

Measuring the “Ripple Effect”: Economic Multipliers

Karen Mundy and Wayne Purcell

Like the ripples on a pond, a change in one part of the economy is felt in other parts of the economy. The impacts get smaller as they move away from the location of the shock, but they can still be significant. Economists measure the responses to an economic shock, whether positive or negative, using various types of *multipliers*. The multipliers indicate how big the changes will be in the surrounding business community.

Multipliers are based on an initial dollar invested or spent or some other unit of economic impact such as a new job. Multipliers, thus, measure impacts caused by a firm making a new investment, hiring or firing people, buying or not buying inputs, or selling or not selling outputs. Specifically, multipliers provide information about changes in the economy that reach beyond the initial action. Having measures of the total economic impact from changes, such as new investments in different types of businesses, helps economic development officials formulate policies and make decisions on what to emphasize in economic development programs.

What is measured

Economists talk about *direct*, *indirect*, and *induced* effects. The *direct* effects measure the changes as the result of the initial expansion or contraction of business activity. *Indirect* effects occur when the original firm that made a change buys supplies from other firms, pays employees, or pays another business to transport products. These two effects together are used to calculate Type I multipliers, which show the sum of the direct and indirect activities associated with the original economic stimulus. For example, assume Barry Goodbuyer, a tourist, purchases a meal at Danny’s Diner for \$15. This \$15 is the direct impact on the diner. The \$15 is used to buy the food used to prepare the meal, to pay the cook and waitress, to pay the utility bills, rent, and so forth—the indirect effects. If all of these activities occur within the geographical region being measured, such as a county or a

state, the multiplier will be larger than if some of the impacts extend beyond the region (Miller and Armbruster).

The impact does not stop with the direct and indirect impacts. Willi Waitress, who works in Danny’s Diner, spends her salary at the grocery store, the clothing store, the gas station, and elsewhere. These businesses in turn hire people who spend their income on goods and services in the local economy. This additional impact is called the *induced* impact. Induced effects are the additional impacts of spending by workers who provide inputs or deal with the outputs of the business that made the original change. This impact can reach as far as the worker running the cash register in the local food store since more cash registers will be in operation as economic activity grows and more people are employed.

Type II and Type III multipliers

Economists use Type II and Type III multipliers; they are both designed to pick up the induced effects. Whether the multiplier is labeled Type II or Type III is a function of how the induced impact is measured (Miller and Armbruster). Type II multipliers are based on the assumption that the induced effects have a linear relationship between income and consumption spending. An X percent increase in income will produce an X percent increase in consumer spending. Type III multipliers calculate the induced impact as a nonlinear relationship where an X percent increase in income will produce a Y percent change in consumer spending that is different and usually smaller than the percentage change in income (Dumas). Practically, whether a Type II or Type III multiplier is used makes little difference when small, incremental changes in income are being considered. What is important is that the induced effects get included.

Karen Mundy is REAP Communications Coordinator and Wayne Purcell is Alumni Distinguished Professor, Department of Agricultural and Applied Economics, Virginia Tech.

The sometimes confusing terms provide a clue to the complexity of multipliers. Their size is partially a function of the model used to make the calculation. REMI, RIMS II, and IMPLAN are the most popular, but many other models are available. Behind the complexity, multipliers allow comparisons across types of businesses, and significant differences in multipliers provide useful information about expected differences in total economic impact.

Measuring change

Remembering that multipliers can measure the change in total economic activity within a region is important. Figure 1 illustrates the essential concepts.¹ If Danny’s Diner receives \$50.00 from Barry Goodbuyer, who brings additional money into the community, some of that \$50.00 will remain in the community and some will not. Of the original \$50.00, \$20.00 stays in the community to pay Willi Waitress, and the remaining \$30.00 leaves the community to buy the food from an out-of-state supplier. What leaves the community is known as *leakage*. If the multiplier is being developed for the state in which the restaurant is located, leakage occurs since some impacts are outside the state and are not counted.

Picturing a set of circumstances in which the added impact would be different from 0.66 of the original \$50 is useful. The final result would be significantly different if the food being prepared in Danny’s Diner were bought from a supplier in the community rather than from one out of state. The leakages will be smaller and the multiplier larger if the supplier is local. The results will also be different if anyone who is a worker in the chain of events shows different buying behavior. If Willi is the head of a household that is struggling with an income level sufficient only to buy food and other basics, she might not buy the blouse and the multiplier could be different from 1.66.

The concept of leakage is important. As more and more people buy from the internet, local multipliers will get smaller. Local businesses and segments of the local economy will be out of the loop in internet sales. Multipliers might also be different depending on average local income levels and related spending behavior. In poor areas, where consumers spend a relatively high proportion of their income buying necessities locally rather than saving or making outside investments, the multiplier effects might be higher than in a community with high incomes that people spend outside the community.

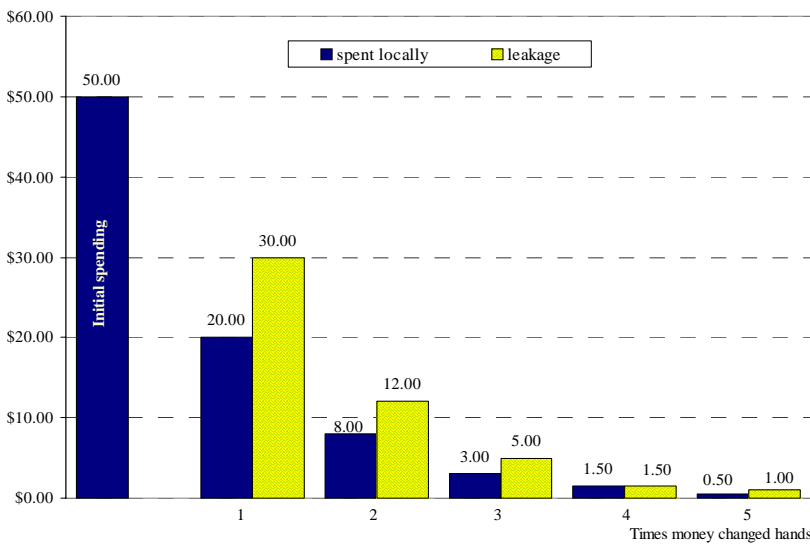


Figure 1. Money flows around the locality

Willi Waitress uses \$8.00 of her \$20.00 to buy a blouse at Dolly’s Dress Shop. Of the \$8.00 spent at Dolly’s Dress Shop, only \$3.00 remains in the community with the remaining \$5.00 going to an out-of-state clothing supplier. Dolly spends \$1.50 of the \$3.00 locally at Pete’s Pet Store. Pete, in turn, spends \$0.50 locally, and so it goes. The multiplier is 1.66: the original \$50.00 and the additional local spending of \$33.00, which is 0.66 times \$50.00 or the sum of \$20.00 + \$8.00 + \$3.00 + \$1.50 + \$0.50.

¹ Based on a figure developed by Western Rural Development Center and used in Miller and Armbruster.

Employment multipliers

Employment multipliers focus on part of the overall changes and measure the number of jobs created or lost as a result of the initial change. Many economic development strategies focus attention on the number of jobs due to a change such as a new firm moving into the area. Like the economic or total multipliers, employment multipliers do not measure some of what would be valuable detail. The employment multiplier does not, for example, always address whether the jobs are part-time, full-time, or seasonal. Employment multipliers are measured based on the number of new jobs created or on jobs per \$1 million in new final sales associated with the initial change. An employment multiplier of 2.40, for example, that is based on new jobs means 1.4 additional new jobs are being created for each new job in the original business.

In some instances, dealing with the new jobs associated with a change in final sales is easier. If the new investment prompts an estimated 27.5 new jobs (direct, indirect, and induced) per \$1 million in new sales, this type of employment multiplier clearly shows that the determining impact will be the level of new sales generated.

Income multipliers

Income or earnings multipliers measure the increase in income—wage and salary incomes, including sole proprietor’s income and rents—as the result of an increase in new business. The example from Danny’s Diner shows what

happens as the result of Willi Waitress's additional \$20.00 in income from her job as the income change prompted change throughout the local economy.

Value added multipliers

Value added multipliers estimate the employee compensation, indirect business taxes, proprietary, and other property income that occur as the result of a \$1 increase in the industry being studied. Value added multipliers are often used to measure regional contributions to the national economy. Such multipliers tend to avoid problems of double counting because they estimate only the value added by final products.

Using multipliers

How these various types of multipliers can be used can again be illustrated using Danny's Diner. Danny's Diner is a popular tourist place because its food is good; the service is fast and cheerful; and the atmosphere is relaxed and nostalgic. Located on a heavily traveled highway, Danny's Diner increased sales to tourists by \$500,000 across the last year. The direct impact of this increase is the \$500,000. Danny has to hire three more employees because of this increase in business from tourists. He has to increase his food order to his various suppliers, some of whom are local, some of whom are not. He spends more with the local advertizing company, and adds new workers and vans to provide delivery service to local motels. His water, sewer, and garbage bills increase. The indirect impact to his suppliers, his staff, and other inputs can be measured by the Type I multiplier. With a Type I income multiplier of 1.97, the *additional* economic activity generated from Danny's diner will be \$485,000 (\$500,000 times 0.97). If the more encompassing Type II or Type III income multiplier is 2.4, the total *additional* income generated would include the \$485,000 and would be larger at \$700,000 (\$500,000 times 1.4). If the Type II or Type III employment multiplier is 2.2, then 1.2 jobs are being created for each new job in the firm making a change. A total of an *additional* 3.6 (3.0 times 1.2) jobs beyond Danny's new employees would therefore be created. All these increases ripple through the local economy. The magnitude of the total impact is a function of where inputs come from and how much leakage occurs.

Multipliers are obviously useful tools. Local banks are required to invest in their communities. The impact that bank investments and loans will have on the economy of the community will vary directly with the size of the multiplier. Local

government will have state and federal block grants to encourage entrepreneurship and new business activities. Those dollars are always limited. With no additional information, the dollars should always go to a request with a business type that has an income multiplier of 3.2 rather than to a business type with an income multiplier of 1.6.

Size of multipliers

The model used to create the multipliers, the geographic area of the market they cover, the amount of economic activity in the area, and the business type will all make a difference in the size of the multiplier. Song et al. illustrate the differences in multipliers based on the area covered and type of business using IMPLAN (Table 1) for Oklahoma. Planning Districts 5 and 8 are next to each other and almost in the middle of the state. Planning District 1 is in the northeast corner. Generally, the statewide multipliers are larger than the multipliers for any one planning district. In some measures, District 1 shows smaller numbers than District 8, perhaps because of leakage across the state line for District 1. Clearly, location is a factor in how much leakage will occur.

Table 1. Type III income and employment multipliers for Oklahoma state and three planning districts, using IMPLAN

Region covered	Sector	Income	Employment
State	Livestock and Products	2.72	2.02
	Transportation equipment	1.66	1.95
	Wholesale and retail trade	1.66	1.51
Planning District 1	Livestock and Products	2.18	1.80
	Transportation equipment	1.56	1.64
	Wholesale and retail trade	1.50	1.42
Planning District 5	Livestock and Products	2.13	1.80
	Transportation equipment	1.55	1.64
	Wholesale and retail trade	1.43	1.38
Planning District 8	Livestock and Products	2.34	1.84
	Transportation equipment	1.65	2.08
	Wholesale and retail trade	1.57	1.48

Arguably, the most useful attribute of multipliers is that they vary significantly across business types (Table 2). A strategic planner looking at investments in different types of businesses needs to know, in some detail, the type of business activities involved. If detailed information is available, the issue of aggregation still has to be considered. The multiplier for a business in dairy manufacturing would be expected to be smaller than the multiplier for a more encompassing category of "livestock and products."

Table 2. Type III income and employment multipliers for New York State using IMPLAN

Sector	Total income	Employment
Dairy manufacturing	2.61	3.53
Construction	1.66	1.57
Finance, insurance, and real estate	1.19	1.54
Mining	1.09	1.82

Limitations of multipliers

Multipliers have limitations on what information they provide. They cannot identify businesses that will be profitable. They cannot determine if the business is compatible with the interests and goals of the area. They cannot determine if the locality is giving away too much in terms of buildings, sites, taxes, and so forth to get the business to locate there. They cannot identify environmentally friendly businesses. They cannot determine where the additional workers will come from to fill the new jobs. They cannot determine if the local workforce is appropriately trained for the new jobs or if the new jobs will be filled by nonresidents.

Value of multipliers

Multipliers *can* provide information on the potential economic impact that a new or expanding or closing or shrinking business might have on a community. They can help guide investments, ranging from venture capital to small loans for a new piece of equipment in an existing business, into the avenues where the economic impact on the local economy would be expected to be the biggest. The sheer magnitude of promised new business activity, arguably, should not be used as the sole determinant of what types of businesses economic developers seek to attract to the community or what type of local businesses will be provided a chance to grow. But the magnitude of economic impact is *always* going to be important when the need is for high-quality jobs that pay well. As policies are formulated and decisions made within the economy of the Commonwealth of Virginia, multipliers need to be important inputs in strategic planning and in overall economic development strategies.

The authors would like to thank Jay Sullivan, Associate Professor, Department of Forestry, for his helpful comments.

References

- Dumas, Lloyd J. "Economic Multipliers and the Economic Impact of DOE Spending in New Mexico." March 2003. Found at <http://www.nukewatch.org/facts/nwd/DumasReport033103.pdf>. Last accessed 13 Aug. 2004.
- "Economic Multipliers and the New York State Economy," *Policy Issues in Rural Land Use*. Vol. 9, No 2, Dec. 1996. Found at www.aem.cornell.edu/outreach/piilu/vol9no2.pdf. Last accessed 13 Aug. 2004.
- Hughes, David W. "Policy Uses of Economic Multiplier and Impact Analysis," *Choices*. Second quarter 2003. Found at <http://www.choicesmagazine.org/archives/2003/q2/2003-2-06.htm>. Last accessed 28 July 2004.
- Jack, Kevin, Nelson Bills, and Richard Boisvert. "Economic Multipliers and the State Economy," *Policy Issues in Rural Land Use*. Vol. 9 No. 2. Dec. 1996. Found at <http://www.aem.cornell.edu/outreach/piirlu/vol9n2.pdf>. Last accessed 13 Aug. 2004.
- Miller, Wayne P. and Tracy Armbruster. "Economic Multipliers: How Communities Can Use Them for Planning," *Economic and Community Development*. U. of Arkansas Coop. Ext. Service. Found at <http://uaex.edu>. Last accessed 13 Aug. 2004.
- Song, Booyong, Mike Woods, Gerald Doeksen, and Dean Schreiner. "Multiplier Analysis for Agriculture and Other Industries. Oklahoma Cooperative Extension Service. F-821.
- The Department of Business, Economic Development, and Tourism, State of Hawaii. "The Hawaii Input-Output Study, 1997 Benchmark Report." March 2002. Found at www.hawaii.gov/dbedt/97io/97i-o.pdf. Last accessed 13 Aug. 2004.

Notices

****Please** notify the REAP office if your address changes or if you know of anyone who would like to be added to our mailing list.

****How to reach us:** REAP, Department of Agricultural and Applied Economics 0401, Virginia Tech, Blacksburg, VA 24061; by phone: (540) 231-9443; by email: reap01@vt.edu; or on the web at <http://www.reap.vt.edu/>

HORIZONS

Virginia Polytechnic Institute
and State University
Department of Agricultural and
Applied Economics 0401
Blacksburg, VA 24061
Address Service Requested



Printed on recycled paper
VT/001/0804/3.6M/250723

Non-Profit Org.
U.S. Postage
PAID
Blacksburg, VA 24060
Permit No. 28