Module 7

ADVANCED IMPLAN ANALYSIS TO UNDERSTAND THE ECONOMIC IMPACT OF LOCAL FOOD SYSTEM INITIATIVES

Module 7 Overview

- This module provides technical and detailed information on how to adjust the modeling environment to be more directly reflective of conditions in your community or region, and discuss:

- Why your team might want to modify IMPLAN for your economic impact study;

- How to modify IMPLAN;

- The data you will need in order to modify the model;

- Modeling approaches for your impact assessment.

At this stage of the project….

- Defined its scope, goals and objectives, timeframe, resources, and regional boundaries (module 1);

- Collected primary and/or secondary data (module 2 for secondary data and module 3 for primary data);

- Involved a technical expert with advanced training on conducting an economic impact assessment, and knowledge of its limitations (module 5);

- Considered how to carefully reflect opportunity costs and countervailing effects into your modeling efforts (module 6).

Adapting your I-O Model

- A careful and comprehensive local food system assessment usually involves making several adjustments to the default modeling systems, such as:
  - Scrutinizing the default baseline data contained in the model;
  - Modifying existing data where appropriate;
  - Amending assumptions about relationships among sectors;
  - Manually introducing missing or new sectors into the economy;
  - Distinguishing between gross and net economic effects

- Although these steps can be challenging, they are necessary to create a depiction informed by your community-based conversation and planning efforts

Improving on the IMPLAN platform

- Though there are other types of software available for this type of analysis, IMPLAN is widely accepted
  - In large part due to ease with which modifications can be made.
  - The content of this module assumes that you are familiar with IMPLAN software and databases
  - For a basic overview of IMPLAN's economic analysis structure and capacities, please refer to their website, http://implan.com
- The techniques presented in this module incorporate additional data to better reflect your community
  - Modules 2 & 3 explained the variety of data to be collected
  - Here we explore how much richer your economic analysis can be in computing the value of inter-industry linkages

Net Economic Impacts Occur When...

- Rely on local production to offset or substitute for commodities that must be fully or partially imported
  - Economists refer to as **import substitution** (see Module 5)
- Can produce sufficiently more than local demand requires and exports the remainder; or,
- Increases share of locally controlled food production enterprises as share of local food sector activity grows
  - I.e., ownership income remains in the local community
- Otherwise, changes from one kind of intra-local activity to another do not produce net economic impacts in the near-term

Impact vs. Contribution

- **Economic impact assessments** of food system initiatives or activities
  - Impact analysis examines the **net** (marginal) change in new (or foregone) economic activity associated with an industry, event, or policy change in an existing regional economy

- **Economic contributions** of local food systems to the local economy
  - Contribution analysis measures the **gross** changes in a region's existing economy that can be attributed to a given industry, event, or policy.

For more information of the distinctions between economic impact assessment and contribution analysis, please 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? The Journal of Regional Analysis and Policy. 37:2.

IMPLAN Baseline Info

- IMPLAN is comprehensive-Using predominantly public data from national sources
  - To create a national table of accounts and balanced Social Accounting Matrices (SAMs) for every county and state in US
  - These SAMs illustrate a relatively complete picture of the economy, expected inter-industry transactions and transfers
    - Households, capital, governments, imports, and exports.
- IMPLAN's SAM yields multipliers that describe how the supplying sectors respond to industrial changes
  - **Indirect effects** or the **type I multipliers**)
  - Indirect plus the household or **induced effects-type II multipliers**).

IMPLAN for Fruit and Vegetables

- Top 10 intermediate outlay categories for vegetable and melon production in Iowa are listed
  - Out of a possible 536 categories of commodity requirements.

Commodity Code	Commodity Description	Coefficient
3019	Support activities for agriculture and forestry	0.050965
3172	Pesticides and other agricultural chemicals	0.017660
3395	Wholesale trade distribution services	0.013922
3156	Refined petroleum products	0.010476
3003	Vegetables and melons	0.009820
3170	Phosphatic fertilizer	0.009519
3169	Nitrogenous fertilizer	0.008667
3440	Real estate buying and selling, leasing, managing, a...	0.008388
3062	Maintained and repaired nonresidential structures	0.006948
3262	Farm machinery and equipment	0.005949

Sectors in IMPLAN

- Each IMPLAN industrial sector represented by a single, initially-fixed expenditure pattern

  - Economists refer to as a **production function**,

  - The sum of all **inputs coefficients** plus those for payments to **value added** equals 1.0.

  - Can be interpreted as each $1 of output change in vegetable and melon farming, that sector required an additional $.051 in ag support activities, nearly $.018 in ag chemicals, and so on.

- For an in-depth discussion of how production functions are constructed within IMPLAN, see Lazarus, W., D. Platas, and G. Morse. 2002. IMPLAN's Weakest Link: Production Functions or Regional Purchase Coefficients. The Journal of Regional Analysis & Policy. 32(1):33-49, and Liu, Z., and M. Warner. 2009. Understanding Geographic Differences in Child Care Multiplers: Unpacking IMPLAN's Modeling Methodology. The Journal of Regional Analysis & Policy. 39(1):71-85.

Expenditure Patterns Represent

- Other sectors in the local economy
  - **Intermediate purchases**;
- Employee compensation, proprietor income/returns to business owners, property type income/payments to investors, and indirect business taxes/sales taxes
  - **Value added payments**;
- Other sectors outside of the local economy
  - **Intermediate imports**;
- Other sources such as institutional outlays

Understanding Value Added

- Value added components together can be thought of conceptually as representing the dollar value the business adds in producing its own output.

- As noted, value added is primarily distributed via the payments out of revenues that go to owners, workers, investors, and government.

- Value added by a business is measured in practice as:
  - The difference between the total value in the market (revenues received for product sales) and the payments to other businesses for the inputs it must purchase from them.

How do Local Food Participants Differ?

- Ample evidence that farmers and value-added businesses interact differently with the local economy
  - For example, data from USDA's Agricultural Resource Management Survey (USDA ARMS) demonstrate that the majority of farms participating in local and regional food system markets are small and mid-scale
  - These producers have different input requirements
- Many value-adding businesses that have emerged to meet the demand for local food are likely to purchase a greater share of their inputs locally
  - Food hubs, local food aggregation and distribution businesses –

A Case Study from New York

Multipliers for the Default Agriculture, Small Direct Agriculture (SDA), and Non-Small Direct Agriculture (NSDA) sectors.[1]

Multiplier	Model 1	Model 2	
	Default	NSDA	SDA
Employment	1.53	1.50	1.73
Labor Income	1.76	1.81	1.84
Total Value Added	2.32	2.47	2.12
Output	1.90	1.94	1.87

[1] Capital District Region, New York State, 2010.

New York Food Producers' Activity

- Modified IMPLAN to estimate the local economic impact of small- and medium-scale producers
    - A team of researchers from Cornell University worked with extension agents from an 11 country region to collect expenditure and sales information (labeled the SDA sector).
- SDA producers have different expenditure patterns
    - The study created two agricultural sectors with differential expenditure patterns resulting in different economic impacts.
- SDA sector had higher associated employment and labor income multipliers
- The NDSA sector had larger total output and value added multipliers.

Customizing the Local Food Farm Sector

- Researchers, practitioners, and policymakers interested in understanding precise impacts
  - Within IMPLAN there are 14 sectors related to agricultural production, but farms participating in local food systems are smaller, more diversified, and assume supply chain functions
  - IMPLAN has weighted average values of production characteristics of common agricultural producers,
- To account for expected variations one can create a new local food farm sector.
  - But the modification is only a valuable if it accurately reflects new economic flows – informed by place-based data

Creating a New Sector

- New sectors can easily be added to IMPLAN by finding one that is unpopulated in the local economy.

  - In many parts of the U.S., for example, there is no tobacco grown so the tobacco farming sector can be used

  - This sector can be renamed and populated with information to more accurately reflect the local food farm sector.

- Given the new sector is empty, it needs data

  - Those new data can come from primary research (your interviews of local producers) or secondary research

  - Through creative modification of existing production functions in the IMPLAN model altered to represent production scenarios or scales that are different than the default, average values.

Case Studies: Imputing Values for CO and WV

- Primary data on employee compensation for farms that participate in farm-to-school programming
  - Gunter and Thilmany (2010) took an average of the percentage of output that employee compensation used for food and beverage retailers, as well as from vegetable, melon and fruit farming from the IMPLAN data.
  - Based on the assumption that the average farm-to-school farmer likely grows and sells their own products, so captured marketing activities as a proxy for retained transaction costs.

- Ag sectors in study of West Virginia farmers' markets
  - Hughes et al. (2008) modified payments to value added categories to reflect farmers selling at these markets are small and have a non-corporate structure

Secondary Data and IMPLAN

- Normally need to augment available data by collecting information from the food system businesses
  - Goal of the primary data collection is to come up with an average local food farm expenditure profile --not an easy task.
- Important to ensure that such surveys are as representative of the targeted local producer or processor population as possible.
  - Surveys of convenient sources of data, like a select sub-set of program participants or advocates, likely will not adequately document operational costs fully and can lead to economic distortions when those data are run through input-output models.

Study Area Data

- The proper specification of **study area** should contain the intended population of producers and their primary labor and inputs supply territory.
  - Not so large as to over-describe primarily localized effects, and it should not be so small as to fail to capture key linkages.
- Should include total size of the sector by:
  - Number of employees-Refers to the number of positions but many jobs in retail may be part-time or seasonal so 1 FTE may be many seasonal workers
  - Total output (value of production, usually in gross sales);
  - Value-added (employee compensation, proprietor income, other property type income, and indirect production taxes).

Industry Production in IMPLAN

- Not just important to know just the total size
  - But also its local inter-industry linkages which help to measure net impacts to assess whether some economic activity that previously "leaked" from the region is now captured
- There are 3 parts to modifying industry production:
  - Customizing the industry's average expenditure patterns (e.g., the **gross absorption coefficient** for each industry sector);
  - Customizing the commodity production to ensure that it reflects the products produced by the local food sector; and
  - Customizing trade flows to reflect portion of products (i.e., commodities) purchased from local sources (e.g., modifying the **regional purchase coefficients**)

Adjusting Other Sectors

- After customizing IMPLAN model, some sectors should be reduced by newly-created amount

  - E.g., fruit, vegetable & melon farming, animal production

- This is important as the local food farm expenditures and sales are now accounted for in IMPLAN

  - If, for example, you are adding $1 million in output, along with all jobs and payments to labor and proprietorships, to a newly itemized 'local foods' vegetables production sector

  - Then subtract those exact values from the vegetable and melons aggregated sector so that the area economy producing those commodities is the same as before the modifications.

Further Customization

- Same approach can modify other industry sectors
  - Swenson, for example, explored economic impact of small-scale meat processing firms in Iowa, compared to the larger, more dominant meat processors in the same state.

- "Small meat processing" was fundamentally different as a sub-industry to larger meat processing in Iowa.
  - Although the local meat processing sector produced more "jobs" per animal units harvested . . .
  - Plants were not as efficient and did not make as significant contribution to the local economy

Swenson, D. 2011. *Exploring Small-Scale Meat Processing Expansion in Iowa.* Ames, IA: Iowa State University, Leopold Center for Sustainable Agriculture. Available at: http://www.iowameatprocessors.org/LeopoldExpan.pdf

Impact Assessment Scenarios

- Different ways to more rigorously use IMPLAN to analyze the local economic impact
  - With a properly specified local foods model one can **shock** that sector of IMPLAN by the jobs in that sector
  - Estimate the multiplied-through economic contribution
- A local foods scenario that involves specifying the activities that exist among producers, distributors / sellers, and different types of local consumers.
- Another analyzing supply chain components of production and distribution or sales to isolate the relative economic contributions of different stages

Analysis By Parts (ABP)

- Trying to create an entity similar to the food hubs industry sector within IMPLAN is complicated.
  - Expenditure pattern similar to that of the "transit by truck" sector (335), but a food hub takes on additional supply chain functions with a different mix of inputs

- The implication is that information is needed to develop a food hub sector and nature of transactions.
  - "Assessing the Economic Impacts of Regional Food Hubs: the Case of Regional Access" report, Schmit et al., propose utilizing an **analysis-by-parts** (ABP) approach in these situations.
  - This is also commonly called a "bill of goods" approach.

Analysis by Parts

- Defining the scope of a value-added business using ABP approach requires data on annual outlays:
  - Purchases by the business from each major industry sector, with share of expenditures purchased within local economy;
  - Payments to the value added components; and
  - Other institutional purchases (e.g., payments to households or government purchases).

- Conceptually, the component expenditures of ABPs represent the first round of indirect inter-industry purchases and payments to value added
  - Trigger additional indirect and induced effects.

Hypothetical Example of Analysis by Parts

- Allocating $100,000 in hypothetical outlays
- The first data column contains the hypothetical purchases.
- The second is important as it allocates those expenditures to suppliers within the region or lets them leak outside
- It is important, though, in the absence of information confirming such, purchases should not be set to 100% local

Sector		Industry Sales	Local Purchase Percentage
19 Support activities for agriculture and forestry	▼	$51,000.00	33.70 %
395 Wholesale trade	▼	$29,000.00	65.92 %
411 Truck transportation	▼	$9,000.00	92.05 %
525 Local government electric utilities	▼	$4,000.00	100.00 %
402 Retail - Gasoline stores	▼	$3,200.00	99.97 %
526 Other local government enterprises	▼	$2,800.00	100.00 %
448 Accounting, tax preparation, bookkeeping, a...	▼	$1,000.00	52.79 %

Module 7 Takeaways

- Competently manipulating an IMPLAN model begins with evaluating the adequacy of the baseline data

- Distinguish between measuring regional economic contributions vs. incremental gains to productivity.

- To customize a local foods sector may include creating new sectors that describe local foods actors.
  - Procuring reliable and defensible data to populate your model.

- Developing a coherent scenario of change considering all gross gains, offsets, and net outcomes.
  - Using alternative approaches, like Analysis by Parts, to compile participants' regional economic linkages