

A Practitioner's Guide to Conducting an Economic Impact Assessment of Regional Food Hubs using IMPLAN: a step-by-step approach

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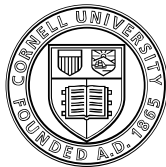
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FULL REPORT

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GLOSSARY¹

Aggregation—the combining of detailed subgroups to form a larger group. For example, the detailed industries available from the Bureau of Economic Affairs are aggregated to summary industries and sectors for publication.

Commodity—a product or service, may be produced by one or multiple industries. Commodity output represents the total output of the product or service, regardless of the industry that produced it. If an industry and the commodity produced by the industry have the same name, the commodity is considered to be the primary product of that industry.

Final Demand—the value of foods and services sold to institutions (or end users) during a calendar year. These goods and services disappear from the economy and are not used to generate more product(s). Exports are included in final demand since the commodity will not be used again to create more product(s) in the region.

Food Hub Farm—a farm that sells product(s) to one or multiple food hubs. Note that producers in this category need not sell products exclusively through this channel, rather these sales are included in its marketing portfolio. Additionally, for the example used herein, this sector reflects the inter-industry linkages of farms that sell to our case study food hub (obtained via primary data collection), and is disaggregated from the default IMPLAN data available via the “food sold-farm” sector (see below).

Food Sold-Farm—for the example used herein, we created two aggregated sectors to reflect the primary expenditure categories for food hubs. The food sold-farm sector reflects the food farm products for sale by the food hub, and includes the default IMPLAN expenditure profile from sectors 1-4, 6, and 10-14.

Food Sold-Nonfarm—for the example used herein, we created two aggregated sectors to reflect the primary expenditure categories for food hubs. The food sold-nonfarm sector is defined as food products purchased from processors by food hubs, and includes the default IMPLAN expenditure profile from sectors 43-47, 50-70.

Industry—a group of establishments engaged in the same or similar types of economic activity.

Margin or Margin Costs—the value of the wholesale and retail trade services provided in delivering commodities from producers’ establishments to purchasers. The margin is

¹ The definitions in the glossary are adapted from IMPLAN’s glossary as well as the IMPLAN Professional, version 2.0, 3rd edition (2004). The IMPLAN glossary is available at: https://implan.com/index.php?option=com_glossary&task=list&glossid=13&letter=All

calculated as sales receipts less the cost of the goods sold. It consists of the trade margin plus sales taxes and excise taxes that are collected by the trade establishment.

Multipliers—final demand drives input-output models. Industries respond to meet demand directly or indirectly (by supplying goods and services to industries responding directly). Each industry that produces goods and services generates demands for other goods and services and so on, round-by-round. Multipliers describe these iterations. Multipliers break the effects of stimuli on economic activity into three components: direct, indirect, and induced. Further, IMPLAN describes three types of multipliers: Type I, Type II, and Type SAM.

1. Direct effects—changes in the industries to which a final demand change was made
2. Indirect effects—changes in inter-industry purchases as they respond to the new demands of the directly affected industries
3. Induced effects—changes in spending from households as income increases or decreases due to the changes in production
4. Type I multiplier—measures the direct and indirect effects of a change in economic activity. It captures the inter-industry effects only, i.e., industries buying from local industries.
5. Type II multiplier—captures the direct and indirect effects. In addition to the inter-industry effects, the Type II also takes into account the income and expenditures of households. The household income and the household expenditures are treated as industries. This internalizes (endogenizes) the household sector, including the induced or household spending effects.
6. Type SAM multiplier—uses all information about the institutions selected to be included in the predictive model.

Production Function—shows where an industry spends, and in what proportions, to generate each dollar of output.

Regional Purchase Coefficient (RPC)—represents the portion of the total demand for a commodity by all users in local economy that is supplied by producers located in that economy. For example, an RPC of 0.6 for the commodity “vegetable and melons” means that local farmers provide 60% of the demand for vegetables and melon (by other farmers, processors, vegetable wholesalers, and others). The remaining 40% of demand is satisfied by imports.

Sector—the institutional units that make up the total economy (including businesses, households, institutions, and general government).

Value Added—the difference between an industry's total output and the cost of its intermediate inputs. Value added consists of compensation of employees (inclusive of benefits) and proprietor (i.e., payments received by self-employed individuals), other property type income (payments for rents, royalties and dividends), and business taxes on production and imports less subsidies.

INTRODUCTION

Interest is increasing in locating funding for food hub development. These local food aggregation and distribution businesses are purported by their developers and funders to elicit substantial positive community economic impact. Yet prior to the report released by Schmit, Jablonski, and Kay (2013), *Assessing the Economic Impacts of Regional Food Hubs: the Case of Regional Access*, there had been no rigorous economic impact assessments of food hubs, nor had a replicable framework been defined for their conduct. This practitioner's guide is complementary to the full report, and walks you through the steps of measuring the local economic impact of expanding food hub activities, either from the establishment of a new hub or the expansion of an existing hub.

This guide is intended for individuals who are familiar with software and databases by IMPLAN Group LLC² (IMPLAN provides data and tools for economic analysis). In addition to the data available from IMPLAN, the proposed approach requires substantial data collection from the food hub, farm and non-farm product suppliers to the food hub, and food hub customers. While time-consuming to collect, the information can be effectively used through the framework detailed here to assess the impacts of food hub activities, particularly in computing the value of inter-industry linkages within the local economy as a result of expanded final demand for food hub goods and services. We have included sample tables containing the type of data you will need to make the necessary modifications within the IMPLAN database.

Please note that this guide presents information about how to assess the *economic impact* of food hubs, which is different from looking at the *contribution* of food hubs to the local economy. Impact analysis examines the marginal economic impact of a change in the economy (e.g., the opening or expansion of a business). Contribution analysis examines the contribution of the business to the local economy. Given the likelihood that most readers of this guide will want to estimate the impact of foundation or government funding used to develop or expand an existing hub, we think that economic impact assessments are a more useful and accurate measure as they provide the *net* changes in new economic activity.³

Happy modeling!

² <<http://implan.com>>

³ For more information on the differences between see: Watson, P., J. Wilson, D. Thilmany, and S. Winter. 2007. "Determining Economic Contributions and Impacts: What is the difference and why do we care?" *Journal of Regional Analysis & Policy*. 37(2): 140-146. See also: http://implan.com/index.php?option=com_multicategories&view=article&id=201:impact-vs-contribution-analysis&Itemid=16

DEFINING THE STUDY AREA

The first step in conducting economic impact assessments is to define the appropriate study area—the boundaries of the “local” economy.⁴ Determining what constitutes local can have a decisive impact on the results—it is nearly always true that the larger the definition of local, the more inter-industry linkages, and the larger the economic multiplier effect of a given change in the demand for local goods and services. To isolate the effects of an impact, make as small a study area as possible, while still including the areas necessary to capture all of the important effects.

When defining the study area, consider the availability of secondary data for the region. The methodology described in this guide uses secondary data available from the IMPLAN Group, LLC. (IMPLAN), which is available by zip code, Congressional district, county and state (it is also easy to build models using multiple counties or states).^{5,6} Though data are available at a sub-county level, IMPLAN advises using the concept of a functional economic area to guide decisions about study area. A functional economic area is a semi-self-sufficient economic unit (and therefore ideal for this type of analysis). It includes the places where people live, work, and shop, and can sometimes be identified by physical or other characteristics. The closer the study area is to a functional economic area, the more robust the analysis will be. It is unlikely that a sub-county area (particularly if it is rural) is likely to fit this functional economic area definition.

*****SIDEBAR*****

Functional Economic Market Area

Functional Economic Market Areas (FEMAs) are frequently used to define economic relationships and flows that are not necessarily reflected by administrative boundaries. FEMAs are areas that are bound together by a relatively contained and cohesive network of trade links—the buying and selling of raw materials, industrial and consumer goods

⁴ The IMPLAN Professional, version 2.0, 3rd edition (2004) has a very helpful section on “defining a project” (see Chapter 9, p. 107).

⁵ Other commercially available input-output models are available (RIMS II or REMI). However, the U.S. Department of Commerce’s Bureau of Economic Analysis announced that due to the impacts of sequestration, they are discontinuing the RIMS II program. For more information, see: <<https://www.bea.gov/regional/rims/rimsii/>>. IMPLAN appears to be the most widely used impact analysis software and data. For example, several branches of the U.S. federal government used IMPLAN to estimate the impacts of the 2009 American Recovery and Reinvestment Act (see: <<http://www.recovery.gov/Pages/default.aspx>>).

⁶ For more information about purchasing data from IMPLAN, see: <http://implan.com/V4/index.php?option=com_virtuemart&page=shop.browse&category_id=1&Itemid=13&vmccchk=1&Itemid=13>.

and services, and labor. In the United States, most county boundaries were delineated 100 or 200 years ago, and are not reflective of contemporary economies. As such, they very often do not capture a single FEMA.

There is no universal approach to defining FEMAs, but there are a few things important to consider. One major consideration is scale or the size of the region chosen. If the scale is too small, then an economic impact assessment will not appropriately capture the ripple effects of a shock—say a new business moving to the area. On the other hand, if the region is too large, then the effects of a shock may be partially or completely lost in the economic noise generated by other economic activity in the area. Accordingly, it makes the most sense to choose the smallest reasonable area, which is still a FEMA.

When looking for a FEMA, one should look for local and regional commuting, shopping, and supply chain patterns, since these are some of the most important trade links that will delineate a FEMA. By way of illustration, Cornell University is located in Tompkins County, NY, but to define Tompkins County as a FEMA is inappropriate on a number of levels. Cornell University, a major employer in the County, draws employees from surrounding (rural) counties who in turn spend the wages they earn in those adjacent locales. Thus, if Cornell University were to close or lay off a percentage of its labor force, it would have important economic impacts on those surrounding counties, which would not be captured if a multi-county region was not defined as the FEMA.

*****END SIDEBAR*****

Consider the use of the assessment when determining an appropriate economic functional area: Why are you conducting this impact assessment? Do you want to show the economic impact of a food hub to a particular funder or government official? If your project is funded by a state agency, defining “local” by state boundaries may make sense. Or, if the food hub is funded by a county or facilitated through a Cooperative Extension agent who is funded through a county, then county borders may be the more appropriate definition of local. Perhaps you are trying to assess what the impact of a food hub is to participating producers. If this is the case then defining your study area based on the locations and distribution patterns of the participating farms might be most appropriate. You will also need to keep in mind the residential location of both the farm and food hub’s labor force, as their spending patterns are important to your study results.

Defining the appropriate study area is ultimately the choice of the researcher, yet can have profound impacts on the results of the study. One way to understand how this definition affects results is to conduct the analysis for several study areas, each relying on

differing assumptions. This strategy allows those reading the study to have a better understanding of the range of potential impacts.⁷

DEFINING FOOD HUB TRANSACTIONS

The second step in an impact assessment is to define the industry sector (or sectors) of interest and its (their) linkages with other industries. Example sectors might include fruit farming or wholesale trade (see glossary for definition). This is less straightforward in the case of food hub assessments as a separate food hub sector and its transactions with other industries do not exist within traditional data sources (including IMPLAN). The implication for an impact assessment is that additional information must be collected to develop a food hub sector or, alternatively and as described here, to describe the nature of all of its transactions.

Depending on the data that are available in your locality, we recommend data collection from three sources: the food hub(s) that you are analyzing, farms (and potentially local processors) that sell product(s) to the food hub(s), and customers that purchase product from the food hub(s).

Primary Data Collection: Food Hub

This approach can be applied to analyze the impact of a single food hub or multiple food hubs. In both cases, you will need to collect information to understand the expenditure pattern of the food hubs in your study area—i.e., to understand the input requirements of the food hub for every dollar of sales.

To begin, ask the food hubs in your study for a copy of its their profit and loss (P&L) statement, or similar income and expense records. This may require a confidentiality agreement with the food hub and agreement on disclosure procedures. A P&L statement summarizes the revenues and expenses incurred during a specific period of time. For the purpose of this assessment, you want a copy of the hub's P&L statement for the most recently completed year of operation (e.g., January 1- December 31).

You will need enough information to be able to assign the food hub expenditure categories to their corresponding IMPLAN sector. IMPLAN divides the economy into 440 sectors, which do not always translate neatly to the ways that businesses record expenditures in a P&L statement. IMPLAN provides a lookup table to assist you in this mapping

⁷ For an example, see: Gunter, A., and D. Thilmany McFadden. May 2012. Economic Implications of Farm to School for a Rural, Colorado Community. *Rural Connections*: 13-16.
<http://wrdc.usu.edu/files/publications/publication/pub__9857945.pdf>.

http://implan.com/V4/index.php?option=com_docman&task=doc_download&gid=152&Itemid=60>. The first two columns in Table 1 provide examples of the sector translations that must occur to assign food hub expenditure items to IMPLAN sectors. An expenditure item like “gasoline” would require additional questioning of the food hub operator to determine if the item was a) purchased from a retail gasoline station (IMPLAN sector 326), or b) purchased in bulk and delivered by a wholesaler (IMPLAN sector 319). Keep in mind that as a general rule, the bigger the sector, the more effect it has on the results, and the more important it is to work to “get it right.”

It is also important to determine the percentage of each expenditure item that was procured in the functional economic market area (“local study area” in IMPLAN terminology). To obtain this information, you will need to work with the food hub operator to determine the percentage purchased locally for each expenditure category. For example, if the P&L statement shows that \$12,000 was spent on office supplies, you will need to ask the food hub operator questions about where these items were purchased. Each expenditure item needs to be broken down by the percentage of the total purchased within and outside of the local study area. Table 1 provides an example of the data you need to gather and a helpful format in which it can be recorded. Note that some expenditure categories from the P&L statement may map to the same IMPLAN sector.

In addition, you will want to keep in mind that any expenditure in the retail or wholesale trade sector requires accounting for “margin” – only the value of the wholesale and retail trade services in delivering products is included here, the value of the costs of goods sold is accounted for in other transactions (see glossary for definition of “margin”). As total gross output for these IMPLAN sectors reflects only the gross margin (revenue less cost of goods sold), the balance is reported in the supporting industry where the product is manufactured/produced. For example, our case study food hub reported expenditures on gasoline at retail stores to be \$16,000, of which 83% was purchased locally. To account for margin, we apply the retail trade-gasoline stations margin (sector 326), of 14.5% (available within the IMPLAN database) such that only \$2,320 ($16,000 * 0.145$) is reported under retail stores-gasoline stations in Table 1. The balance (\$13,680) is mapped to petroleum refineries (sector 115) and the local purchase percentage is taken from IMPLAN for that sector. The same approach was used for office supply purchases, with the wholesale trade margin of 18.6% and the balance allocated to office supplies (except paper) manufacturing (sector 313). IMPLAN retail and wholesale margining is based on national data, and varies by year, see:

http://implan.com/index.php?option=com_multicategories&view=article&id=680:680&Itemid=71.

Finally, you will need to record expenditures on value added components, which include: employee compensation, taxes, other property type income, and proprietor’s income.

Though value added may mean something different in other contexts, within an IMPLAN framework, and for the purposes of this guide, the four above-mentioned items comprise value added. Employee compensation (including benefits paid to employees) and taxes are included in the P&L statement and can be assigned directly. Note that payments to contractors and consultants are not regarded as employee compensation, but are included in different IMPLAN categories (see IMPLAN lookup table above for more detail). All taxes paid by the food hub should be recorded under “tax on production and imports”. We assume that the difference between total sales and total expenses is proprietor’s income, and may be positive or negative.⁸

Primary Data Collection: Food Hub Farm

Understanding how farms that sell product to food hubs (henceforth “food hub farms”) interact with other sectors of the economy is important in improving the precision of an impact assessment. While the same can be said of any input supplying sector, since purchases from farms generally represent a relatively large share of total food hub expenses and we are particularly interested in how food hub farms are impacted by food hubs, it is important to consider the inter-industry linkages for farm suppliers.

Furthermore, for most of the businesses from which food hubs purchase inputs, it is sufficient to assume that the expenditure patterns of individual businesses reflect that of the entire industry sector. For example, a food hub is unlikely to purchase insurance from a specialty food hub insurance provider. Rather, the food hub’s insurance agency more likely funds a range of businesses with a variety of products. As such, assuming that the food hub’s insurance company has a similar expenditure profile to that of the relevant insurance sector within IMPLAN should be sufficient. By contrast, there is growing evidence that farms participating in local food system outlets are often (but not exclusively) smaller in scale, and/or have different patterns of expenditures and labor requirements per unit of output than is reflected in IMPLAN’s default agricultural sectors. For example, smaller-scale farms may utilize more labor and less mechanized equipment than their larger counterparts, thus having a different impact on the labor force. Accordingly, we recommend that any food hub impact assessment involve primary data collection from food hub farms regarding labor and purchase/use of equipment. Again, as above, the larger the purchases from the sector and the more the policy/intervention is intended to support that sector, the more important it is to work to “get it right.”

⁸ For the purpose of this guide we assume the food hub farm sector has no allocation to other property type income. However, it may be appropriate in certain contexts, depending on the ownership structure of the food hub, to assign the difference between total sales and total expenses to the other property-type income component (e.g., corporate profits).

Table 1: Sample Food Hub Expenditure Profile and Mapping to IMPLAN Categories ^a

Food hub expenditure category (from P&L statement)	Food hub IMPLAN category	Expense (\$)	Percent Local	Expense Share
Cost of food—from nonfarm	Food sold–nonfarm ^b	\$ 494,000	20.0%	0.494
Cost of food—from farm	Food sold–farm (food hub farm) ^b	\$ 180,000	90.0%	0.180
Gasoline (retail margin)	Retail stores—gasoline stations (326)	\$ 2,320	83.0%	0.002
Gasoline (production) ^d	Petroleum refineries (115)	\$ 13,680	1.3%	0.014
Lease trucks	Automotive equipment rental and leasing (362)	\$ 13,000	100%	0.013
Utilities	Electric power generation, transmission, and distribution (31)	\$ 13,000	100%	0.013
Insurance	Insurance carriers (357)	\$ 12,000	100%	0.012
Office supplies (wholesale margin)	Wholesale trade (319)	\$ 2,232	0.0%	0.002
Office supplies (production) ^e	Office supplies (except paper) manufacturing (313)	\$ 9,768	16.9%	0.010
Credit card merchant fees	Nondepository credit intermediation and related activities (355)	\$ 10,000	100.0%	0.010
Value added components				
Employee compensation	Employee compensation	\$ 160,000	100.0%	0.160
<i>Difference between total sales and total expenses^c</i>	Proprietor income	\$ 30,000	100.0%	0.030
Taxes (all)	Tax on production and imports	\$ 60,000	70.0%	0.060
Total		\$1,000,000	55.0%	1.0000

^a In addition to the information above, our sample food hub employs 4 people.

^b For additional explanation about these sectors, please refer to the section entitled “Creating your model and aggregation scheme” below (p.12).

^c By assumption, the difference between total sales and total expenses is allocated to proprietor income. Note, that this can be a negative number. In this example, total food hub sales are \$1,000,000 and total expenses from the P&L statement is \$970,000, leaving \$30,000 allocated to proprietor’s income.

^d Balance of total retail gasoline purchases after margining (margin = 14.5%), % local taken from IMPLAN default

^e Balance of total office supply purchases after margining (margin = 18.6%). % of local taken from IMPLAN default.

The goal of the primary data collection is to come up with an average food hub farm expenditure and outlay profile that can then be scaled up by the total number of farms in the study area to create the food hub farm sector within the IMPLAN model. To begin, you will need to ask the food hub(s) for a complete list of the farms from which they purchase product, as well as farm contact information.

Next, you will need to collect sales and expenditure information from the farms analogous to what is required from the food hub described above (i.e., the P&L statement from each food hub farm, along with location of expenditures, and total number of food hub farm employees).⁹ Please note that direct face-to-face contact with food hub farms may be the most efficient way of obtaining such sensitive information. In order for our research team to gain access to financial information from food hub farms, members of our research team were obliged to conduct in-person interviews, as farmers were wary to provide financial information via a telephone, online, or mail survey. Additionally, our team made assurances to the farmers that farm financial information would only be presented in aggregate, and it would never be possible to identify this information on an individual farm basis.

Table 2 provides a sample of an average food hub farm expenditure profile. This is the information you should have on hand once you are finished with your data collection.¹⁰ As we did before and explained earlier, we assume the difference between total sales and total expenses is allocated to proprietor income, and retail and wholesale purchases are margined.

Primary Data Collection: Customer Data

Before building your model, the final pieces of information that you need to collect are from food hub customers (or potential customers). Collecting information from food hub customers serves two important purposes. First, customer data can be used to understand the scalability of the food hub sector—i.e., what is a realistic amount of additional sales by which final demand (see glossary for definition) for the food hub sector can grow. Second, customer data can be used to estimate the opportunity cost associated with increases in final demand for food hub goods and services. Opportunity cost impacts reflect what would have occurred had the increased final demand for food hub products not have happened. It is unrealistic to assume, without supporting evidence, that all purchases from food hubs represent new final demand, rather some purchases from food hubs probably represent reduced purchases in other sectors. Including opportunity cost in

⁹ Employees should be counted based on the number of paid, full-time, part-time, or temporary positions. Unpaid or family labor should be excluded.

¹⁰ You will probably have more categories of expenditures than indicated in the sample table.

the impact assessment is very important; for example in the authors' case study of Regional Access, we found that excluding opportunity cost overestimated total impacts by over 10%.¹¹

¹¹ Note that the sectors in which opportunity costs are reflected are unclear. For example, additional purchases from the food hub sector may increase purchases in the retail trade/grocery store sector as households may be more likely to cook at home.

Table 2: Sample Food Hub Farm Expenditure Profile and Mapping to IMPLAN Categories ^a

Food hub expenditure category (from P&L statement)	Food hub IMPLAN category	Expense (\$)	Percent Local	Expense Share
Items purchased from other farms	Food sold-farm ^b	\$ 30,000	\$1,500,000 ^e	89.0%
Items purchased from food processors	Food sold-nonfarm ^b	\$ 10,000	\$ 500,000	30.0%
Gasoline (retail margin)	Retail stores – gasoline stations (326)	\$ 1,450	\$ 72,500	83.0%
Gasoline (production) ^f	Petroleum refineries (115)	\$ 8,550	\$ 427,500	1.3%
Freight	Transport by truck (335)	\$ 5,000	\$ 250,000	76.0%
Repair and maintenance	Maintenance and repair construction of nonresidential structure (39)	\$ 5,000	\$ 250,000	99.0%
Utilities	Electric power generation, transmission, and distribution (31)	\$ 3,000	\$ 150,000	100.0%
Insurance	Insurance carriers (357)	\$ 2,000	\$ 100,000	100.0%

Value added components

Employee compensation	Employee compensation	\$ 160,000	100.0%	0.160
Difference between total sales and total expenses ^c	Proprietor income	\$ 30,000	100.0%	0.030
Taxes (all)	Tax on production and imports	\$ 60,000	70.0%	0.060
Total		\$1,000,000	55.0%	1.0000

^a This example assumes that there are 50 farms in the food hub farm sector and that, on average, farms have 5 employees. Thus the total employment for the food hub farm sector = 50 * 5 = 250.

^b For additional explanation about these sectors, please refer to the section entitled “Creating your model and aggregation scheme” below (p.12).

^c By assumption, the difference between total sales and total expenses is allocated to proprietor income. Note that this can be a negative number. In this example, total food hub farm sales per farm are \$100,000 and total expenses are \$95,000, leaving \$5,000 allocated to proprietor’s income.

^d Numbers may not add up due to rounding.

^e The numbers shaded in grey represent intermediate expenditures. The sum of the shaded column area represents the total intermediate expenses for the food hub farm sector.

^f Balance of total retail gasoline purchases after margining (margin = 14.5%), % local taken from IMPLAN default.

To more accurately gauge opportunity costs, we recommend designing a short online survey for food hub customers (or potential customers) that asks the following questions:

1. Is your business interested in purchasing additional items from the food hub if the food hub expanded in some way (i.e., carried additional items/quantities, offered different delivery options, etc.)? (yes/no/unsure)
2. If yes, can you quantify the amount of additional purchases that your business is interested in making from the food hub on a weekly basis?
3. If yes, based on the additional purchases your business would make from the food hub, would your business purchase fewer items from other local businesses? (yes/no/unsure)
4. If yes, what percentage of new purchases from the food hub would represent displaced purchases from other local sources?

Based on the responses from customers, calculate:

1. The percentage of customers who responded “yes” they are interested in purchasing additional items from food hubs;
2. The average \$ amount of additional purchases that business customers are interested in making *annually*;
3. The total dollar amount of additional final demand for food hub goods and services (i.e., total number of customers multiplied by percentage of customers interested in purchasing more product multiplied by average additional purchases). This number will be used later as the hypothetical “shock” in our model;
4. The percentage of customers who responded “yes” that food hub purchases result in fewer purchases from other sources;
5. The average decrease in consumer purchases from other sources represented by food hub purchases;
6. The opportunity cost associated with \$1 of additional demand for food hub products (i.e., the percentage of customers from #3, above, multiplied by the average decrease in #4).

CONSTRUCTING THE MODEL IN IMPLAN

Once you have collected the requisite information from the food hubs, the food hub farms, and the food hub customers you can develop the IMPLAN model.

Creating the Model and Aggregation Scheme

To begin, select the data file within IMPLAN based on the region defined by the study (i.e., county, multi-county, or state, and year). Once you have selected your data file, go

to *User Preferences* within the IMPLAN software and adjust the event year. The event year should reflect the year that changes in final demand occur, i.e., the year in which the customers will increase their food hub purchases.¹²

Next, create an aggregation scheme (see glossary for definition). It is preferable to leave the model as disaggregated as possible, to minimize aggregation bias.¹³ That being said, for some key sectors it may be difficult to avoid some level of aggregation. As one can see from the above description, translating the P&L statement to the appropriate IMPLAN industry sector can be complex and require some informed judgments.

For the example used here, we made the decision to create two aggregated sectors to reflect the primary expenditure categories for food hubs: 1) agricultural and food products from farms; and, 2) food products from processors for resale. For farm product purchases, we created an aggregated sector representing the types of agricultural industry sectors that sell products to a food hub. We defined this to include IMPLAN sectors 1-4, 6, and 10-14, and entitled it “food sold–farm.” Second, with respect to the food products purchased from processors, we created an aggregated sector reflecting the types of processed products purchased by food hubs, IMPLAN sectors 43-47, 50-70. We entitled this aggregated sector “food sold–nonfarm.” Ultimately the decision of how to aggregate the model should be defined based on your research objectives and data availability. However, as mentioned above, it is preferable to leave the model more disaggregated to minimize aggregation bias.

No matter what decisions you make in regard to your aggregation scheme, you will need to identify one sector that does not contain any economic transactions in your study area.¹⁴ This sector will be used to create a food hub farm sector. The food hub farm sector will be constructed subsequently, using the farm-level data you collected. In our study, we used the “tobacco farming” sector as it contains no sales or expenditure information in

¹² For more information about changing the event year, see:
<http://implan.com/v4/index.php?option=com_multicategories&view=article&id=561:561&Itemid=71>.

¹³ Aggregation bias stems from the loss of detail that occurs when you aggregate a region’s sectors before generating the multipliers. For more information, see:
<http://implan.com/index.php?option=com_glossary&id=227>.

¹⁴ You can identify a useable sector by looking in the Explore > Study Area Data for sectors that contain no output.

NYS. Once you have completed your aggregation scheme, you will need to reconstruct your model.¹⁵

Creating a food hub farm sector

Next, customize a food hub farm sector within IMPLAN that reflects the average expenditure pattern of the farms in your study that sell to food hubs.¹⁶ Conceptually, the food hub farm sector customization has three steps within the IMPLAN software. The first step is to create a food hub farm sector, customized with data collected from the food hub farms to include the total number of employees, total output, and value added components. See Table 2 for data to include and Box 1 for details on IMPLAN model construction.¹⁷ A screen shot for our example is shown in Figure 1.

Box 1: Creating a food hub farm industry sector

(utilize data from Table 2)

1. Customize Tasks Bar > Study Area Data (Note that if the *Customize menu* is not activated, you can show this menu by checking *Enable Model Customization* in *User Preferences*).
2. Edit an industry.
3. Highlight tobacco farming, and click *Rename industry* button.
4. Rename to “food hub farm.”
5. Make sure that the *lock* feature (under *Output, Value Added*) is unchecked for the newly renamed “food hub farm” sector.
6. Under *Employment* fill in the *Total Employment* in the food hub farm sector.
7. Select Edit Options > Edit totals then update per worker values.

¹⁵ For more information about how to aggregate a model within IMPLAN, see:
http://implan.com/V4/index.php?option=com_multicategories&view=article&id=556:556&Itemid=10

¹⁶ For more information, see IMPLAN’s “Customizing Study Area Data” tutorial:
http://implan.com/v4/index.php?option=com_multicategories&view=article&id=545:545&Itemid=14

¹⁷ All of our boxes and screen shots include the sample data from Tables 2. Additionally, we assume New York State data and event year = 2011.

8. Enter *Total Output* and *Value Added* information, including employee compensation, proprietor's income, other property type income,¹⁸ and tax on production and imports.
9. Click *Update* and double-check that your numbers haven't changed.¹⁹ The computed value in *Intermediate Expenditures* should match the total of the shaded numbers in Table 2 (perhaps with a small amount of rounding).
10. Click *Save*.

The second step is to reduce the default food sold–farm sector by the same amount that you added to the newly created food hub farm sector (see Box 2 below for details). A screen shot from our example is shown in Figure 2. This is important because the food hub farm expenditures and sales are already accounted for within the IMPLAN database. Thus, these first two steps remove food hub farm contributions from the aggregate agricultural sector, and assign them to a uniquely defined “food hub farm” sector. This ensures you are not double counting the food sold through the food hub.

¹⁸ In our case, we change other property type income to zero as we do not have other property type income in our example food hub farm sector.

¹⁹ There appears to be a bug in IMPLAN that changes the other property type income after first clicking update. If this happens, re-enter the correct number (in our case, 0) and click update again. This should resolve the problem.

MIG IMPLAN (IMpacts for PLANning)

File Options Analyze Explore Customize Help

Current Model: guide test2 Your model is aggregated with scheme: User Defined Custom Scheme

Tasks

Model

- New Model
- Open Model
- Close Model
- Model Overview

Analyze

- Setup Activities
- Analyze Scenarios
- Scenario Results

Explore

- Study Area Data
- Social Accounts
- Industry Accounts
- Multipliers

Customize

- Study Area Data
- Industry Production
- Commodity Production
- Trade Flows

Edit Industry Data Rename Industry...

Edit an Industry

Industry List:

- 1 Food Sold - Farm
- 5 Tree nut farming
- 7 Food Hub Farm**
- 8 Cotton farming
- 9 Sugarcane and sugar beet farming
- 15 Forestry, forest products, and timber tract pr...
- 16 Commercial logging
- 17 Commercial Fishing
- 18 Commercial hunting and trapping
- 19 Support activities for agriculture and forestry
- 20 Extraction of oil and natural gas
- 21 Mining coal
- 22 Mining iron ore
- 23 Mining copper, nickel, lead, and zinc
- 24 Mining gold, silver, and other metal ore
- 25 Mining and quarrying stone
- 26 Mining and quarrying sand, gravel, clay, and...
- 27 Mining and quarrying other nonmetallic miner...
- 28 Drilling oil and gas wells
- 29 Support activities for oil and gas operations
- 30 Support activities for other mining
- 31 Electric power generation, transmission, and...

Make the changes to the items you know, then click update totals.

Employment

Total: 250.0

Output, Value Added

Edit Options

- ☐ Edit totals then update per worker values.
- ☒ Edit per worker values then update.

	Total	Per Worker	National Per Worker
Output (Value of Production):	\$5,000,000	\$20,000	\$60,723
Value Added:			
Employee Compensation:	\$1,250,000	\$5,000	\$2,498
Proprietor Income:	\$250,000	\$1,000	\$12,747
Other Property Type Income:	\$0	\$0	(\$2,782)
Tax on Production and Imports:	\$250,000	\$1,000	(\$1,048)
Total Value Added	\$1,750,000	\$7,000	\$11,415
Intermediate Expenditures:	\$3,250,000	\$13,000	\$49,307

Reset Industry Update Zero Out Industry

Save Close

Figure 1. Creating a food hub farm industry sector

Box 2: Delete food hub farm information from original food sold–farm sector

1. While you are still in the Edit an Industry tab, select *food sold farm*.
2. Under *Employment* edit the *Total Employment* (reduce by the same amount added to the food hub farm sector).
3. Select *Edit Options* > *Edit totals then update per worker values* (reduce by the same amount added to the food hub farm sector).
4. Edit total *Output* and *Value Added* information, including employee compensation, proprietor's income, other property type income, and tax on production and imports. Make sure to reduce each category by the same amount added to the food hub farm sector categories.
5. Click *Update* and double-check that your numbers haven't changed.²⁰ The computed value in *Intermediate Expenditures* should match the total of the food sold farm sector minus the total value of the shaded numbers in Table 2 (perhaps

²⁰ Note that there appears to be a bug in IMPLAN that changes the other property type income after first clicking update. If this happens, re-enter the correct numbers and click update again. This should resolve the problem.

- with a small amount of rounding).
- Click *Save*.
 - Click *Close*.
 - Reconstruct model (*Options > Construct > Multipliers*).

MIG IMPLAN (IMpacts for PLANning)

File Options Analyze Explore Customize Help

Current Model: guide test2 Your model is aggregated with scheme: User Defined Custom Scheme

Tasks Edit Industry Data Rename Industry...

Model

- New Model
- Open Model
- Close Model
- Model Overview

Analyze

- Setup Activities
- Analyze Scenarios
- Scenario Results

Explore

- Study Area Data
- Social Accounts
- Industry Accounts
- Multipliers

Customize

- Study Area Data
- Industry Production
- Commodity Production
- Trade Flows

Industry List:

- 1 Food Sold - Farm
- 5 Tree nut farming
- 7 Food Hub Farm
- 8 Cotton farming
- 9 Sugarcane and sugar beet farming
- 15 Forestry, forest products, and timber tract pr...
- 16 Commercial logging
- 17 Commercial Fishing
- 18 Commercial hunting and trapping
- 19 Support activities for agriculture and forestry
- 20 Extraction of oil and natural gas
- 21 Mining coal
- 22 Mining iron ore
- 23 Mining copper, nickel, lead, and zinc
- 24 Mining gold, silver, and other metal ore
- 25 Mining and quarrying stone
- 26 Mining and quarrying sand, gravel, clay, and...
- 27 Mining and quarrying other nonmetallic miner...
- 28 Drilling oil and gas wells
- 29 Support activities for oil and gas operations
- 30 Support activities for other mining
- 31 Electric power generation, transmission, and...
- 32 Natural gas distribution

Make the changes to the items you know, then click update totals.

Employment

Total

Employment: 45,325.6

Output, Value Added

Edit Options

- ☒ Edit totals then update per worker values.
- ☐ Edit per worker values then update.

	Total	Per Worker	National Per Worker
Output (Value of Production):	\$5,494,987,000	\$119,650	\$151,654
Value Added:			
Employee Compensation:	\$643,113,300	\$14,003	\$10,084
Proprietor Income:	\$873,326,600	\$19,029	\$20,490
Other Property Type Income:	\$683,686,400	\$14,887	\$22,154
Tax on Production and Imports:	(\$38,634,800)	(\$841)	(\$1,225)
Total Value Added	\$2,162,092,000	\$47,078	\$51,503
Intermediate Expenditures:	\$3,332,895,000	\$72,572	\$100,151

Reset Industry Update Zero Out Industry

Save Close

Figure 2. Deleting food hub farm information from original food sold–farm sector

The third step customizes the expenditure pattern (or the production function, see glossary for definition) of the food hub farm sector. In other words, it is not just important to know the total size (employment, output, total intermediate expenditures, and value added) of the food hub farm sector, but also its inter-industry linkages or how much of the total size can be attributed to which categories. There are three parts involved in this step within IMPLAN. The first part of this step is to customize the industry production function, based on the data in Table 2 (last column).²¹ By creating the food hub farm sector above (Box 1), you defined the amount of expenditures per unit of output that go to all intermediate inputs (defined in IMPLAN as the total absorption

²¹ For more information, see IMPLAN's guide to editing industry production: http://implan.com/v4/index.php?option=com_multicategories&view=article&id=546:546&Itemid=14.

value) and value added components (defined in IMPLAN as the value added coefficient). The sum of these two components, by definition, must equal one. Now you compute the gross absorption coefficient for each industry the food hub farm sector buys from based on your survey data; i.e., compute the ratio of expenditures and total output for each industry (see Table 2). The sum across all industries must equal the total absorption value.

Since the sectors included in the production function of the food hub farm sector are likely to be similar to the food sold–farm sector, we recommend that you export the food sold–farm sector production function and then import it into food hub farm sector. This should minimize the number of commodities to add to the production function of the food hub farm sector. Any commodities purchased by the food hub farm sector but not included in the imported production function profile can be added by clicking on *Options > Add a commodity*, selecting the commodity and adding the gross absorption coefficient. Detailed steps are shown in Box 3 and the screen shot below shows the results based on the sample food hub; i.e., using the gross absorption coefficients from the last column of Table 2. The applicable screen shot for our example is shown in Figure 3.

Box 3. Customizing the food hub farm sector’s production function

1. Select Customize > Industry Production
2. Export the production function of the food sold farm sector. Select Food Sold Farm sector (industries are selected on the left side of the window, production function will be pre-populated based on local economy) > Options > Library > Export > Ok)
3. Select the food hub farm sector on left side of window (production function will be pre-populated, in our example with that of the “tobacco farming” sector based on national data)
4. Import production function of the food sold farm sector into the food hub farm sector. With the food hub farm sector highlighted select Options > Library > Import > Select *Food Sold Farm* > Import > Yes).
5. Add the *food hub farm sector* commodity in order to account for intra-sector purchases. (Options > Add a Commodity > Tobacco farming (still has the old name, but this IS the food hub farm commodity) > enter gross absorption coefficient (based on primary data collection) > Ok. In our case, we assume the food hub farms purchase food sold–farm commodities but not food hub farm commodities.

6. Edit gross absorption coefficients based on the survey data and sector scheme for all of the commodities from which the food hub farm sector purchases products and/or services. For any sector with zero purchases, enter zero.²²
7. Make sure to enter all of the non-zero gross absorption coefficients but one, and then click *balance*. Before you click balance, each of the coefficients should be *fixed* (i.e., make sure that the fixed box is checked) except the last one that you are leaving for IMPLAN to balance. IMPLAN will automatically compute the last commodity such that the sum of the gross absorption coefficients equals the total absorption value.
8. Click Save > Close
9. Reconstruct model (*Options > Construct > Multipliers*).

²² If a sector contains zero purchases, you can try removing the commodity from the list. However, we found what appears to be a bug within the IMPLAN software removing a commodity field may cause the program to crash.

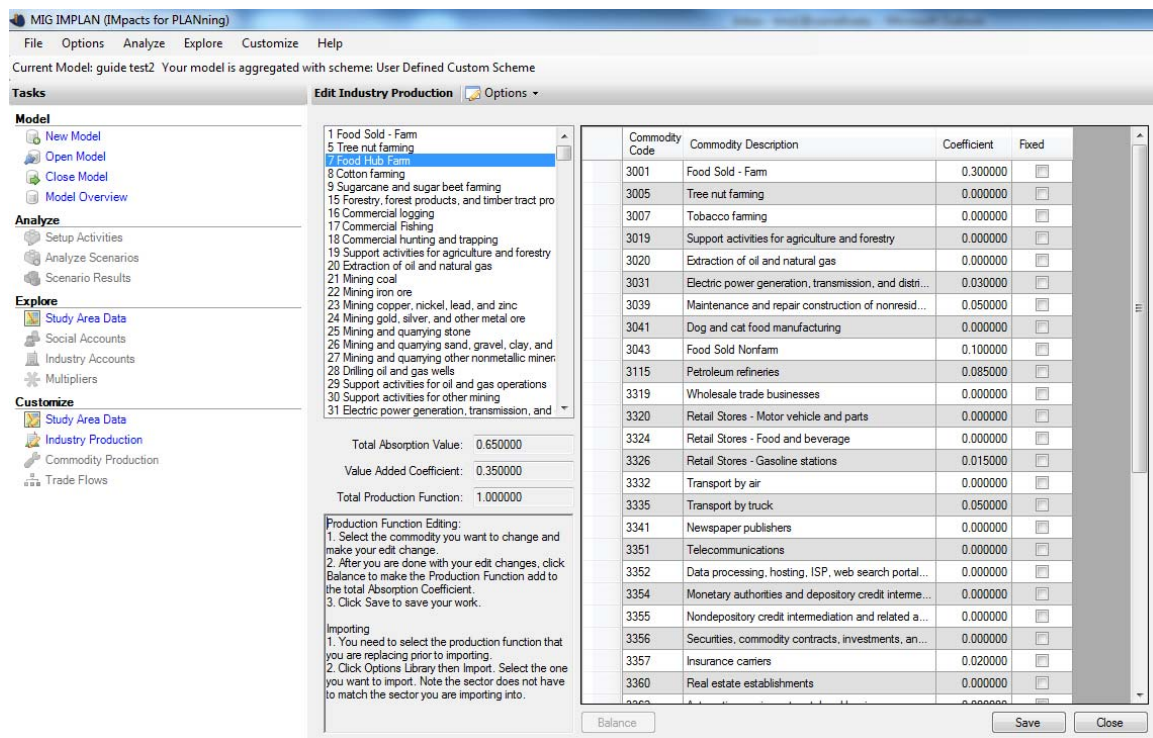


Figure 3. Customizing the food hub farm sector’s production function.

The second part of this step is to customize the commodity production for the food hub farm sector that we have created. Commodities are produced by industries, some of which produce multiple commodities (generally a primary commodity and one or more byproducts). The depiction of an industry’s commodity production is shown under *Customize > Commodity Production* (see screen shot below). For example, the food sold–farm sector in our case produces mostly food sold farm commodities (97.5%), along with some forestry, fishing, and hunting products (1.0%), support activities for agriculture and forestry (1.0%), and arts, entertainment and recreation products or services (0.5%). Without additional data showing otherwise, we assume that the food hub farm sector produces only its primary commodity (i.e., agricultural products) with no byproducts. As byproducts for most agricultural production sectors represent a fairly small percentage of total commodities produced, this should not materially affect the impact results. In our application, we replaced the original “tobacco farming” sector in IMPLAN (zero production) with our food hub farm information. While zero in production, IMPLAN still prepopulates the allocation of total output to commodities produced using national data. This step changes the default values such that only the primary commodity is produced. Detailed instructions are given in Box 4 and a screen shot (Figure 4) is provided below. Once you complete this part, you must reconstruct your model before continuing.

Box 4. Customizing the food hub farm sector's commodity production

1. *Customize > Commodity Production > Select Food Hub Farm Sector (formerly “tobacco farming”) > Adjust coefficients so that the sector produces only its primary commodity (no byproducts).*
2. The primary commodity will still be listed as “tobacco farming” although this is the food hub farm commodity. Enter 1 for this commodity, make sure the *fixed* box is checked, and click *Balance*. The other byproducts should go to zero. Click *Save > Close*.
3. Reconstruct model (Options > Construct > Multipliers).

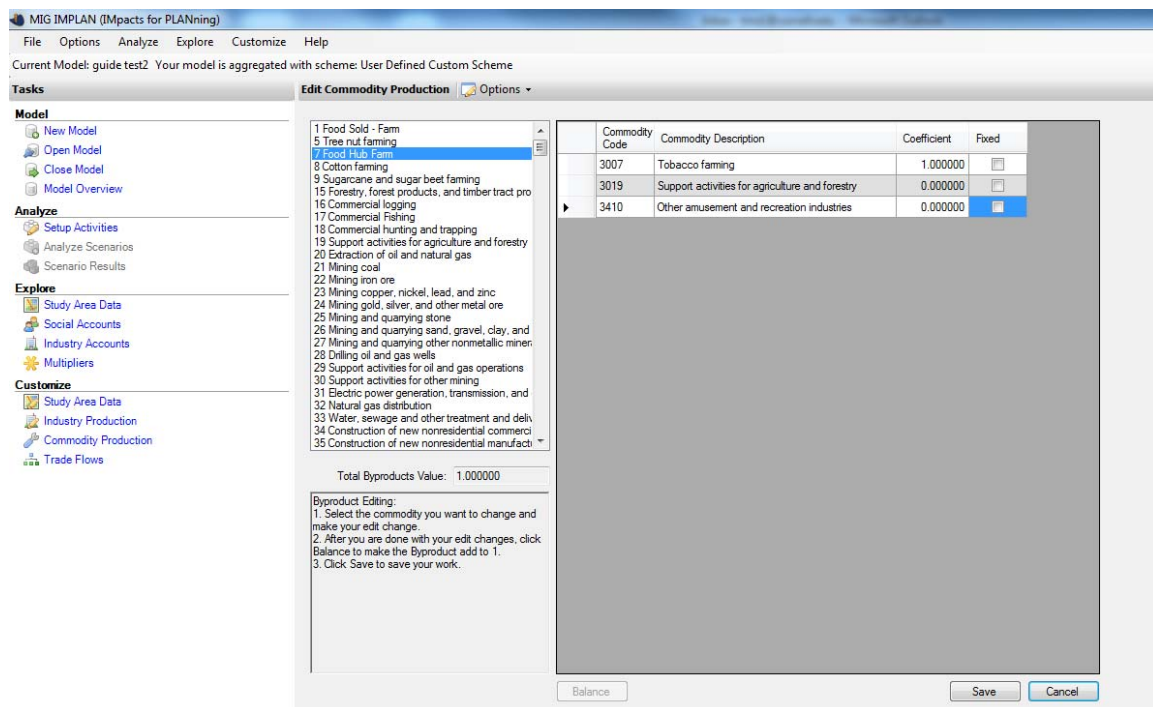


Figure 4. Customizing the food hub farm sector's commodity production

The final part of this step is to customize trade flows to reflect the portion of commodities purchased by the food hub farm sector from local sources.²³ Specifically, you will edit the regional purchase coefficients (RPCs, see glossary for definition) of the food hub farm sector for each commodity purchased by them to reflect the amount they procure locally. The estimated RPCs will be based on the data you collect from the food hub farms on the

²³ For more information about editing trade flow information, see IMPLAN's guide:

<http://implan.com/v4/index.php?option=com_content&view=article&id=548:548&catid=235:KB18>

percentage of expenditures procured locally (See “Local Expense” column in Table 2). Note that the RPCs can be among the most important and often most difficult parameters to correct to local conditions based on local data rather than using the IMPLAN estimates. By default in IMPLAN, RPCs for a commodity are assumed the same across all sectors that purchase them (e.g., the RPCs for the commodity utilities are the same across all sectors—each sector procures the same proportion of utilities locally). In this part, you will edit the RPCs for only the food hub farm sector’s commodities purchased. Box 5 details the steps, while the screen shot shows the results for purchases of food sold–farm products by the food hub farm sector in our simple example. After editing all RPCs you must reconstruct your model. A screen shot for purchases of food sold–farm commodities is shown in Figure 5.

Box 5. Customizing the food hub farm sector’s regional purchase coefficient (RPC)

1. Select Customize > Trade Flows.
2. Select Industry/Institution RPC tab.
3. For each commodity purchased by the food hub farm sector, select the commodity from the dropdown list.
4. Under *Industry Intermediate Demand for Commodities*, scroll down to *Food Hub Farm* sector and edit RPC for that commodity. The RPC should be entered as a decimal. Make sure to click *Save* after each edit.
5. Repeat steps 3 and 4 for each commodity purchased.
6. Reconstruct model (Options > Construct > Multipliers).

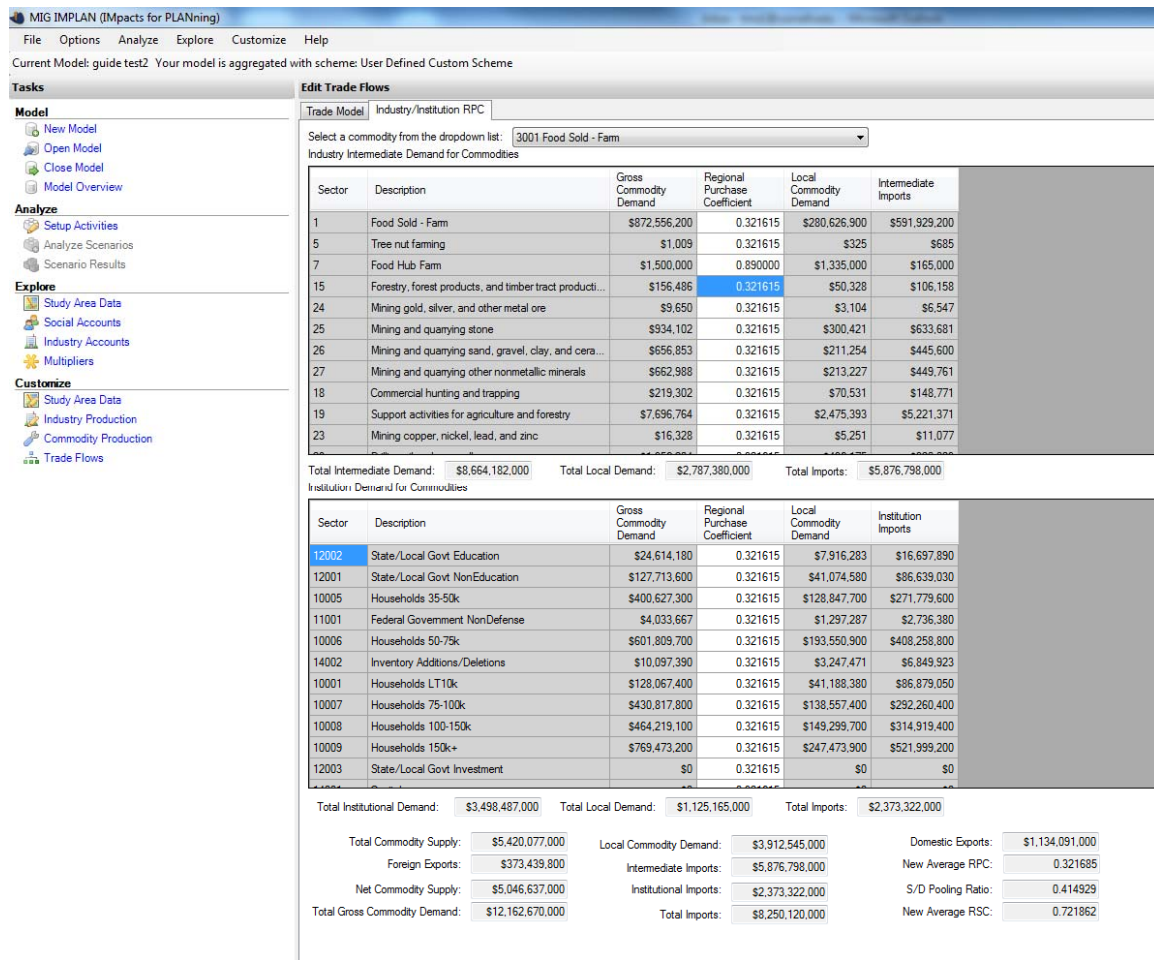


Figure 5. Customizing the food hub farm sector's regional purchase coefficient (RPC)

The development of your model is now complete. You can review the multipliers of the final sectors in your model, by going to *Explore* > *Multipliers*. A useful comparison is between the computed multipliers in the edited food sold farm sector and the newly created food hub farm sector.

IMPACT ANALYSIS

Once the IMPLAN model is customized to reflect a distinct food hub farm sector, we can perform the impact analysis. Recall from our discussion earlier that a food hub sector does not exist within IMPLAN. Accordingly we model a hypothetical change in final demand for food hub goods and services based on how its revenues are allocated to

component expenditures, an analytically equivalent method known as “analysis-by-parts” (ABP).²⁴

As a food hub’s production ramps up due to the increase in final demand (i.e., the direct effect), its expenditures represent increasing demand for inputs from other local sectors (i.e. the indirect effect) and from imports. It is the portion of spending that occurs locally that drives impacts. In other words, only a portion of input expenditures are incurred with local firms, and it is only these local expenditures that are included in the impact analysis (i.e., as first-round indirect effects). The remaining non-local purchases represent leakages from the local economy and are excluded. In general, only a fraction of payments to value added expenditures are regarded as generating impacts. While spending on employee compensation and proprietor income generate induced impacts and are included, payments to other property type income and indirect business taxes are generally excluded from impact analyses. Similarly, any payments to government institutions (e.g., for municipal water) are excluded. This is because government policy decisions and long- term investment income do not typically follow the same re-spending patterns as other kinds of value added incomes/revenues.

An example may be helpful here. Consider a \$100 increase in final demand for food hub products. To satisfy this increase in demand, the food hub spends \$60 to input sectors (such as products from farms and non-farm vendors, insurance, utilities), \$25 to employee compensation, \$10 to proprietor’s income and \$5 on indirect business taxes. The \$100 represents the direct output effect. One-half of the inputs (\$30) are procured locally, the other \$30 represent leakages. The \$25 and \$10 value added components are included in the analysis, but the \$5 payment is not. Applying these values to our model will generate the entire cumulative impact from all inter-industry transactions.

Quantifying the Direct Effects

To quantify a reasonable scenario for evaluating an increase in final demand for food hub products and services, we recommend collecting information from customers as discussed above. In our example food hub (Table 1), let’s suppose that customers reported an interest in purchasing an additional 25% of products from the food hub, or a \$250,000 increase in demand for food hub products. The positive shock (\$250,000) is then allocated into the corresponding industry sectors (intermediate inputs) and value added components based on the food hub’s pattern of expenditures (Table 1).²⁵ The direct

²⁴ See IMPLAN’s “Case Study: Analysis-By-Parts” for more information:

<http://implan.com/v4/index.php?option=com_multicategories&view=article&id=730:case-study-analysis-by-parts&Itemid=71>.

²⁵ The increase in output may also need to be allocated to institutional purchases if applicable; e.g., purchases directly from households.

effect for output is the \$250,000, while the direct effect for employment, labor income, and total value added can be computed based on the data in Table 1. Assuming proportional changes, the 25% expansion will have a direct employment effect of 1 employee (0.25×4), a direct labor income effect of \$47,500 ($0.25 \times (160,000 + 30,000)$), and a direct total value added effect of \$62,500 ($0.25 \times (160,000 + 30,000 + 60,000)$).

Quantifying Opportunity Costs

In addition to the positive shock from an increase in demand for food hub products, we need to consider possible negative impacts due to decreased spending by purchasers in other sectors as a consequence of an increase in purchases of food hub products. From the customer survey results, you should have generated an estimate of how much the increase in demand for food hub purchases also involves a shift of demand away from other sectors. For our analysis, we assume that these offsets would occur in the wholesale trade sector (in our case study, business customers reported decreasing purchases from other distributors, which are included in IMPLAN's wholesale trade sector). Thus, in addition to the positive shock in the food hub sector, we consider a simultaneous negative shock to the wholesale trade sector in order to account for the opportunity cost. For ease of exposition, assume for our sample food hub that, on average, for every additional dollar of food hub products purchased, ten cents worth of product purchases are decreased in the wholesale trade sector (i.e., a 10% offset). With an increase of \$250,000 of output of food hub products, this would imply a minus \$25,000 shock to the wholesale trade sector.

Analysis by Parts (ABP)

You now have sufficient information to construct your impact analysis in IMPLAN using ABP. To do so requires you to set up activities that reflect the industry spending pattern of the food hub for intermediate input expenditures, labor income changes for employee compensation and proprietor income, and the opportunity costs. In each of the activities you enter in a set of events, and then define a scenario that includes your activities. After analyzing your scenario the scenario results are displayed in IMPLAN. The detailed steps are outlined in Box 6 below, along with screen shots for the sample food hub scenario (Figures 6a-6e). Before you begin, make sure the *Advanced* box is checked under *User Preferences* (*File > User Preferences > Analysis* tab).

Box 6. Analysis-by-Parts Impact Assessment

1. Define Industry Spending Pattern.
 - a. Click *Setup Activity > New Activity > Industry spending pattern* (entitle it: “Hub Input Spending Pattern per dollar of output”). Set Activity level to amount of increase in final demand for food hub products and services, the direct output effect, in our case \$250,000. (Adjust this number based on your customer survey results). Click *Save*
 - b. Click *New Event* for each intermediate input sector purchase. Enter food hub intermediate input spending coefficient, along with the Local Purchase Percentage (LPP); the amount of each input commodity the food hub procures locally (See Table 1). Note that the food hub will be purchasing farm products from the newly created food hub farm sector rather than the food sold farm sector. Purchases of food hub farm commodities will be reflected under ‘tobacco farming’ – that is the food hub farm commodity.
2. Define Labor Income Change for Employee Compensation
 - a. Click *Setup Activity > New Activity > Labor Income Change* (entitle it “Food Hub Labor”). Set Activity Level to 1.000. Click *Save*.
 - b. Click *New Event* and select sector *5001 Employee Compensation*. Enter change in employee compensation associated with the increase in final demand for food hub products and services. In our case, the proportional change in employee compensation is $0.25 * \$160,000 = \$40,000$. Edit LPP if less than 100%. We assume the increase is all local.
3. Define Labor Income Change for Proprietor Income
 - a. Click *Setup Activity > New Activity > Labor Income Change* (entitle it “Food Hub Proprietor Income”). Set Activity Level to 1.000. Click *Save*.
 - b. Click *New Event* and select sector *6001 Proprietor Income*. Enter change in proprietor income associated with the increase in final demand for food hub products and services. In our case, the proportional change in proprietor income is $0.25 * \$30,000 = \$7,500$. Edit LPP if less than 100%. We assume the increase is all local.
4. Define Opportunity Cost
 - a. Click *Setup Activity > New Activity > Industry spending pattern* (entitle it: “Opportunity Cost Wholesale Trade”). Set Activity level to the negative of the amount of increase in final demand for food hub products and services, in our case \$-250,000. The proportion of offset is defined next. Click *Save*
 - b. Click *New Event* and select the *Wholesale Trade* sector. Enter the proportional offset under the coefficient column based on the customer survey data. In our case, 0.10. As we assume all of these offsets are from other local purchases, we leave the LPP at 100%.
5. Click *Next*
6. Analyze Impact Scenarios

- a. After clicking *Next* you will be brought to the *Analyze Scenarios* screen.²⁶ If this is the first scenario you are establishing, a screen will open asking you to name the *New Scenario* and enter the *Scenario Level*. Choose a name descriptive enough to understand its components. We name our scenario “Food Hub \$250K output with OppCost”. Set the level to 1.000. Click *Save*.
- b. The activities you previously set up are now shown on the left side of the screen. Select all activities you would like to use in your scenario. In our case all four activities are selected.
- c. Click *Analyze Single Region*
- d. Click *Yes* to view results

Activities

Activity Name	Level	Activity Type
Hub Input Spending Patter per doll...	250,000.000	Industry Spending Pattern
Food Hub Labor	1.000	Labor Income Change
Food Hub Proprietor Income	1.000	Labor Income Change
Opportunity Cost Wholesale Trade	-250,000.000	Industry Spending Pattern

Events

Sector	Coefficient	Event Year	Local Purchase Percentage
3043 Food Sold Nonfarm	0.494000	2011	20.00 %
3007 Tobacco farming	0.180000	2011	90.00 %
3326 Retail Stores - Gasoline stations	0.002000	2011	83.00 %
3115 Petroleum refineries	0.014000	2011	1.30 %
3362 Automotive equipment rental and leasing	0.013000	2011	100.00 %
3031 Electric power generation, transmission, and distribution	0.013000	2011	100.00 %
3357 Insurance carriers	0.012000	2011	100.00 %
3319 Wholesale trade businesses	0.002000	2011	0.00 %
3313 Office supplies (except paper) manufacturing	0.010000	2011	16.90 %
3355 Nondepository credit intermediation and related activities	0.010000	2011	100.00 %

Number of Events in the Current Activity: 10 Sum of Event Values: 0.75

Figure 6a. Analysis-by-Parts Impact Assessment, Industry Spending Pattern, Step 1

²⁶ For more information on analyzing scenarios within IMPLAN, see:
http://implan.com/v4/index.php?option=com_multicategories&view=article&id=524:524&Itemid=14.

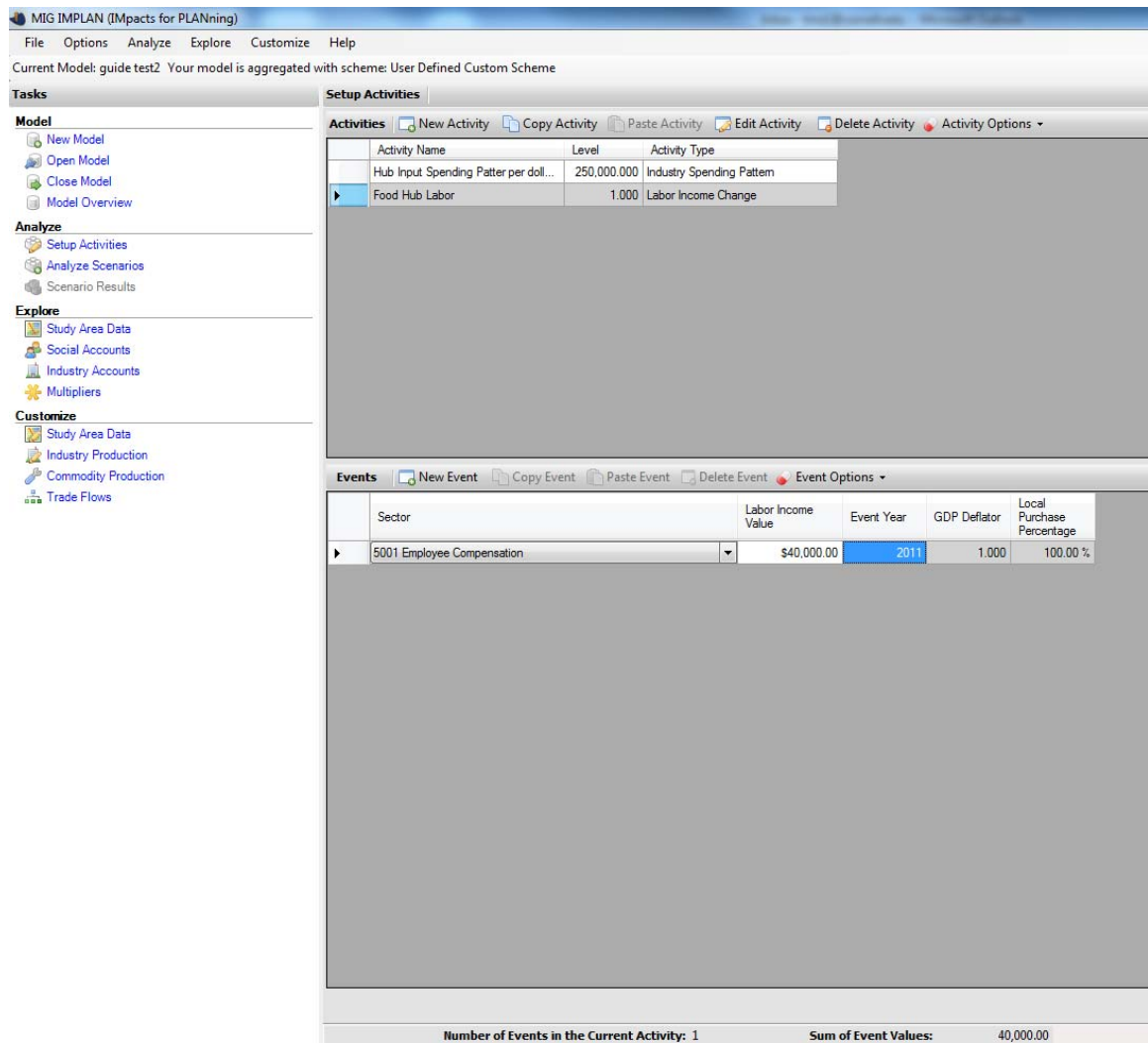


Figure 6b. Analysis-by-Parts Impact Assessment, Employee Compensation, Step 2

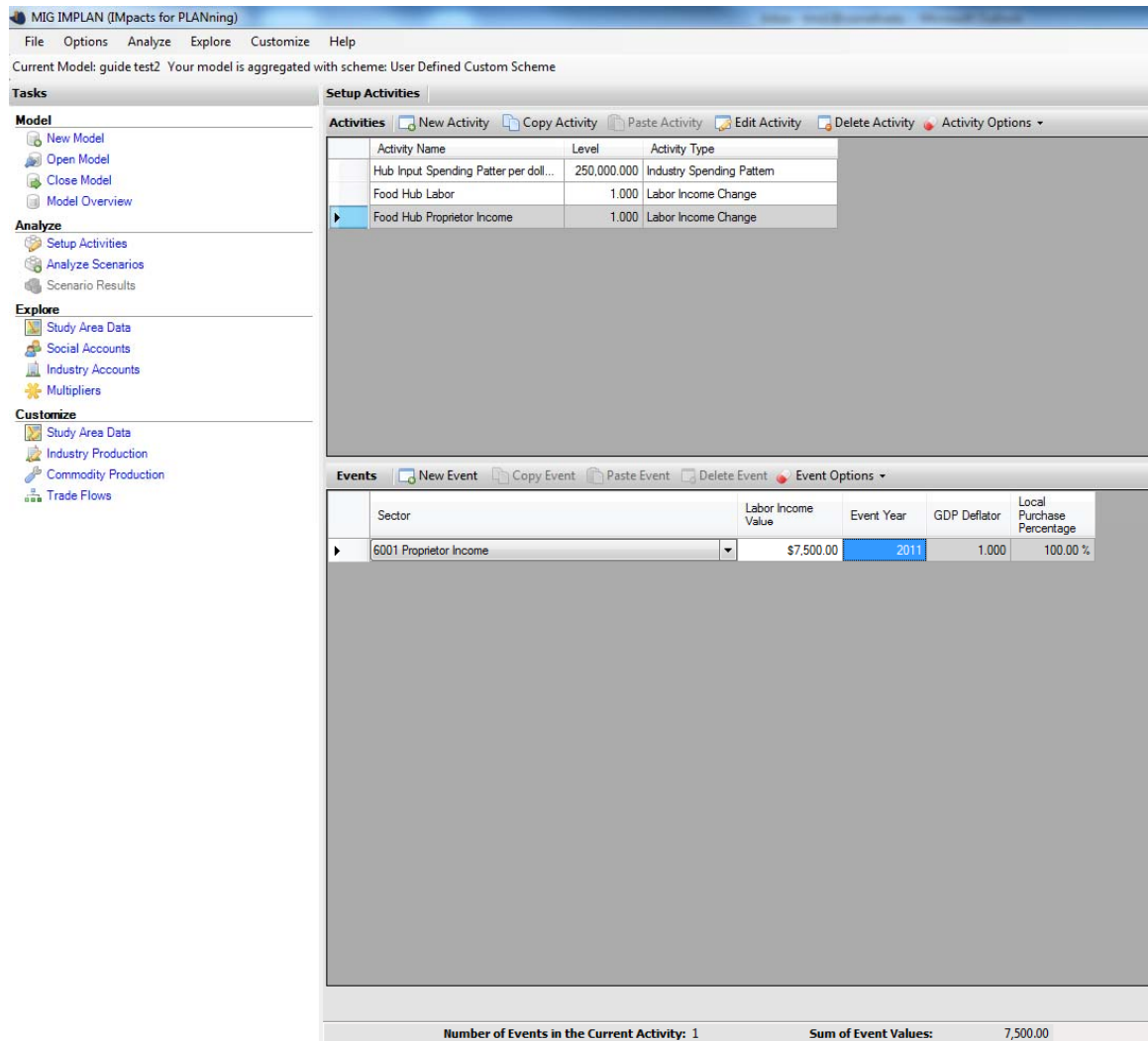


Figure 6c. Analysis-by-Parts Impact Assessment, Proprietor Income, Step 3

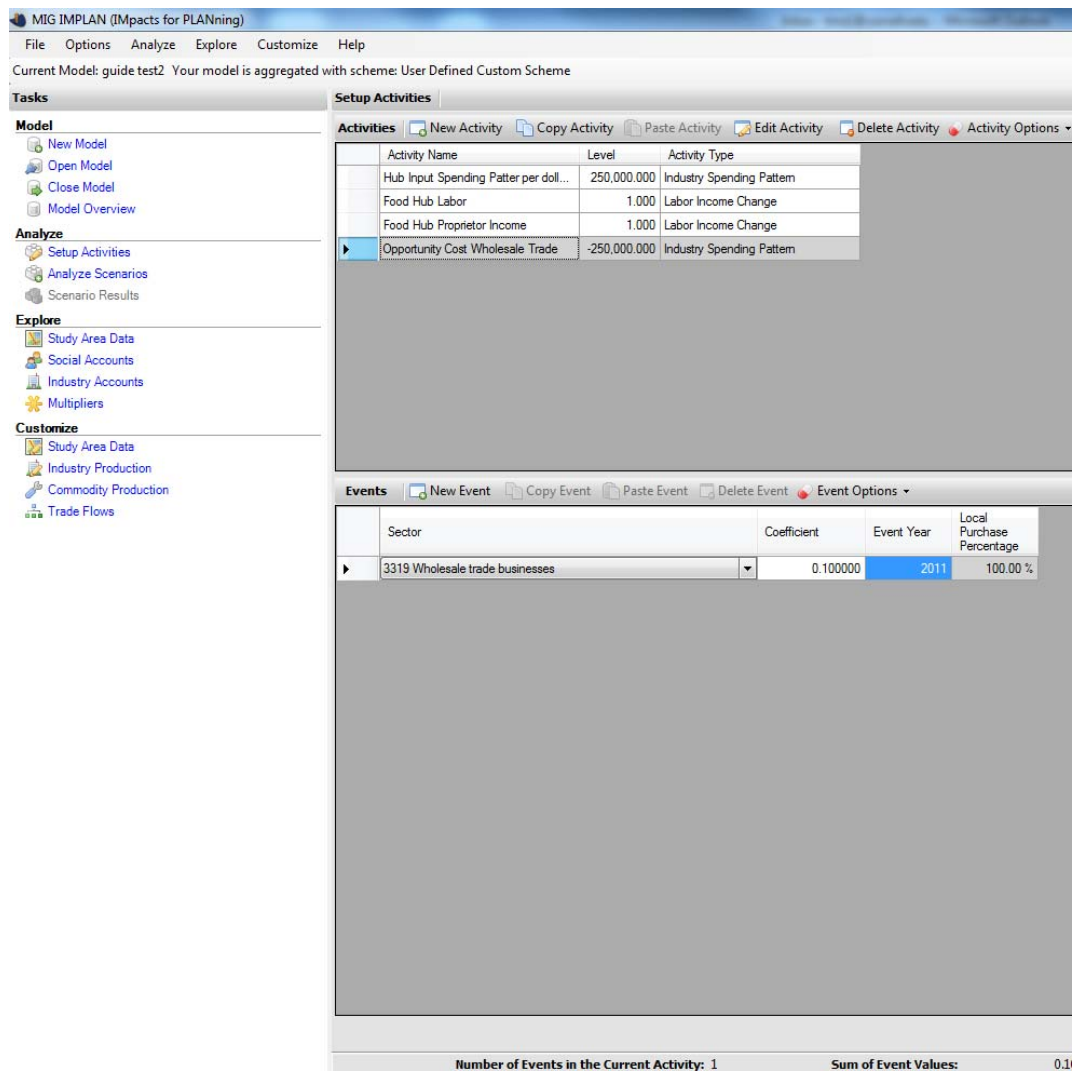


Figure 6d. Analysis-by-Parts Impact Assessment, Opportunity Cost, Step 4

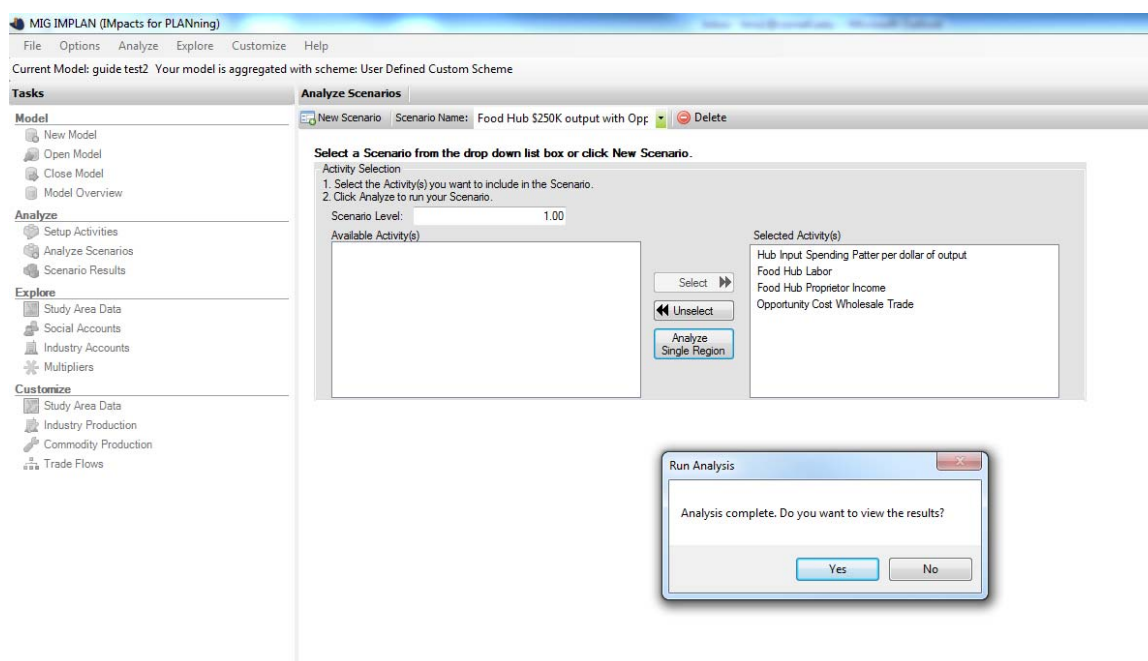


Figure 6c. Analysis-by-Parts Impact Assessment, Analyze Single Region, Step 5

INTERPRETING YOUR RESULTS

Congratulations! You have made it to the fun part, interpreting your results. IMPLAN displays results in a summary report that covers the total economic impacts, detailed industry reports that can be sorted by impact type (employment, output, labor income, and value added), and a tax impact report. By definition, IMPLAN shows no direct effects since you defined them. In this methodology, using an ABP approach, you provided the first round indirect effects (industry spending pattern) and labor income changes that provide induced effects. Following the quantification of direct effects above, we show the final summary results in Table 3 below, along with the applicable screen shot in Figure 7.

Summary Results

The generative impacts of the increase in final demand for food hub products and services are displayed in Table 3. As illustrated, for every additional employee added to the food hub's payrolls, an additional 2.5 jobs are generated in backward-linked industries (i.e. industries on the supply chain from which the food hub purchases its inputs in order to produce its output). In this example, the employment multiplier effects are relatively strong, particularly contributing from backward linkages of the food hub farm sector (see detailed results). Similarly, the initial \$250,000 of direct final demand

output generates a total of over \$385,000 of impact when all backward linked industry effects are considered, or an implied multiplier of 1.54.

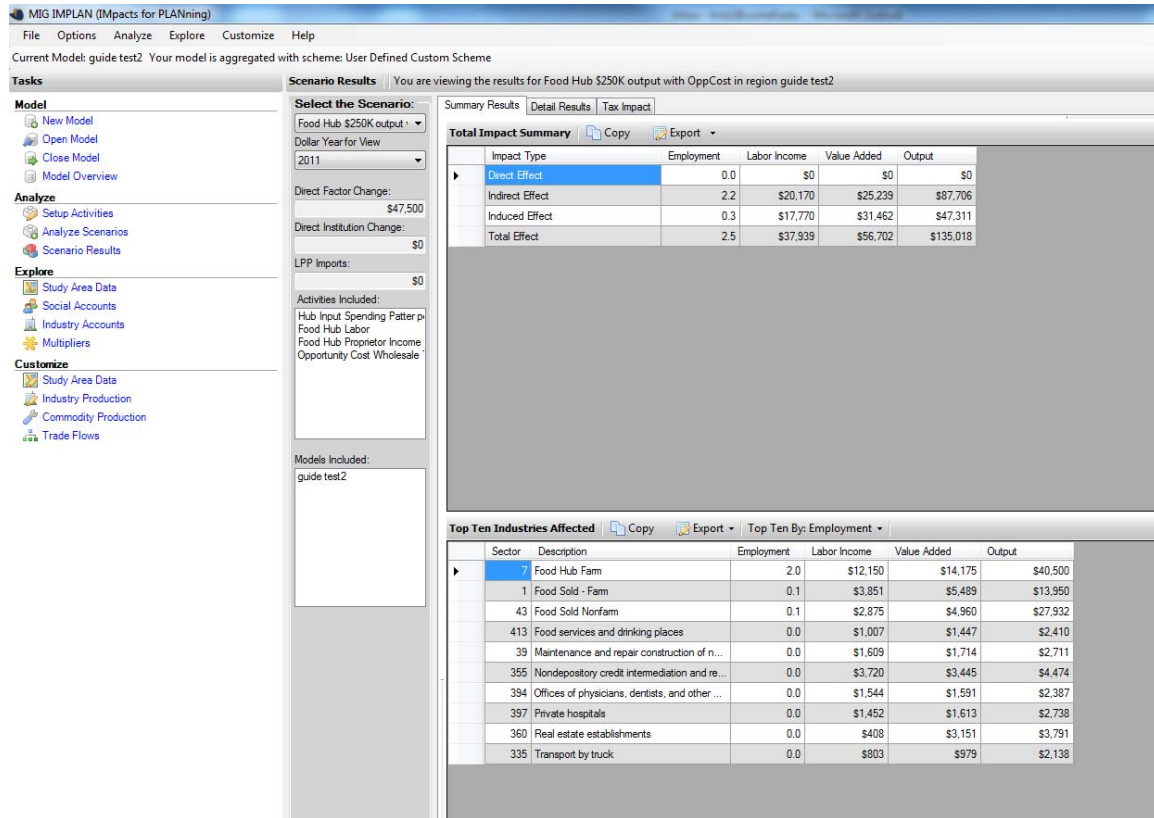


Figure 7. Summary Results

Table 3. Summary Economic Impact Results of \$250,000 Increase in Final Demand for Food Hub Products and Services, with opportunity costs considered

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	1.00	\$47,500	\$62,500	\$250,000
Indirect Effect	2.20	\$20,170	\$25,239	\$87,706
Induced Effect	0.30	\$17,770	\$31,462	\$47,311
Total Effect	3.50	\$85,440	\$119,201	\$385,017
Implied Multiplier	3.50	1.80	1.91	1.54

It may be useful to compare your multiplier results with other industries in your study area. However, recall that this analysis importantly includes opportunity costs, so direct comparison is problematic. If you want to compute the implied multipliers without opportunity costs (for comparison with other industry multipliers), create an additional scenario that does not include opportunity cost as one of the activities. The summary results for this scenario (follow the same general steps in Box 6, but without selecting the opportunity cost activity) are shown in Table 4. The differences in results in Tables 3 and 4 highlight the importance of considering opportunity costs in your analysis.

Table 4. Summary Economic Impact Results of \$250,000 Increase in Final Demand for Food Hub Products and Services, without considering opportunity costs (all final demand is new demand)

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	1.00	\$47,500	\$62,500	\$250,000
Indirect Effect	2.40	\$33,517	\$47,953	\$118,233
Induced Effect	0.40	\$21,306	\$37,725	\$56,728
Total Effect	3.80	\$102,323	\$148,178	\$424,961
Implied Multiplier	3.80	2.15	2.37	1.70

Detailed Industry Impact Results

Given the objectives of your study, it may also be useful to examine what industries are primarily affected via the indirect and induced effects (see glossary for definition). The screen shot below (Figure 8) shows the first page of detailed industry results for output (considering opportunity costs), ranked by total (indirect + induced) effects. Not surprisingly, of the total \$135,018 of indirect and induced effects, the top two affected industries are the food hub farm (\$40,500) and food sold–nonfarm (\$27,932) sectors, from which the hub’s primary purchases/expenditures accrue. The food sold–farm sector (net of the food hub farm sector) also demonstrates relatively large impacts (\$13,950), primarily due to the purchases of the food hub farm sector from food sold farm (Table 2).

Given the relatively disaggregate model (390 sectors in our example), you will likely want to aggregate some of the other sectors following your model runs, perhaps following the two-digit NAICS aggregation scheme, to helpfully summarize your results. However, even with the disaggregate model results, one can see that the imputed rental

activity (all induced), electric power utilities, insurance carriers, and non-depository credit intermediaries (mostly indirect), and real estate and other monetary authorizes (mostly induced) are also relatively important sectors affected by food hub expansion. Note that the net change in the Wholesale Trade sector was -\$21,928 (not shown), as some of the -\$25,000 of opportunity cost are offset by positive influences to the wholesale trade sector from food hub expansion by other indirect industry effects.

Sector	Description	Direct	Indirect	Induced	Total
0	Total	\$0	\$87,706	\$47,311	\$135,018
7	Food Hub Farm	\$0	\$40,500	\$0	\$40,500
43	Food Sold Nonfarm	\$0	\$27,286	\$647	\$27,932
1	Food Sold - Farm	\$0	\$13,801	\$149	\$13,950
361	Imputed rental activity for o...	\$0	\$0	\$5,799	\$5,799
31	Electric power generation, tr...	\$0	\$4,822	\$972	\$5,794
357	Insurance carriers	\$0	\$3,837	\$1,411	\$5,248
355	Nondepository credit interm...	\$0	\$4,024	\$451	\$4,474
360	Real estate establishments	\$0	\$860	\$2,931	\$3,791
354	Monetary authorities and de...	\$0	\$1,290	\$1,978	\$3,267
397	Private hospitals	\$0	\$0	\$2,738	\$2,738
39	Maintenance and repair con...	\$0	\$2,473	\$239	\$2,711
356	Securities, commodity contr...	\$0	\$831	\$1,623	\$2,454
413	Food services and drinking ...	\$0	\$153	\$2,258	\$2,410
394	Offices of physicians, dentis...	\$0	\$0	\$2,387	\$2,387
335	Transport by truck	\$0	\$1,913	\$225	\$2,138
358	Insurance agencies, broker...	\$0	\$1,134	\$413	\$1,547
362	Automotive equipment renta...	\$0	\$1,265	\$65	\$1,330
351	Telecommunications	\$0	\$130	\$1,131	\$1,261
381	Management of companies ...	\$0	\$917	\$334	\$1,251
326	Retail Stores - Gasoline stati...	\$0	\$921	\$165	\$1,086
42	Other animal food manufact...	\$0	\$891	\$29	\$919
367	Legal services	\$0	\$163	\$703	\$867
398	Nursing and residential care...	\$0	\$0	\$824	\$824
324	Retail Stores - Food and be...	\$0	\$21	\$779	\$801
359	Funds, trusts, and other fina...	\$0	\$36	\$743	\$779
396	Medical and diagnostic labs...	\$0	\$0	\$673	\$673
331	Retail Nonstores - Direct an...	\$0	\$13	\$644	\$657
432	Other state and local gover...	\$0	\$139	\$513	\$652
392	Private junior colleges, colle...	\$0	\$9	\$633	\$642
329	Retail Stores - General merc...	\$0	\$16	\$595	\$611
320	Retail Stores - Motor vehicle...	\$0	\$13	\$558	\$571
32	Natural gas distribution	\$0	\$280	\$208	\$488
327	Retail Stores - Clothing and ...	\$0	\$12	\$452	\$464
107	Paperboard container manu...	\$0	\$380	\$26	\$406
388	Services to buildings and d...	\$0	\$106	\$283	\$389
368	Accounting, tax preparation...	\$0	\$106	\$283	\$388

Figure 8. Detailed Industry Results (Output)