cattle	270	3.65
523	State & Local Government - Non-Education	205	2.77
289	Screw Machine Products and Bolts, Etc.	190	2.57
490	Doctors and Dentists	165	2.23
451	Automotive Dealers & Service Stations	161	2.17
447	Wholesale Trade	152	2.05
493	Other Medical and Health Services	143	1.94
462	Real Estate	141	1.90
505	Religious Organizations	132	1.79
435	Motor Freight Transport and Warehousing	128	1.74
48	New Residential Structures	119	1.61
22	Forest Products	111	1.50
56	Maintenance and Repair Other Facilities	102	1.38
	Subtotal	**5,405**	**73.01**
	Remaining 85 Industries		26.99
	Total	**7,403**	**100.00**

*Millions of dollars
Source: IMPLAN, Report SA050

The Owner-occupied Dwellings and the Real Estate sector are ranked first and second in the value added category (Table 2.8). They contribute close to eleven percent and over nine percent of the industry value added, and total value added, respectively. Although tobacco is an important sector in regional jobs, it is not in the top ten for total output (Table 2.6) or value added (Table 2.8). It is ranked sixteenth in the region's value added (Table 2.8) and twenty-fifth in regional output (not shown in the table).

Table 2.8 – Scott County Top Twenty Sectors by Total Industry Value Added (2000)

Sector No.	Industry	Industry Value Added	Percentage of Total Value Added*
461	Owner-occupied Dwellings	27.916	10.83
462	Real Estate	23.575	9.15
522	State & Local Government - Education	21.057	8.17
289	Screw Machine Products and Bolts, Etc.	12.644	4.91
455	Miscellaneous Retail	12.330	4.78
450	Food Stores	9.948	3.86
523	State & Local Government - Non-Education	8.599	3.34
490	Doctors and Dentists	8.370	3.25
491	Nursing and Protective Care	8.213	3.19
447	Wholesale Trade	7.761	3.01
385	Truck and Bus Bodies	7.430	2.88
441	Communications, Except Radio and TV	7.204	2.80
451	Automotive Dealers & Service Stations	5.874	2.28
435	Motor Freight Transport and Warehousing	4.901	1.90
13	Hay and Pasture	4.897	1.90
15	Tobacco	4.746	1.84
454	Eating & Drinking	4.688	1.82
456	Banking	4.149	1.61
146	Reconstituted Wood Products	4.107	1.59
520	Federal Government - Non-Military	3.586	1.39
	Subtotal	**191.992**	**74.50**
	Remaining 85 Industries		25.50
	Total	**257.692**	**100.00**

*Millions of dollars
Source: IMPLAN, Report SA050

It is apparent that sectors rankings with respect to income, value added and employment differ significantly. Therefore policy initiatives that have desirable impact on income may be relatively inefficient in terms of inducing employment. It is thus necessary that policy makers take into consideration the relative importance of income and employment growth when selecting policy instruments.

II.5 Industry Interactions and Multiplier Analysis

The industry analysis so far has considered sectors of the economy individually, disregarding their effects on other sectors. The following analysis shows how sectors of the local economy are related by making use of multipliers. IMPLAN is used to derive employment and value added multipliers[11]. The top twenty sectors are ranked based on total effects and Type II multipliers for employment and value added. Total effects represent the total impact that occurs in the economy for a change in final demand and are computed as the sum of direct, indirect and induced effects. Direct effects represent the impact that occurs in the industry or industries whose final demand changed. Indirect effects are the impacts that occur in industries other than where the final demand change occurred as a result of an increased demand from the directly affected industries. Induced effects represent the impact on households spending as a result of direct and indirect effects from final demand changes. Type II multipliers represent the direct and indirect effect, as well as the household's income and expenditure effects[12]. By definition, Type II multipliers show the linkages that exist between sectors of the economy and how a change in the final demand of one sector will affect other sectors and household spending. Consequently, it is important to analyze these linkages in order to see what impacts are expected with a change in final demand.

Tables 2.9 and 2.10 present the top twenty sectors in employment ranked by total effects and Type II multipliers, respectively. In Table 2.9 the top sectors ranked by total effects are mainly agricultural sectors. This is due to a large direct effect compared to the other sectors. This observation may be related to agriculture employing a high share of the work force and resulting

[11] For a complete discussion on multipliers refer to Chapter 3.
[12] Type II multipliers consider the household sector as an endogenous sector and include it in the matrix inversion.

in a high direct effect on labor. Tobacco ranks fifth in employment with a total effect of 99.452. This means that for every one million dollar change in final demand, the tobacco sector generates approximately 99.5 jobs. In table 2.10 the top sectors ranked by Type II employment multipliers are different from those in table 2.9, and no agricultural sector is ranked in the top twenty. This is explained by the way Type II multipliers are calculated: total effects divided by direct effects. Since the direct effects were large for the top sectors in Table 2.9, the resulting multipliers are small leaving those sectors unranked. The first ranked sector in this table is Insurance Carriers with a multiplier of 2.497. This means that for every job created in the Insurance Carrier sector, a total of 2.5 jobs are sustained throughout the economy.

Table 2.9 – Employment Multipliers Ranked by Total Effects for Top Twenty Sectors (2000)

Sector No.	Industry	Direct Effects^	Indirect Effects^	Induced Effects^	Total^	Type I Multiplier*	Type II Multiplier**
6	Sheep, Lambs and Goats	278.588	1.665	5.030	285.283	1.006	1.024
13	Hay and Pasture	143.571	0.239	3.673	147.483	1.002	1.027
525	Domestic Services	121.757	0.000	6.043	127.800	1.000	1.050
9	Miscellaneous Livestock	119.560	0.185	4.708	124.452	1.002	1.041
15	Tobacco	95.077	1.243	3.131	99.452	1.013	1.046
4	Range Fed Cattle	85.225	0.767	5.123	91.114	1.009	1.069
3	Ranch Fed Cattle	84.112	0.488	5.016	89.616	1.006	1.065
464	Laundry, Cleaning and Shoe Repair	82.085	1.502	4.290	87.877	1.018	1.071
476	Detective and Protective Services	65.727	1.634	3.775	71.136	1.025	1.082
26	Agricultural, Forestry, Fishery Services	58.102	2.932	2.987	64.021	1.050	1.102
488	Amusement and Recreation Services, N.E.C.	56.148	1.959	2.655	60.762	1.035	1.082
466	Beauty and Barber Shops	50.262	3.062	3.453	56.778	1.061	1.130
16	Fruits	47.212	0.234	4.630	52.076	1.005	1.103
449	General Merchandise Stores	46.168	0.976	3.046	50.191	1.021	1.087
501	Residential Care	42.668	2.278	3.702	48.648	1.053	1.140
27	Landscape and Horticultural Services	41.151	3.853	2.848	47.852	1.094	1.163
474	Personnel Supply Services	41.400	0.072	5.724	47.196	1.002	1.140
22	Forest Products	42.881	0.174	2.528	45.582	1.004	1.063
440	Transportation Services	39.604	1.355	3.535	44.494	1.034	1.123
450	Food Stores	39.587	0.418	3.687	43.692	1.011	1.104

^Per Million dollars of output
*Type I=(Direct + Indirect)/Direct
**Type II =(Direct + Indirect + Induced)/Direct = Total Effects/Direct
Source: IMPLAN, Report MR020

Table 2.10 - Employment Multipliers Ranked by Type II Multipliers for Top Twenty Sectors (2000)

Sector No.	Industry	Direct Effects^	Indirect Effects^	Induced Effects^	Total^	Type I Multiplier*	Type II Multiplier**
459	Insurance Carriers	6.090	6.294	2.825	15.208	2.033	2.497
512	Other State and Local Govt Enterprises	5.412	4.549	1.963	11.924	1.841	2.203
37	Coal Mining	3.616	1.931	2.155	7.701	1.534	2.130
254	Blast Furnaces and Steel Mills	3.382	2.443	1.067	6.892	1.722	2.038
134	Sawmills and Planning Mills, General	6.725	4.867	1.528	13.120	1.724	1.951
146	Reconstituted Wood Products	4.331	2.513	1.343	8.187	1.580	1.890
206	Explosives	7.816	4.088	2.818	14.722	1.523	1.884
505	Religious Organizations	8.154	5.290	1.571	15.014	1.649	1.841
433	Railroads and Related Services	5.614	2.002	2.588	10.204	1.357	1.818
471	Photofinishing, Commercial Photography	10.937	6.251	2.275	19.463	1.572	1.780
441	Communications, Except Radio and TV	4.513	1.759	1.743	8.015	1.390	1.776
385	Truck and Bus Bodies	4.568	1.623	1.764	7.954	1.355	1.741
139	Veneer and Plywood	8.062	3.557	2.290	13.909	1.441	1.725
48	New Residential Structures	6.758	3.374	1.291	11.423	1.499	1.690
435	Motor Freight Transport and Warehousing	10.168	4.534	2.452	17.153	1.446	1.687
462	Real Estate	4.248	1.595	1.071	6.915	1.375	1.628
55	Maintenance and Repair, Residential	8.066	3.177	1.703	12.947	1.394	1.605
445	Water Supply and Sewerage Systems	9.431	3.452	2.174	15.058	1.366	1.597
312	Mining Machinery, Except Oil Field	6.424	1.229	2.594	10.246	1.191	1.595
54	New Government Facilities	7.314	2.125	2.084	11.523	1.291	1.575

^Per Million dollars of output
*Type I=(Direct + Indirect)/Direct
**Type II =(Direct + Indirect + Induced)/Direct = Total Effects/Direct
Source: IMPLAN, Report MR020

Tables 2.11 and 2.12 illustrate the value added top twenty sectors ranked by total effects and Type II multipliers, respectively. In Table 2.11 more than half of the sectors in the top twenty are agricultural sectors. There is no substantial difference in the direct, indirect or induced effects of these sectors. The first ranked sector is State and Local Government – Education with a total effect of 1.258. This means that for a million dollar increase in final demand of this sector, 1.258 million dollars in value added are generated. In table 2.12 the first ranked value added

sector by Type II multipliers is the Religious Organizations sector. The corresponding multiplier is 4.953 meaning that for a million dollar change in value added of Religious Organizations, 4.95 million dollars in value added are generated.

Table 2.11 - Total Value Added Multipliers Ranked by Total Effects for Top Twenty Sectors (2000)

Sector No.	Industry	Direct Effects	Indirect Effects	Induced Effects	Total	Type I Multiplier*	Type II Multiplier**
522	State & Local Government - Education	1.000	0.000	0.258	1.258	1.000	1.258
525	Domestic Services	0.993	0.000	0.257	1.250	1.000	1.258
474	Personnel Supply Services	0.982	0.004	0.243	1.229	1.004	1.251
1	Dairy Farm Products	0.987	0.003	0.229	1.218	1.003	1.234
520	Federal Government - Non-Military	1.000	0.000	0.218	1.218	1.000	1.218
4	Range Fed Cattle	0.981	0.009	0.218	1.208	1.009	1.231
3	Ranch Fed Cattle	0.981	0.006	0.213	1.201	1.006	1.224
523	State & Local Government - Non-Education	1.000	0.000	0.200	1.200	1.000	1.200
5	Cattle Feedlots	0.977	0.008	0.212	1.197	1.008	1.225
6	Sheep, Lambs and Goats	0.969	0.010	0.214	1.192	1.010	1.231
9	Miscellaneous Livestock	0.988	0.002	0.200	1.190	1.002	1.205
16	Fruits	0.985	0.004	0.197	1.185	1.004	1.204
519	Federal Government - Military	1.000	0.000	0.152	1.152	1.000	1.152
18	Vegetables	0.972	0.009	0.167	1.148	1.010	1.182
13	Hay and Pasture	0.979	0.005	0.156	1.141	1.005	1.165
23	Greenhouse and Nursery Products	0.967	0.011	0.162	1.140	1.011	1.179
12	Feed Grains	0.984	0.004	0.144	1.132	1.004	1.151
22	Forest Products	0.983	0.005	0.107	1.095	1.005	1.114
450	Food Stores	0.909	0.021	0.157	1.087	1.023	1.196
24	Forestry Products	0.913	0.035	0.137	1.085	1.038	1.188

*Type I=(Direct + Indirect)/Direct
**Type II =(Direct + Indirect + Induced)/Direct = Total Effects/Direct
Source: IMPLAN, Report MR040

Table 2.12 - Total Value Added Multipliers Ranked by Type II Multiplier for Top Twenty Sectors (2000)

Sector No.	Industry	Direct Effects	Indirect Effects	Induced Effects	Total	Type I Multiplier*	Type II Multiplier**
505	Religious Organizations	0.107	0.356	0.067	0.530	4.330	4.953
134	Sawmills and Planning Mills, General	0.184	0.199	0.065	0.448	2.084	2.438
254	Blast Furnaces and Steel Mills	0.123	0.118	0.045	0.286	1.962	2.331
48	New Residential Structures	0.158	0.130	0.055	0.343	1.824	2.172
483	Motion Pictures	0.195	0.132	0.063	0.390	1.680	2.002
471	Photofinishing, Commercial Photography	0.335	0.199	0.097	0.631	1.595	1.884
499	Child Day Care Services	0.262	0.144	0.083	0.489	1.549	1.865
206	Explosives	0.345	0.165	0.120	0.629	1.478	1.826
55	Maintenance and Repair, Residential	0.238	0.121	0.072	0.431	1.508	1.813
512	Other State and Local Govt Enterprises	0.327	0.170	0.083	0.581	1.521	1.775
139	Veneer and Plywood	0.348	0.154	0.097	0.599	1.441	1.721
435	Motor Freight Transport and Warehousing	0.388	0.173	0.104	0.665	1.445	1.714
244	Ready-mixed Concrete	0.258	0.115	0.069	0.442	1.445	1.712
315	Conveyors and Conveying Equipment	0.248	0.103	0.067	0.418	1.414	1.684
124	Apparel Made From Purchased Materials	0.176	0.070	0.049	0.294	1.397	1.674
151	Mattresses and Bedsprings	0.287	0.111	0.079	0.477	1.389	1.664
146	Reconstituted Wood Products	0.282	0.109	0.057	0.448	1.385	1.587
500	Social Services, N.E.C.	0.380	0.105	0.112	0.597	1.277	1.571
243	Concrete Products, N.E.C	0.300	0.094	0.075	0.470	1.314	1.564
506	Engineering, Architectural Services	0.392	0.103	0.114	0.610	1.263	1.555

*Type I=(Direct + Indirect)/Direct
**Type II =(Direct + Indirect + Induced)/Direct = Total Effects/Direct
Source: IMPLAN, Report MR040

The descriptive analysis of the industries is important because it establishes the linkages that exist between sectors of the economy. It illustrates how these sectors are dependant on one another and how changes in a sector influence other sectors through multipliers. A higher value of the multipliers indicates that a sector has more linkages with other sectors (Wise, 1996). In Table 2.9 the tobacco sector was ranked fifth in employment ranked by Type II multipliers. This indicates that tobacco production has a large contribution to the employment of Scott

County. The high multipliers indicate the dependence of the local economy on the tobacco sector and the effects that a change in the tobacco industry might have in the employment of the county. This observation once again shows the role of tobacco production in the county.

II.6 Summary

This chapter has provided a description of the main characteristics of Scott County and important socio-economic indicators. Furthermore, a detailed analysis of the industries in the county and their contribution to output, employment and value added was discussed. This analysis helps create a clear view of the structure of the local economy as well as the importance of different industries in the region. Multiplier analysis was also used to observe the linkages that exist between the industries in the county.

CHAPTER III – Input Output Analysis

III.1 Introduction

This chapter provides a detailed description of input-output modeling[13], as well as other models that can be used in impact analysis. Specifically, the input-output transactions, input-output matrix and underlying production functions are discussed. Finally the types of multipliers generated from input-output analysis are presented, as well as a discussion of the assumptions used in the analysis.

III.2 Introduction to Input-Output Analysis

Input-output models have been used in economic analysis since the early 1900's. Today all applications of the input-output analysis are based on the initial work of Wassily Leontief. Leontief was the first to publish an input-output model of the United States. In 1973, Leontief received the Nobel Price for his contribution in the input-output analysis.

There were other efforts prior to Leontief's work. As Richardson (1972) mentions, concepts such as general equilibrium and inter-industry relations go back to the *Tableau Economique* and the work of Francois Quesnay in mid-1700's. Quesnay presented the idea of sectors of the industry being related to each other through expenditures and represented this relation in a table format, which was later transformed to the input-output table.

Today input-output modeling is not only used for national level analysis (as originally developed by Leontief) but also for regional analysis on a state, county, or industry level.

[13] Two main sources are used in this chapter: Richardson (1972) and Miller and Blair (1985).

Technological developments have contributed to a wider use of the input-output method through the years by easing the computations necessary for the analysis. Availability of better data sources has increased the number of industry sectors used in the input-output frameworks, as well as the use of the input-output model in economic analysis.

One of the most common uses of input-output analysis is to evaluate the impacts of economic changes in a particular area. Richardson (1972) explains that input-output models are a good method for the analysis of regional policy and in calculating the effects of an economic change in a region. Another popular use is to conduct simulations that help evaluate the impact of alternative policy actions. An economic change may be the introduction of a new industry, an expansion of an existing industry, establishment of a new commercial unit, and changes in governmental policies that would affect spending in the region. In the present study, the regional economic change is the introduction of a cannery (whether for community or commercial use) in Scott County's local economy.

Input-output models focus on sectoral linkages in the economy and follow double accounting principles. The input-output model disaggregates the economy into sectors and describes the flow of goods and services between industries and sectors of the economy. Industries produce goods for intermediate consumption by other sectors and for final consumption by the final demand sector. They also purchase goods and services from other sectors to use in the production process. The amount of goods and services produced by an industry is equal to the amount of goods and services consumed. The input-output model is driven by changes in final demand. These changes result in direct, indirect and induced effects in the economy, which are represented by the table of multipliers. Therefore multipliers illustrate

the changes in the output of the economy resulting from a unit change in the final demand of a sector.

Unlike other general equilibrium models, the input-output framework can easily be applied in regional analysis. Despite its restrictive assumptions[14] and high costs of obtaining data, input-output analysis is a unique analytical tool. It provides descriptive information about the study area interactions among industrial sectors within the economy and helps predict the impact of economic development projects.

III.3 Economic Base Analysis

Economic base analysis is another analytical tool used in regional impact analysis. The economic base model describes the local economy by using two types of activities: basic activities that are exogenous or exports, and non-basic activities that are endogenous or local (Hewings, 1985). Hewings (1985) assumes that only basic sectors can make sales outside the region, the non-basic sectors sell to basic sectors and to each other and there are no transactions between basic sectors. The relationship between the basic and non-basic sectors allows us to see the impact of policy changes in the economy through the community multipliers that are produced. More specifically the economic base analysis looks at the effect of a change in exports or exogenous demand in the local economic activities.

Economic base analysis produces multipliers that are not identical but are similar to those produced by the input-output analysis. Economic base analysis multipliers are very simple and more cost effective to derive than input-output multipliers (Richardson, 1972). Economic base models are used instead of input-output models in regional studies when data are not available and time and resources are very limited. Some limitations associated with the use of this method

[14] Assumptions of input-output are discussed later on in this chapter.

are that it presents a very aggregate view of the local or national economy, and it does not do a good job of representing the interactions between sectors of the economy. Input-output analysis is preferred over economic base analysis for impact analysis as it provides more complex sectoral linkages and sectoral multipliers (Guaderrama et al, 2000). For the purpose of this study, the input-output method will be used, as there are no data limitations. The data needed in the analysis are available through the Minnesota IMPLAN Group, Inc.

III.4 Social Accounting Matrices (SAM)

A SAM is a comprehensive economy wide framework that tracks economic flows across sectors in an economy, factors of production, institutions, and so forth. Similar to an input-output model, a SAM is constructed by focusing on sectoral linkages in an economy. It is a square matrix with row accounts representing incomes and column accounts representing expenditures. A SAM is consistent, meaning that for every dollar of expenditure, there is a dollar income, so rows and columns sum to the same total value. It is also complete, meaning that all senders and receivers of transactions are identified. It contains these types of accounts: an activities account that characterizes production activities for all sectors, a commodities account that characterizes market activities for all sectors, a factors account that is mainly labor and capital, an institutions account that describes in and out flows for agents in the economy including households, firms, government, etc. There is a capital account describing savings and investment activity and a rest of the world (ROW) account describing interactions of the economy with the rest of the world through imports, exports and transfers. Accounts in a SAM will either be endogenous or exogenous. Typical accounts to be set as exogenous are ROW, government, or capital accounts, and they usually capture leakages from the economy.

SAM multipliers are obtained by subtracting the SAM from the identity matrix and inverting the resulting matrix. The multiplier matrix will show how an exogenous change on one industry will impact that industry, other industries, factors of production and different agents or institutions. The SAM framework is used for monitoring the impact of changes on the overall economy of a nation, a city or a household unit. The same assumptions as in the input-output analysis[15] are made when constructing a SAM. One limitation of the SAM framework is that it is a static model, so any long-term implications of each alternative will not be captured. SAM is also monetary, so any non-monetary effects will not be captured, such as pollution that a new industry might bring in the area. Because activities in the model are aggregated, the resulting multipliers could be an average within this category.

SAM is different from the input-output framework in certain aspects. Its multipliers are larger than the ones in input-output analysis where only intermediate demand is a multiplier. SAM looks at value added activities and the final demand sector as endogenous rather than exogenous, as in input-output analysis. SAM is mainly used for descriptive analysis, tax analysis and computable general equilibrium modeling.

III.5 Input-Output Transactions

Richardson (1972) states that the input-output table has two main functions. First, the coefficients in an input-output table show the quantitative relationship between the production sectors in the economy and how they are related through the inputs they acquire or the outputs they produce. Second, the input-output table is used to evaluate the impact of an economic change in the region's output, income, employment, etc.

[15] Assumptions of input-output are discussed later on in this chapter.

The input-output table represents all the economic activity in a country, state or region. The economy in an input-output analysis is divided into sectors, which consist of groups of industries that produce very similar outputs. The economy may be further disaggregated into separate industries or even firms. The number of industries or sectors in the input-output framework varies through different studies, but it mainly depends on the availability of data, the level of aggregation and the purpose and depth of the study. The input-output transactions table consists of two main parts, the intermediate sectors or industries and the final demand and value added sectors.

The intermediate sectors are represented by an n x n matrix (where n represents the number of producing sectors) also called the A matrix. Products of an intermediate sector are used as inputs by other sectors or the producing sector itself. For example, vegetables produced by the agricultural sector are inputs for the food processing industry. In input-output analysis the flow of products between the sectors is of interest. The values in the table are initially recorded in physical terms, but are later converted to dollar values by multiplying the units of output with the price per unit for each particular good. Working in dollar value terms is easier, since the units of output for different sectors or even within the same sector are not the same, and measurement errors that may occur can be avoided. The disadvantage of using dollar value terms is that these values do not reflect changes in the price of outputs.

The elements of the A matrix are denoted by the term z_{ij} which shows the amount of output from sector i that is used as input by sector j. The amount of input that goes from sector i into sector j depends on the amount of goods produced by sector j and not vice versa. Table 3.1 illustrates the flow of products in a simple economy of three sectors. The first three columns represent the selling industries (industries that produce the inputs) and the first three rows

represent the purchasing industries (industries that buy the inputs produced). The coefficients in the input-output table are the inter-industry flows (including intra-industry flows) for a certain period of time, usually a year. The inter-industry flows show the quantitative relationship between the production and purchasing sectors in the economy.

The goods produced by a sector i, except for being used by industries for inputs, are also used by other sectors of the economy such as government, household consumption or trade. These sectors of the economy are referred to as exogenous sectors (Miller and Blair, 1985). The goods used by these particular sectors are not used as inputs but rather as final products and for this reason, they are grouped under the final demand sector. Therefore the total output of a sector goes to other industries as inputs in their production as well as to the final demand sector. If the total output of a sector is denoted by X_i and the final demand sector by Y_i, then:

$$X_i = z_{i1} + z_{i2} + z_{i3} + \ldots + z_{in} + Y_i \tag{3.1}$$

where z_{in} is the amount of output from sector i that is used as input in sector n. The right hand side of the equation 3.1 represents the total sales of sector i, which are equal to the total output X_i.

In producing its output, sector j uses inputs from sector i, but it also uses other inputs that are not provided through industry i, such as labor, capital or other inputs. In the input-output table these inputs are grouped under the value added sector. Part of the inputs used by sector j may also come from trade (imports). All the input sources other than the industries are called the payments sector. Table 3.1 illustrates an input-output transactions table.

Table 3.1 - Simplified Input-output Transactions Table for a Three-sector Economy

To / From	Sector 1	Sector 2	Sector 3	Final demand				Total Output
Sector 1	z_{11}	z_{12}	z_{13}	C_1	I_1	G_1	E_1	X_1
Sector 2	z_{21}	z_{22}	z_{23}	C_2	I_2	G_2	E_2	X_2
Sector 3	z_{31}	z_{32}	z_{33}	C_3	I_3	G_3	E_3	X_3
Payments Sector	L_1	L_2	L_3	L_C	L_I	L_G	L_E	L
	N_1	N_2	N_3	N_C	N_I	N_G	N_E	N
	M_1	M_2	M_3	M_C	M_I	$M_{G/}$	M_E	M
Total Outlays	X_1	X_2	X_3	C	I	G	E	X

Source: Miller and Blair (1985) p.9

The final demand sector is further broken down in four sub-sectors: consumption (purchases made by the household sector), investment (purchases from private investors), government (purchases from the federal, state and local government) and exports (sales made abroad). Mathematically, the final demand of sector i is shown by equation 3.2:

$$Y_i = C_i + I_i + G_i + E_i \tag{3.2}$$

The payments sector is broken down into two sub-sectors: value added and imports (purchases from abroad). Value added is further broken down into labor payments and all other value added payments that include capital payments (interest payments), government payments (taxes), land payments (rents), depreciation, and so forth. If imports for sector i are denoted by M, labor payments are denoted by L and other value added payments are denoted by N, the above relationship can be expressed mathematically by equation 3.3:

(3.3) $W_i = L_i + N_i + M_i$

where W_i is the payments sector for industry i. Considering the information above, the total output X of the economy can be expressed mathematically as:

(3.4) $X = X_1 + X_2 + X_3 + \ldots + X_n + L + N + M$

The same can be done for the total outlays X of the economy, which are:

(3.5) $X = X_1 + X_2 + X_3 + \ldots + X_n + C + I + G + E$

From the double entry accounting rule, total output is equal to total outlays in the economy. Equating 3.4 and 3.5, and rearranging terms yield equation 3.6.

(3.6) $L + N = C + I + G + (E - M)$

The left hand side of the equation 3.6 represents the Gross Income of the economy and the right hand side represents the Gross Product of the economy.

III.6 Input-Output Matrix and Production Functions

The transactions table developed in the previous section is used to derive the input-output matrix or the structural matrix. The input-output matrix consists of coefficients that are usually called input-output coefficients or technical coefficients. These coefficients are noted by a_{ij} and

they represent the amount of output from sector i that goes as input into sector j per dollar of total output of sector j. Mathematically input-output coefficients are calculated as $a_{ij} = z_{ij} / X_j$. By using simple algebra the transaction table can be transformed into the input-output matrix. Replacing the coefficients z_{ij} using the relationship $z_{ij} = a_{ij} X_j$ the equations represented by the transactions table can be converted into the following:

(3.7)
$$X_1 = a_{11}X_1 + a_{12}X_2 + \ldots + a_{1n}X_n + Y_1$$
$$X_2 = a_{21}X_1 + a_{22}X_2 + \ldots + a_{2n}X_n + Y_2$$
$$\ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots$$
$$X_n = a_{n1}X_1 + a_{n2}X_2 + \ldots + a_{nn}X_n + Y_n$$

(3.7) is equivalent to:

(3.8)
$$(1 - a_{11}) X_1 - a_{12}X_2 - \ldots - a_{1n}X_n = Y_1$$
$$- a_{21}X_1 - (1 - a_{22}) X_2 - \ldots - a_{2n}X_n = Y_2$$
$$\ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots$$
$$- a_{n1}X_1 - a_{n2}X_2 - \ldots - (1 - a_{nn}) X_n = Y_n$$

The results are a set of n linear equations and n unknowns. This set of equations can be represented using matrix notation. If:

$$A = \begin{bmatrix} 1-a_{11} & -a_{12} & \dots & -a_{1n} \\ -a_{21} & 1-a_{22} & \dots & -a_{2n} \\ \dots & \dots & \dots & \dots \\ -a_{n1} & -a_{n2} & \dots & 1-a_{nn} \end{bmatrix} \quad X = \begin{bmatrix} X_1 \\ X_2 \\ \dots \\ X_n \end{bmatrix} \quad Y = \begin{bmatrix} Y_1 \\ Y_2 \\ \dots \\ Y_n \end{bmatrix} \quad I = \begin{bmatrix} 1 & 0 & \dots & 0 \\ 0 & 1 & \dots & 0 \\ \dots & \dots & \dots & \dots \\ 0 & 0 & \dots & 1 \end{bmatrix}$$

then the system of equations is written as $(I - A) X = Y$ or $X = (I - A)^{-1} Y$ where I is an n x n identity matrix, A is an n x n matrix of input-output coefficients or the matrix of technical coefficients, X is an n x 1 matrix and Y is an n x 1 matrix[16]. The term $(I - A)^{-1}$ is called the Leontief Inverse matrix or the matrix of multipliers. The elements of the Leontief Inverse matrix represent the requirements of sector i per unit of output that goes from sector i to final demand.

The A matrix contains the technical coefficients but unlike the input-output matrix, it does not contain any value added inputs or a final demand sector. The input-output matrix has more rows to account for the value added inputs. This will ensure that the value added inputs and the intermediate inputs used in the production of an output will sum to one. The columns in the input-output matrix are referred to as production functions because they represent the amount of inputs used to produce the maximum amount of output by a sector (Miller and Blair, 1985).

III.7 Open and Closed Models

The model described above consists of exogenous sectors or the final demand column. The final demand column includes household consumption, investment, government spending and exports. These sectors of final demand can be converted to endogenous sectors by being included in the production sectors. Moving one or more sectors from the final demand column inside the production sector is referred to as closing the model with respect to that sector or

[16] Note that the inverse of the matrix (I – A) has to exist in order to get to equation $X = (I - A)^{-1} Y$.

sectors. If a model has no exogenous sectors at all, it is referred to as a completely closed model. The most common sector to be endogenized is the households sector because of the link between consumption, income earned and output (Miller and Blair, 1985). Other sectors are endogenized depending on the purpose of the analysis. Having defined a closed model, an open model would be one in which the four components of final demand remain exogenous throughout the analysis.

III.8 Multiplier Analysis

The elements of the Leontief Inverse matrix, $(I - A)^{-1}$, are used to forecast the effects of an economic change. This matrix is also called the matrix of multipliers and is used to generate all the different types of multipliers. Some multipliers can be directly derived from the inverse matrix and others can be derived by conducting additional calculations and incorporating more information into the matrix of multipliers.

Multipliers illustrate the difference between the initial effect of a change in the final demand sector and the total effects of that change (Lindall and Olson, 2000). Total effects are the direct and indirect effects of the change (in an open model where the household sector is exogenous) or the direct, indirect and induced effects of the change (in a model that is closed with respect to households where the household sector is endogenous). Direct effects are changes in the production of output as a result of the change in final demand. Indirect effects are changes in production of output of other related industries as a result of an increased need for inputs by the directly effected industries. Induced effects are changes in households sector spending as a result of increased income caused by the direct and indirect effects (Lindall and Olson, 2000).

There are different types of multipliers based on the effects that they measure. The most common multipliers are Type I, Type II and Type SAM multipliers. A type I multiplier is the

direct and indirect effects of a one dollar change in the final demand of a sector when the household sector is part of final demand. These multipliers are usually the elements in the Leontief Inverse matrix and represent the production requirements for each sector or industry to satisfy one dollar of output increase in the final demand sector. A type II multiplier, in addition to the direct and indirect effects, includes the induced effect as well and the household sector is one of the intermediate sectors. These multipliers show the relationship between income from labor and the expenditures incurred by households. A type SAM multiplier is the direct, indirect, and induced effects of a dollar change in the final demand. In contrast to Type II multipliers, the induced effect in Type SAM multipliers is based on the information of the social account matrix, and the multiplier is flexible enough that any institutions can be included (Lindall and Olson, 1993). Type I multipliers are calculated as the sum of the direct and indirect effects divided by the direct effect. Type II and SAM multipliers are the sum of direct, indirect and induced effects divided by the direct effect.

Different multiplier reports can be generated based on measures of economic activity, the most common being output, income and employment multipliers. For each report, the different types of multipliers can be estimated. The types of reports in an analysis will depend on whether the income, output or employment effects of an economic change are going to be explored. Miller and Blair (1985, p. 102) define the output multiplier of sector j as the total value of output by all sectors of the economy that is needed to satisfy a dollar change in the final demand of sector j. The output multipliers show the interdependence between sectors and therefore the larger the multipliers, the greater the interdependence of the sector with the rest of the economy (Lindall and Olsen, 2000). The output multiplier can be calculated as the sum of the direct and indirect effect divided by the direct output effect. Type II and SAM multipliers illustrate the

induced effect in the economy aside from the direct and indirect effects. Output multipliers are mainly used when evaluating the impact of a new industry or firm on the economy.

Income multipliers estimate the direct, indirect and induced effects that a unit increase in final demand has on income and are calculated as the ratio of direct, indirect and induced income effects to the direct income. The increase in output of sector j will bring additional income to the employers of sector j. Employment multipliers show the employment opportunities created per dollar of output increased by changes in final demand. Similar to income multipliers, employment multipliers are the ratio of direct, indirect and induced employment effects to the direct employment effect.

In addition to the output, income and employment multipliers, other sets of multipliers can be derived from the input-output matrix by using the IMPLAN Professional software such as value added multipliers. The set of income multipliers can be broken down to additional sets of multipliers including labor income multipliers, proprietor income multipliers, employee compensation multipliers and other property type income. In regional impact studies, the most commonly used multipliers are the income and employment multipliers, because the interest is in economic changes that bring about job creations or increases in income as a result of new outputs generated.

III.9 Assumptions of the Input-Output Model

The alteration of the transactions table to the Leontief Inverse matrix (and the table of multipliers) requires a series of assumptions. When the economy is divided in sectors, it is assumed that the sectors produce a single homogeneous product with similar techniques. This is not a very realistic assumption and for the products of each sector to be homogeneous to a

certain extent, the sectors of the economy are aggregated and the coefficients in the transaction table are expressed in dollar values instead of quantities (Farag, 1967, p. 35). The implicit assumption made here is that prices of inputs and outputs are always known.

In calculating the technical coefficients (a_{ij}), it is assumed that the amount of input used by each sector depends only on the amount of the output produced, or that the output of sector i that goes as input in sector j depends solely on the output of sector j. Richardson (1972, p.8) states that everything depends on the need for the output production, and the usual economic assumptions of profit maximization, utility maximization, and so forth, are not relevant in this case. The technical coefficients do not change with a change in output; that is, if the output of the sector is doubled, then the inputs used to produce this output are doubled and the a_{ij} coefficient does not change. The assumptions implied here are that the relationship between the inputs and outputs of a sector is fixed (Miller and Blair, 1985) and there is no substitution between inputs. In making this assumption, economies of scale in producing the output, price changes and technological changes are ignored and constant returns to scale are assumed.

As a result of having fixed technical coefficients in input-output analysis, inputs are used in fixed proportions. Graphically this condition is illustrated by the L-shaped isoquants (Figure 3.1) of the production functions (in a two sector economy). X_1 and X_2 are the inputs used in the production of output Y. Different combinations of inputs yield different levels of output, denoted as Y_1, Y_2 and Y_3 in Figure 3.1. If the use of only one input is increased, it would not affect the level of output produced. Both inputs have to increase at a given proportion for the output to increase, as both of them are required in production. The production functions for the industries in the economy are assumed to be constant and linear. Another assumption made by Richardson (1972, p.9) is that changes in technology are slow paced. This will ensure that technical changes

will not affect the coefficients in the input-output table and that the table will be useful for some time into the future.

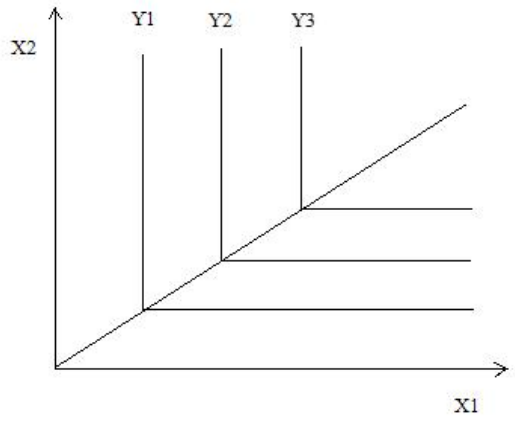


Figure 3.1 – Fixed Proportions Inputs Production Functions

Although the assumptions of the input-output model are simple and restrictive, input-output analysis is preferred over other models for regional analysis because, as Richardson (1972, pp. 9) states, "input-output models pass the critical test that for many purposes they predict reasonably well".

III.10 Summary

This chapter has presented a summary of the history, characteristics and uses of the input-output analysis. Also it has provided the steps necessary to transform the transaction table to the input-output matrix and the production functions. In addition, a description of the common multipliers used in the analysis as well as how they are derived is discussed in the chapter. A discussion of the assumptions associated with input-output is provided.

CHAPTER IV – Methods and Procedures

IV.1 Introduction

This chapter describes the methodology used for the impact analysis. First, an overview of the input-output analysis is presented together with definitions of important terms and concepts. Second, a description of the IMPLAN modeling tools is provided in order to better understand the features of the software. Finally, the project and the scenarios depicted in the study are discussed.

IV.2 The IMPLAN Model

IMPLAN stands for IMpact Analysis for PLANning and it was initially developed by the USDA Forest Service to assist with the land and resource management planning; it was further developed by researchers at the University of Minnesota. Building an input-output model requires a considerable amount of industry data, and the cost of gathering these data can be tremendous. IMPLAN was developed as a cost-effective alternative to construct input-output models, especially for regional studies when the cost for obtaining data is even greater (Olson and Lindall, 2000). The IMPLAN system consists of two different parts: the IMPLAN database and the software.

The IMPLAN database provides all the information necessary to develop regional input-output models and estimate the economic impact of new firms or new economic activities in the area (Olson and Lindall, 2000). Components of the database include industry outputs, employment data, value added, final demands, structural matrices and social accounting matrix

(SAM) data. The database consists of 528 industrial sectors that are broken down to 2,3 or 4 digit SIC (Standard Industrial Classification) codes. Data are available at the national, state, county, and zip code level, which offers more flexibility in model building and choice of study area. The data sources for the database are mainly government data sources and include the US Bureau of Economic Analysis, US Bureau of Labor Statistics, US Census, US Department of Agriculture, and so forth. IMPLAN allows the data in the IMPLAN database to be edited and modified to better fit the purpose of the study.

The IMPLAN software is mainly an economic impact analytical tool. Shocks to the economy are introduced in the form of final demand changes, and the software uses the data from the database to calculate economy wide impacts resulting from the exogenous shocks. Together with the database, it is used to develop local input-output models to evaluate the economic impact of a new activity in an area. IMPLAN software serves three main purposes: data retrieval, data reduction and model development, and impact analysis (Olson and Lindall, 2000). Other functions include development of input-output accounts, SAM and multiplier tables. It is particularly useful in development policy analysis as it can be used to stimulate different scenarios, making comparisons of the predicted impact of alternative policy actions readily available.

IV.3 Overview of Input-Output Analysis[17]

Input-output analysis examines the relationships between businesses in an economy, as well as the relationship between businesses and final consumers. The data used in input-output analysis may come from primary or secondary sources. Data that comes from secondary sources

[17] The definitions in this section refer to Olson and Lindall (2000), Chapter 8.

results in secondary input-output analysis. IMPLAN is an example of a model that conducts secondary input-output analysis and will be used to generate impact results for this study.

An input-output model consists of two parts: the descriptive model[18] and the predictive model. The descriptive model contains information on local industry interactions in the regional economic accounts. Regional economic accounts describe the local economy in terms of dollar flows from purchasers to producers in the study area. The descriptive model also contains information on trade flows describing the movement of goods and services outside or within the region. Social Accounting Matrices are also part of the descriptive model and describe the flow of money between institutions.

Multipliers that are derived from the regional economic accounts represent the predictive model. Multipliers describe how a change in the final demand affects the economy. Changes in final demand of one or more sectors are the driving force of an input-output model. The final demand of a sector is the purchases of goods and services that are used for final consumption. If the final demand of a sector increases, the firms that produce for the final demand would have to increase their production. This would require more inputs that are produced by other firms, and, in turn, these firms would have to increase their production. These iterations create the direct, indirect and induced effects captured by the multipliers. The direct, indirect and induced effects describe the full impact that a change may have in the economy. The direct effects are the changes in the industries to which a final demand change was made. The indirect effects are the changes in inter-industry purchases as a result of the new demand from the directly affected industry. The induced effects represent the changes in the income or expenditure of the households as a result of the changes in production. Total effects are the sum of the direct, indirect and induced effects.

[18] The results of the descriptive model are discussed in Chapter 2.

IV.4 IMPLAN Impact Analysis[19]

This section provides definitions and describes in detail the mechanics of conducting the impact analysis using IMPLAN. Economic impact analysis is concerned with changes in final demand. It is defined as an assessment of change in overall economic activity as a result of some change in one or several economic activities (Olson and Lindall, 2000). This study examines the impact of two different food-processing units, a community cannery and a commercial cannery. The analysis evaluates the impact based on the effects on output, employment value added, and labor income. Value added in the present study includes labor income, other property type income, and indirect business taxes. Labor income represents all payments to workers for all forms of employment and is the sum of employee compensation and proprietor income (Olson and Lindall, 2000).

Before running the model, certain issues should be taken into consideration. A distinction should be made whether expenditures are expressed in purchaser or producer prices. Producer prices are prices paid to an industry for its output. Purchaser prices are prices paid at the retail level and are usually higher than producer prices. The difference between producer and purchaser prices is represented by margins, which can be adjusted to convert all prices to producer prices.

The IMPLAN model requires that it is specified whether the sectors in the analysis are commodities or industries. The distinction between the two is that commodities are the goods and services produced; industries are a collection of business that produces these goods and services. Based on this distinction, the final demand changes would be made to an industry or a

[19] Definitions of terms in this section refer to Olsen and Lindall (2000).

commodity. If the sectors are defined as commodities, the changes in final demand will apply to all sectors that produce that particular commodity.

Another important distinction in the analysis is the trade flow assumption to be used. Trade flows are the imports and exports in an area. There are different techniques to describe trade flows, but the most widely used methods are the regional purchase coefficients (RPC) and supply/demand pooling (Olson and Lindall, 2000). Regional purchase coefficients represent the proportion of local demand that is met by regional production. An RPC of 0.80 means that for each dollar need for that commodity, 80 percent is satisfied through local production while 20 percent is imported. RPCs in IMPLAN are generated automatically through a set of econometrically based equations and are based on the characteristics of the region. When using IMPLAN, one can choose to use the model RPCs, edit the RPCs of one or more commodities, or choose 100 percent of the commodity to be produced locally. The supply/demand pooling technique assumes that the local supply will satisfy as much of the local demand as possible. If local demand is greater than local supply, part of the demand will be met by the local supply, and the rest will be imported. If local demand is smaller than local supply, then all local demand will be satisfied by local supply, and the remainder of the supply will be exported. Thus the supply/demand pooling coefficient is calculated as the ratio of supply over demand. Those coefficients maximize the quantity of commodities purchased locally, hence they are larger than the RPC coefficients. RPCs in the model are limited by the supply/demand ratio, and they are not allowed to be greater than this ratio (Olson and Lindall, 2000).

Deflators are used to adjust all money measures used in the model across time. In this case the data is for the year 2000, and the deflators have inflated the impact analysis to the current year. Furthermore, the IMPLAN model allows editing of the regional data. The regional

data contains the original data that includes the study area data (output, employment, value added, final demands), foreign exports and commodity sales. A detailed explanation of the specific edits made for the current study follows in the next section.

IV.5 Project Definition[20]

The idea of project definition in the context of this section is that of translating the changes in the local economy posed by the alternative proposed projects into terms that are consistent with the model at hand. The project definition includes impact location, local expenditures involved, and time frame of the analysis, as well as institutions and industries that are affected, and the year of expenditures.

The community and the commercial canneries are part of the food preserving sectors of the economy and are new to the region; there are no similar units currently present in the county. Therefore we will consider the introduction of such food-preserving firms as a new firm introduced in the area. The impacted sectors from the presence of the cannery do not exist in the study area, changes to IMPLAN are necessary to make these sectors exist. The details on the adjustments of the study area are discussed in section IV.6.

The economic activity in the region will bring about changes in final demand, which in turn will affect different institutions. Institutions may include industries, households, and federal or state government. The institutions affected in this analysis include the industries of Canned Fruits and Vegetables (67)[21], Canned Specialties[22] (66), Pickles, Sauces and Salad Dressings (69), Sausages and Other Prepared Meats (59) and New Industrial and Commercial Buildings (49). Due to lack of specific output data for the new firms, the changes in the final demand are

[20] This section refers to Olson and Lindall (2000), Chapter 9.
[21] This represents the sector number used in IMPLAN
[22] This sector includes soups, stews, chili, different nationality foods, baby foods and fruit preserves, etc.

introduced as changes in employment. The IMPLAN model can convert between the two using appropriate conversion factors for each industry.

In this type of analysis local expenditures have to be specified. The expenditures may occur in the study area, outside the study area, or they may be imports. To study the effects of a change in the local economy, only local expenditures should be used. In IMPLAN this is accomplished by the RPC coefficients. For this study all the expenditures are assumed to be local, thus the output of the cannery will fulfill local demand first. This will minimize imports and maximize local activity (Olson and Lindall, 2000). If one does not make the above assumption, the local activity will be smaller resulting in a smaller impact in the local economy.

The activity time frame for the food processing units involves phased impacts. Phased impacts include investment and operations of the cannery where the investment in construction and the operation are considered separately. While the current study is static, and considers only the impact of the new project in the year 2004, one may be interested in the effect of the project over time. In that case only the effects of the operation of the cannery may be considered for future years, as construction is a one-time activity.

The sectors affected by the new economic activity in the area have to be defined as industries or commodities. In the case of an industry, the final demand changes are applied only to the industry affected. In contrast, when sectors are defined as commodities, all the industries producing the commodity experience changes in their final demand. The presence of the cannery is going to affect some food preserving industries, not particular commodities, therefore the sectors in consideration are defined as industries and the impact analysis is industry based. Part of the project definition is the distinction between producer and the purchaser prices. Since the input values in the model are expressed in terms of employment, it is not necessary to make

this distinction or make use of margins. IMPLAN will automatically convert the employment values to sales based on producer prices.

The final demand changes in the impact analysis have to be denoted as a specific numerical value. A discussion on the figures used is provided in the following section. No other modifications of the model have been performed as far as changes in production functions, byproducts or multipliers.

IV.6 Study area adjustments

The IMPLAN database for Scott County contains information on 105 industries in the county compared to 528 industries for the US, because only 105 industries are present in the local economy. The presence of a cannery is considered as a new firm moving in the area since no other similar food-processing unit exists in the county. The cannery is going to have an impact on industrial sectors that do not exist in the model. A solution to this concern is to make these industries exist. The regional data are edited and output, employment and value added data are added to the non-existing industries. The values for these figures are calculated based on the state model. Using the values for output, employment and value added for the same industries for the state of Virginia, employment ratios are calculated. The only data needed from the new firm is the number of people that are to be employed. The values for the other components are calculated using the state ratios[23]. Since the community cannery and the commercial cannery are expected to employ different numbers of people, different models were constructed for each case. Once the industry data is edited, the model is build and the impact analysis is conducted.

[23] This method is suggested from the Minnesota IMPLAN Group Inc. when sectors of the economy are missing.

Table 4.1 illustrates the calculations of data for Sector 66 – Canned Specialties for the community cannery. The calculations for the data of the other sectors are conducted in a similar way.

Table 4.1 – New Data Calculations for Sector 66 – Canned Specialties

	2000 Virginia Data	Employment Ratios	New Scott County Data
Output ($millions)	8,005.560	0.503	1.006
Employment (jobs)	15,915.000	1.000	2.000
Value Added ($millions)			
Employee Compensation	902.981	0.057	0.113
Other Property Type Income	1,912.940	0.120	0.240
Indirect Business Taxes	65.199	0.004	0.008

The data in the second column are the state of Virginia data for sector 66 in term of output, employment and value added. The source for these data is the Virginia State data file for the year 2000 from the IMPLAN database. The figures in the second column are calculated as the ratio of each of the elements in the second column over the number of jobs for Virginia for this sector. These are called the employment ratios. In the last column the employment figure (2 jobs) is the number of people that the community cannery is expected to employ. The new Scott County data are calculated by multiplying the employment ratios with the expected number of jobs for the cannery. These data are used to modify the existing study area data and make the industry exist in the model. The other sectors that do not exist in the region are introduced in the model in a similar way. The calculations for these sectors are presented in Appendix A.

IV.7 Scenario descriptions

This study uses input-output analysis to look at the economic impact of two different food-preserving establishments: a small size unit or a community cannery and a large size unit or a commercial cannery. The community cannery will be used by county residents that want to preserve produce for personal consumption, while the commercial cannery will preserve and process food products that will be marketed under a label. The first group of impacts is conducted for the investment in construction and operations of the community cannery. The second set of impacts considered is that of the operation of the commercial cannery. The impact of the construction of a commercial cannery is not considered due to data limitations[24].

The investment and operations of the community cannery are treated as two different impacts since their time frame is different. The construction cost of the community cannery is estimated to be 500,000 dollars. This value does not include the investment in equipment and machinery. The equipment and machinery is going to be purchased outside the region, therefore the impact of this investment is not local and will not be included in the analysis. The construction cost estimate is based on the construction costs of an existing community cannery in Carroll County, Virginia. The Carroll County cannery was rebuilt in 2001, and it is a good representation of the community cannery that is being considered for Scott County. Hence, the Carroll County cannery is used as a reference for this study. The construction costs are entered in IMPLAN as a change in production of New Industrial and Commercial Buildings, sector (49).

A community cannery in Scott County is estimated to provide two full-time jobs. This employment value is consistent with existing community canneries that were visited as part of the study, including the Riner cannery and Carroll County cannery. The changes in final demands for the operation's impact are entered as employment changes and the IMPLAN model

[24] This is discussed in more detail in section I.8.

automatically converts the employment values to production inputs. The changes in final demands affected the following sectors: Canned Fruits and Vegetables, Canned Specialties, Sauces, Pickles and Salad Dressings and Sausages and Processed Meats. The sector choices were based on the results of a questionnaire[25] filled out by Scott County residents. The questionnaire involved questions related to the usage of a community cannery if it was available, in addition to personal information about the participants. The results of the questionnaires implied that the participants anticipated canning products such as fruits and vegetables, pickles, sauces, meats, soups, beans, fruit juices, etc, mainly in cans or glass containers. These products are grouped according to main business classifications codes (SIC) and fall into the four sectors mentioned above. The final demand changes are made to the employment value of the four sectors. As previously mentioned, all sectors are defined as industries and the data is deflated to the year 2004.

The commercial cannery is a larger operation compared to the community cannery. The output of such a cannery varies considerably depending on the size of containers and prices of output; therefore, it is difficult to estimate a dollar value for production. Instead the changes in final demand for this scenario are calculated through changes in employment. The commercial cannery is expected to provide around 144 jobs in the county. The employment input value is calculated based on data from the directory "Judge's Peerless Food Processors North America 2004". This publication is a directory of small, medium and major food processors (including frozen, refrigerated and shelf stable foods) located in North America. The description of each food processor contains information on the main office location, annual production volume, number of plant employees, products that are processed, SIC codes, container sizes, parent company, brands owned, factories' names and addresses, trade associations, and so forth. The

[25] The questionnaire is presented in Appendix B.

food processors considered in this analysis were selected by the SIC codes and the type of package or process. More specifically the businesses selected preserve products in cans and glass containers, and their output is classified under the SIC codes of Canned Fruits and Vegetables, Canned Specialties, Sauces, Pickles and Salad Dressings and Sausages and Processed Meats. The number of plant employees used in the IMPLAN analysis is an average of the number of people employed by the 219 selected food processors in North America. Concerns may however arise on whether it is realistic to assume that Scott County can sustain an operation of similar size. To address any potential concerns few other similar size operations and the counties in which they are located were compared. At least two counties[26] similar to Scott County in terms of population composition and population structure host similar size operation.

A second scenario is also considered for the commercial cannery. The commercial cannery may specialize in processing products classified under one of the four sectors considered in the above analysis. Given that specialization opportunities exist, it is natural to ask if specialization would create differential impacts in the community. If so, it may be beneficial to know which sector would produce the highest impact. For each sector a different impact analysis is conducted and the final demand changes are made to each sector separately. The cannery is expected to employ the same number of people, 144 employees[27]. The impact of the operation of the commercial cannery in the region might differ with the cannery specializing in production, because the four sectors differ in structure. The impact is evaluated in terms of output

[26] Such counties include Accomack County (Easternshore Seafood Products Inc.) and Shenandoah County (Bowman Apple Products Co. Inc.).

[27] The inputs for the commercial cannery (including labor) may be supplied locally or may be imported. Imports are more likely to occur if the local supply is limited. In the case of imported inputs or labor, the multipliers will be different; the local impact will be smaller because part of the impact will happen in the exporting regions. In this study, however, it is assumed that all inputs for the commercial cannery are supplied locally.

employment and value added and a comparison of the results for the four scenarios is provided in Chapter V.

Alternative scenarios may be considered for a cannery including alternative uses or sizes such as a combination of a commercial and a community cannery. This study does not take into consideration such scenarios, however the model can be easily modified to evaluate the impacts of these alternatives.

IV.8 Summary

This chapter has provided a summary of procedures for input-output modeling as well as different decision factors that are crucial to the analysis. The chapter has outlined the main steps used in the definition of the input-output problem. The study area changes made to the original data are explained and the calculations of the new data are discussed in detail. Finally, this chapter has provided an explanation of the scenarios that are part of the analysis together with the expenditures that go into the different scenarios. The results from the IMPLAN models are discussed and summarized in the next chapter.

CHAPTER V – Results and Conclusions

V.1 Introduction

This chapter presents the results for each of the proposed scenarios. Furthermore, the impacts for the community and the commercial cannery are compared and summarized, as well as the results from the specialization of the commercial cannery. Also, a discussion of the limitations of the study is presented, together with conclusions and policy recommendations.

V.2 Community Cannery Construction Impact Analysis

The construction of the community cannery is part of the initial investment that will have an impact on the local economy by increasing the output of the New Industrial and Commercial Buildings sector. Table 5.1 summarizes the results of the impact analysis for the construction project. The investment in construction is 500,000 dollars, which is represented by the direct effect in the total industry output. The total change in industry output amounts to 641,057 dollars that includes an indirect effect of 74 thousand dollars and an induced effect of 67 thousand dollars. The indirect and induced effects represent the inter-industry and the household expenditure effects, respectively, as a result of the 500,000 dollar increase in the New Industrial and Commercial Buildings sector. These effects are important because they illustrate the linkages that exist between sectors in the economy, as well as identifying the industries on which they depend the most (see Table 5.2). The direct impact on employment in the New Industrial and Commercial Buildings sector is 4.3 jobs with labor income of 137,308 dollars. The total

effects of construction in the economy in terms of employment are 6.2 jobs earning 185,346 dollars in labor income.

Table 5.1 – Community Cannery Construction Economic Impact

	Direct Effects	Indirect Effects	Induced Effects	Total Effects
Industry Output*	500,000	74,027	67,029	641,057
Employment (Jobs)	4.3	1.0	0.9	6.2
Total Value Added*	151,489	40,578	42,775	234,841
Labor Income*	137,308	26,813	21,225	185,346

*2004 Dollars
Source: IMPLAN Impact Reports

As mentioned above, the change in the final demand of New Industrial and Commercial Buildings sector affects other industries in output value, employment and value added. Table 5.2 illustrates the relation between industries and to what extent the change in the construction industry affects the other industries.

Table 5.2 – Construction Total Effects by Industry

Sector No.	Industry	Industry Output*	Employment (Jobs)	Value Added*	Labor Income*
1	Agriculture	2,077	0.1	1,481	947
28	Mining	12	0.0	5	3
48	**Construction**	**501,711**	**4.3**	**152,384**	**138,121**
58	Manufacturing	11,004	0.1	3,804	2,401
433	TCPU	23,018	0.2	10,165	6,238
447	Trade	40,485	0.8	29,492	18,240
456	FIRE	26,434	0.1	18,872	2,806
463	Services	32,407	0.6	16,817	14,988
510	Government	3,735	0.0	1,647	1,430
516	Other	174	0.0	173	173
	Total	**641,057**	**6.2**	**234,841**	**185,346**

*2004 Dollars
Source: IMPLAN Impact Reports

The major impact of the investment in construction occurs in the Construction industry. The second highest total impact is found in the Trade industry in terms of output, employment, value added and labor income. This result may be explained by the sectors that are part of the Trade industry such as Building Materials and Gardening Supplies, General Merchandise Stores, Miscellaneous Retail, etc. Building materials and other merchandise items are necessary in the construction process, thus increasing the demand for output of these sectors. The third most impacted sector from the construction is the Services sector. This industry is composed of Services to Buildings, Equipment Rental and Leasing, Electrical Repair Services, Engineering, Architectural Services, etc. Total impacts for this sector are about 32.5 thousand dollars in output with labor income effects close to 15 thousand dollars. Some other high-impacted sectors include Finance, Insurance and Real Estate, Transportation, Communications and Utilities and Manufacturing sector.

V.3 Community Cannery Operation Impact Analysis

The operation of the community cannery will have an impact on the economy of Scott County affecting the manufacturing sector through changes in the sectors of canned and processed produce. Table 5.3 illustrates the different effects of the food processor in terms of output, employment, value added and labor income. The operation of the cannery increases total industry output by 852,674 dollars with direct effects contributing over 75 percent of the total effects. The cannery is expected to employ two people (that is the direct effect), however it creates a total of 4.2 jobs in the region. The jobs created earn about 147.5 thousand dollars annually in labor income. The total value added effect is a little over 330 thousand dollars. These figures represent the total impact in the area. Table 5.4 represents total effects by industry.

Table 5.3 – Community Cannery Economic Impact

	Direct Effects	Indirect Effects	Induced Effects	Total Effects
Industry Output*	662,858	135,353	54,463	852,674
Employment (Jobs)	1.9	1.6	0.7	4.2
Total Value Added*	228,598	66,783	34,755	330,136
Labor Income*	84,998	45,282	17,246	147,526

*2004 Dollars
Source: IMPLAN Impact Reports

The largest impact of the cannery occurs in the manufacturing industry since it consists of the food processing sectors. The number of jobs created in this sector is half of the total number of new jobs earning over 60 percent of the total industry labor income. The second largest impact in the region occurs in the Transportation, Communications and Utilities sector, followed by the

Trade sector. These large impacts result from the sectors involved such as electric services, communications (except radio and TV), water supply and sewerage systems, sanitary services and steam supply, gas production and distribution, general merchandise stores, food stores, etc. The outputs of these sectors are important inputs of the cannery, and the operation of the cannery will increase the demand for products from these sectors, therefore the impacts on these sectors are relatively large.

Table 5.4 – Community Cannery Total Effects by Industry

Sector No.	Industry	Industry Output*	Employment (Jobs)	Value Added*	Labor Income*
1	Agriculture	12,082	0.4	11,568	8,362
28	Mining	202	0.0	84	56
48	Construction	4,478	0.1	2,720	2,484
58	**Manufacturing**	**678,984**	**2.0**	**235,803**	**90,392**
433	TCPU	69,282	0.6	24,364	16,916
447	Trade	36,262	0.6	25,132	15,552
456	FIRE	24,521	0.1	17,405	2,792
463	Services	21,639	0.4	10,861	9,188
510	Government	5,082	0.0	2,059	1,644
516	Other	141	0.0	140	140
	Total	**852,674**	**4.2**	**330,136**	**147,526**

*2004 Dollars
Source: IMPLAN Impact Reports

V.4 Commercial Cannery

The presence of the commercial cannery in the county is going to affect the food processing sectors in the manufacturing industry. The change in the local economy is introduced as jobs are created in the area, and the IMPLAN program is allowed to automatically convert employment figures to output values. The commercial cannery is expected to employ 144

people. The direct change in employment in the region is 136 jobs however the total change is close to 268 jobs. The indirect and induced effects in employment comprise about half of the total effects. This means that half of the total number of jobs is created in other sectors than the sectors that are directly impacted. The total labor income changes from the expansion in employment are 9.5 million dollars. The change in total industry output is 59.2 million dollars.

Table 5.5 – Commercial Cannery Economic Impact

	Direct Effects	Indirect Effects	Induced Effects	Total Effects
Industry Output*	47,725,800	7,982,000	3,514,256	59,222,058
Employment (Jobs)	136.1	84.8	47.0	267.9
Total Value Added*	16,459,020	3,519,742	2,211,045	22,189,807
Labor Income*	6,119,858	2,318,316	1,086,253	9,524,428

*2004 Dollars
Source: IMPLAN Impact Reports

Table 5.6 describes the total impacts of the commercial cannery by industry. The largest impacts are observed in the Manufacturing, Trade, Communications and Utilities and Trade industries. These sectors are similar for the community and the commercial cannery analysis, because the initial impact is applied to the same industries. The Agriculture sector has the third largest change in employment as a result of the operation of the commercial cannery, although the change in industry output is not very significant compared to the other sectors.

Table 5.6 – Commercial Cannery Total Effects by Industry

Sector No.	Industry	Industry Output*	Employment (Jobs)	Value Added*	Labor Income*
1	Agriculture	498,863	22.7[28]	473,007	353,070
28	Mining	14,558	0.1	6,067	4,060
48	Construction	273,788	4.8	165,620	151,214
58	**Manufacturing**	**50,731,356**	**149.4**	**17,239,300**	**6,631,190**
433	TCPU	2,687,264	22.7	1,060,747	710,492
447	Trade	1,962,222	36.8	1,365,936	848,740
456	FIRE	1,559,785	5.4	1,108,726	174,914
463	Services	1,154,142	22.6	627,617	535,299
510	Government	330,913	2.3	133,682	106,345
516	Other	9,166	1.0	9,105	9,105
	Total	**59,222,058**	**267.9**	**22,189,807**	**9,524,428**

*2004 Dollars
Source: IMPLAN Impact Reports

Table 5.7 is a summary of the effects of the community and the commercial cannery in the region. The impacts for the commercial cannery are significantly larger than the community cannery. This is due to the difference in size of the operating units, as well as the initial impact on the local economy. The change in total industry output is 825.7 thousand dollars for the community cannery compared to 59 million dollars for the commercial cannery. The total effects in terms of employment for the community cannery are 4.2 jobs and 268 jobs for the commercial cannery.

[28] This figure represents new jobs created in the agricultural sector as a result of the operation of the commercial cannery in the area.

Table 5.7 – Economic Impacts of the Community Cannery vs. Commercial Cannery

	Community Cannery	Commercial Cannery
Output Impact (dollars)		
Direct Effects	662,858	47,725,800
Indirect Effects	135,353	7,982,000
Induced Effects	54,463	3,514,256
Total Effects	**852,674**	**59,222,058**
Employment Impact (jobs)		
Direct Effects	1.9	136.1
Indirect Effects	1.6	84.8
Induced Effects	0.7	47.0
Total Effects	**4.2**	**267.9**
Total Value Added Impact (dollars)		
Direct Effects	228,598	16,459,020
Indirect Effects	66,783	3,519,742
Induced Effects	34,755	2,211,045
Total Effects	**330,136**	**22,189,807**
Labor Income Impact (dollars)		
Direct Effects	84,998	6,119,858
Indirect Effects	45,282	2,318,316
Induced Effects	17,246	1,086,253
Total Effects	**147,526**	**9,524,428**

*2004 Dollars
Source: IMPLAN Impact Reports

V.5 Commercial Cannery Sector Specialization

In this scenario, the commercial cannery specializes in preserving products that fall in one of the following groups: Canned Fruits and Vegetables, Canned Specialties, Pickles, Sauces & Salad Dressings and Sausages & Other Prepared Meats. The results of the impact analysis are

presented in table 5.8. Each sector has a different impact in the region's industry output, employment, value added and labor income. The largest impact in industry output occurs if the cannery specializes in the Canned Specialties sector. This figure is about two times larger than the output impacts of specialization in the Canned Fruits and Vegetables and the Sausages & Other Prepared Meats sector. Specializing in the Sausages & Other Prepared Meats sector has the largest employment effect compared to the other industries and is expected to employ 320.3 workers. The result is consistent with the fact that processing of meat products is more labor intensive than other produce. This sector is restricted by stronger rules and regulations from the food inspection agencies, making heavier use of labor necessary. The second largest change in employment comes from the Canned Specialties sector with 292.2 jobs. This is also the sector that generates the highest earnings from labor with an income of 12.5 million dollars. The largest change in value added is found in the scenario of specialization of the cannery in the Canned Specialties sector. The sector of Canned Specialties has the largest impacts in the local economy with respect to total industry output, total value added and labor income.

Table 5.8 – Commercial Cannery Sector Specialization Impact

	Canned Fruits & Vegetables	Canned Specialties	Pickles, Sauces & Salad Dressings	Sausages & Other Prepared Meats
Output Impact (dollars)				
Direct Effects	33,227,798	72,434,848	53,138,284	32,102,262
Indirect Effects	4,311,391	9,454,748	6,265,117	11,896,741
Induced Effects	3,027,543	4,586,572	3,113,645	3,329,263
Total Effects	**40,566,729**	**86,476,166**	**62,517,046**	**47,328,266**
Employment Impact (jobs)				
Direct Effects	135.0	135.0	135.0	139.4
Indirect Effects	48.2	95.9	58.5	136.4
Induced Effects	40.5	61.3	41.6	44.5
Total Effects	**223.7**	**292.2**	**235.2**	**320.3**
Total Value Added Impact (dollars)				
Direct Effects	11,452,734	26,068,568	22,027,550	6,287,223
Indirect Effects	2,345,825	4,419,725	3,060,569	4,252,846
Induced Effects	1,904,823	2,885,709	1,958,995	2,094,654
Total Effects	**15,703,382**	**33,374,003**	**27,047,115**	**12,634,722**
Labor Income Impact (dollars)				
Direct Effects	5,815,344	8,170,233	5,704,753	4,789,102
Indirect Effects	1,488,726	2,915,971	1,822,410	3,046,157
Induced Effects	935,811	1,417,705	962,425	1,029,072
Total Effects	**8,239,881**	**12,503,909**	**8,489,588**	**8,864,331**

*2004 Dollars
Source: IMPLAN Impact Reports

The impact of the Canned Specialties sector on output, labor income and value added and the impact of Sausages & Other Processed Meats on employment are larger than the impact of the commercial cannery when there is no specialization. Therefore specialization in particular products has a larger effect in the local economy than being an all purpose cannery.

V.6 Limitations of the Study

The purpose of this study requires that the analyses be based on the county level. A county is defined by IMPLAN User's Guide as a small study area and may result in leakages[29] missing important backward linkages. This in turn may influence the outcomes of the analysis. To account for the leakages, data on other larger regions should be collected and compared to the impacts results of the study area. This process requires extensive time and funds and may be a possible research project in the future.

This study may be limited in that the study area adjustments for Scott County are made based on the state totals. Although the county is part of the state, it may not be the case that state data are a good representation of the county and may result in inaccuracies. While using state data is the closest approximation feasible, there is some cause for concern as Scott County is a relatively underdeveloped area in Virginia. For more accurate results, data may be collected from the region and can be used to estimate the values for output, employment and value added.

Assumptions of the input-output analysis itself are restrictive and may influence the findings of a study. In this analysis the impact of the cannery in the regional economy is directly related to its size and the number of jobs it may create: the more people the cannery will employ, the larger the impacts will be. Furthermore, the model does not take into consideration any costs such as social or environmental costs and all the effects in the IMPLAN analyses are positive (Olson and Lindall, 2000).

This analysis also assumes that the inputs that go into production are supplied locally. Implicitly this implies two things: (1) the local output is sufficient to supply all the inputs

[29] Leakages include any payments made outside the region or to value added sectors that are not spent within the region.

needed, and (2) the inputs will be supplied locally and not imported. Either assumption may be violated. If the local economy cannot sustain all the local demand for inputs, imports will be necessary. Further, even if local output is sufficient, inputs may be imported if imports cost less. In the case that either assumption is violated, leakages need to be adjusted in the model.

This model is further limited in that it does not take into consideration the marketing of the output from the commercial cannery. Possible markets for the canned produce or possible competition in the nearby markets are not examined in this analysis. In addition, the demand for such output is not estimated in this model. These topics may be explored in detail in future research.

V.7 Conclusions and Recommendations

The results of this analysis indicate that the impact of the commercial cannery on the local economy is larger than the impact of the community cannery with respect to employment, output and value added. These results are consistent with prior expectations, because the commercial cannery may employ more people and may produce more output than the community cannery. The commercial cannery may however face additional constraints such as human capital, credit, environmental, legal, and so forth that do not apply to the community cannery, in which case the community cannery would be easier to implement. If the policy makers are strictly interested in the impact on the local economy, then the commercial cannery would be a better project to implement.

In considering the kind of food processing plant for Scott County, other factors should be taken into account. Since the two units are different in size, the initial investment on the commercial cannery as well the operating costs would be higher than the initial investment and

the operating cost of the community cannery. The commercial cannery will have to abide to certain regulations and pass regular inspections, since the food products are intended for commercial sale and have to be marketed under a label.

The commercial cannery may process a mix of products from the four sectors in the analysis or may specialize in one sector. Specializing in the Canned Specialties sector will have the largest impact in the region with respect to industry output, labor income and total value added. Specialization in the Sausages & Other Prepared Meats sector will have a larger impact on the number of jobs in the county than Canned Specialties. The commercial cannery has a larger impact if it specializes in preserving products from the above-mentioned sectors compared to not specializing at all, or specializing in other sectors. The decision on the kinds of products to be processed by the commercial cannery should be based on what is more important for the county: job creation, labor income or industry output.

This study considers the impact of the two different food-preserving units and takes into account only the benefits that result from their operation in the county. However a cost analysis is necessary to evaluate each cannery. Policy makers should take into consideration both the costs and the benefits for each cannery when making a decision. Also, the assumed changes in final demands and employment are average figures in this study. The same model can be used to accommodate different size plants as more information on the proposed projects becomes available.

Other feasible projects should be considered and compared to the projects in this study in making an investment decision. In order to answer the question of whether the canneries should be constructed, a benefit cost ratio is necessary for each feasible project. This ratio represents the benefits of each project over the total initial investment, and the higher this ratio is, the better the

investment will be. Studies of similar feasible projects may be necessary in making such a decision.

Further, it is beyond the scope of this study to compare the proposed project to other alternative uses for policy funds. The decision maker may make use of this study as well as others to compare this project to alternatives such as investments in infrastructure, public education, and job training programs for workers affected by tobacco revenue losses.

Other tobacco counties may utilize the model in this study to evaluate similar projects they might want to implement. The model can also be modified to evaluate other projects in consideration not related to canning.

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Appendix A

New data calculations for commercial cannery.

Table A.1 – Sector 66 – Canned Specialties

	2000 Virginia Data	Employment Ratios	New Scott County Data
Output ($millions)	8005.56	0.50	72.43
Employment (jobs)	15915.00	1.00	144.00
Value Added ($millions)			
Employee Compensation	902.98	0.06	8.17
Other Property Type Income	1912.94	0.12	17.31
Indirect Business Taxes	65.20	0.00	0.59

Table A.2 – Sector 67 – Canned Fruits and Vegetables

	2000 Virginia Data	Employment Ratios	New Scott County Data
Output ($millions)	16114.10	0.23	33.23
Employment (jobs)	69834.00	1.00	144.00
Value Added ($millions)			
Employee Compensation	2820.20	0.04	5.82
Other Property Type Income	2611.40	0.04	5.38
Indirect Business Taxes	122.50	0.00	0.25

Table A.3 – Sector 69 – Pickles, Sauces and Salad Dressings

	2000 Virginia Data	Employment Ratios	New Scott County Data
Output ($millions)	7848.60	0.37	53.14
Employment (jobs)	21269.00	1.00	144.00
Value Added ($millions)			
Employee Compensation	842.60	0.04	5.70
Other Property Type Income	2352.10	0.11	15.92
Indirect Business Taxes	58.80	0.00	0.40

Table A.4 – Sector 59 – Sausages and Other Prepared Meats

	2000 Virginia Data	Employment Ratios	New Scott County Data
Output ($millions)	481.09	0.22	32.10
Employment (jobs)	2158.00	1.00	144.00
Value Added ($millions)			
Employee Compensation	71.77	0.03	4.79
Other Property Type Income	18.95	0.01	1.26
Indirect Business Taxes	3.50	0.00	0.23

New data calculations for community cannery.

Table A.5 – Sector 66 – Canned Specialties

	2000 Virginia Data	Employment Ratios	New Scott County Data
Output ($millions)	8005.56	0.50	1.01
Employment (jobs)	15915.00	1.00	2.00
Value Added ($millions)			
Employee Compensation	902.98	0.06	0.11
Other Property Type Income	1912.94	0.12	0.24
Indirect Business Taxes	65.20	0.00	0.01

Table A.6 – Sector 67 – Canned Fruits and Vegetables

	2000 Virginia Data	Employment Ratios	New Scott County Data
Output ($millions)	16114.10	0.23	0.46
Employment (jobs)	69834.00	1.00	2.00
Value Added ($millions)			
Employee Compensation	2820.20	0.04	0.08
Other Property Type Income	2611.40	0.04	0.07
Indirect Business Taxes	122.50	0.00	0.00

Table A.7 – Sector 69 – Pickles, Sauces and Salad Dressings

	2000 Virginia Data	Employment Ratios	New Scott County Data
Output ($millions)	7848.60	0.37	0.74
Employment (jobs)	21269.00	1.00	2.00
Value Added ($millions)			
Employee Compensation	842.60	0.04	0.08
Other Property Type Income	2352.10	0.11	0.22
Indirect Business Taxes	58.80	0.00	0.01

Table A.8 – Sector 59 – Sausages and Other Prepared Meats

	2000 Virginia Data	Employment Ratios	New Scott County Data
Output ($millions)	481.09	0.22	0.45
Employment (jobs)	2158.00	1.00	2.00
Value Added ($millions)			
Employee Compensation	71.77	0.03	0.07
Other Property Type Income	18.95	0.01	0.02
Indirect Business Taxes	3.50	0.00	0.00

Appendix B

SCOTT COUNTY – Questionnaire for Consumers

CANNERY USAGE INFORMATION

1. Would you use a Scott County community cannery if it were available?
   - ❑ Yes
   - ❑ No
   - ❑ Unsure
   - ❑ Depends on location

   If you select "no" please skip to Section II.

2. How much do you anticipate canning per year?
   Pints _____ Quarts _____

3. What do you anticipate canning? (Check all that apply)
   - ❑ Vegetables
   - ❑ Meat
   - ❑ Juice
   - ❑ Fruits
   - ❑ Cakes
   - ❑ Other

4. Which do you participate canning? (Check all that apply)
   - ❑ Fresh products from a garden
   - ❑ Dry store-bought items
   - ❑ Fresh store-bought items

5. Which do you prefer?
   - ❑ Canning
   - ❑ Freezing
   - ❑ I do some of both

6. Experience with canning

   a. Have you ever canned, either at home or at a cannery?
   - ❑ Yes, at home
   - ❑ Yes, at a cannery
   - ❑ No

   b. Did either of your parents can?
   - ❑ Yes, at home
   - ❑ Yes, at a cannery
   - ❑ No

   c. Did either of your grandparents can?
   - ❑ Yes, at home
   - ❑ Yes, at a cannery
   - ❑ No

7. Do you currently use the Russell County cannery?
   - ❑ Yes
   - ❑ No

8. How many miles would you be willing to travel to use a community cannery?
   - ❑ Less than 5
   - ❑ 10
   - ❑ 20
   - ❑ 5
   - ❑ 15
   - ❑ More than 20

9. Would you be willing to pay an annual fee to use the cannery
   - ❑ Yes
   - ❑ No

If yes, how much would you be willing to pay per year?

- ❑ $ 5.00
- ❑ $ 10.00
- ❑ $ 15.00
- ❑ $ 20.00
- ❑ More than $ 20.00

10. If there were no annual fee, how much would you be willing to pay per unit canned ($/jar)?
    - ❑ $ 0.05
    - ❑ $ 0.10
    - ❑ $ 0.15
    - ❑ $ 0.20
    - ❑ $ 0.25
    - ❑ $ 0.30
    - ❑ $ 0.35
    - ❑ $ 0.40
    - ❑ $ 0.45
    - ❑ $ 0.50
    - ❑ More than $ 0.50

11. Would you be willing to pay both an annual fee and a per unit fee?
    - ❑ Yes
    - ❑ No

12. Would you prefer to buy your jars at the cannery or bring your own jars?
    - ❑ Buy jars at cannery
    - ❑ Bring own jars

13. Would you require help with preparing your products for canning?
    - ❑ Yes
    - ❑ No

14. When is the best time of day for you to use the cannery?
    - ❑ 7 – 10 am
    - ❑ 10 am – 1 pm
    - ❑ 1 – 4 pm
    - ❑ 5 – 8 pm

15. Would you rather wait while your products are processing or come back later to pick them up?
    - ❑ Wait
    - ❑ Pick up later

16. Have you ever taken a canning class?
    - ❑ Yes
    - ❑ No

    If yes, when and where? _____ _____

17. Why do you want to can your produce rather than buying it at the grocery store? (Check all that apply)
    - ❑ Price
    - ❑ Gifts
    - ❑ Quality
    - ❑ Flavor
    - ❑ Food safety
    - ❑ I enjoy growing things
    - ❑ Special recipe
    - ❑ Cannot find it in grocery stores
    - ❑ Other

PERSONAL INFORMATION

18. What is your age?
    - ❑ Under 25
    - ❑ 25 – 45
    - ❑ 46 – 65
    - ❑ Over 65

19. Are you:
    - ❑ Female
    - ❑ Male

20. How many people (adults and children) live in your house? _____

21. What is your income before taxes, in dollars per year?
    - ❑ Less than $20,000
    - ❑ $20,000 to $40,000
    - ❑ More than $40,000

22. Are you employed outside the home?

- ❑ Yes
- ❑ No

23. Are you: (Check all that apply)

- ❑ Employed full-time
- ❑ Employed part-time
- ❑ A student
- ❑ Off in the summer
- ❑ Retired
- ❑ Farmer

24. What is the highest level of education you have attained?

- ❑ High school
- ❑ Trade school
- ❑ Some college
- ❑ Associate degree
- ❑ Bachelor's degree
- ❑ Graduate degree

25. What is your zip code? _____

VITA

Eftila Tanellari was born in Albania on May 19, 1979. Her basic education was completed in Korca, Albania. In 1997 she graduated from "Preca College" High School. One year after high school Eftila attended Dimitris Perrotis College of Agricultural Studies in Thessaloniki, Greece and earned an Associate Degree in Agricultural Business Management.

She received a B.S. in Agricultural Business Management from the University of Arkansas in Fayetteville in 2001. Eftila joined the department of Agricultural and Applied Economics at Virginia Tech in the spring of 2002. She is currently a Ph.D. candidate in Economics at Virginia Tech.