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**AUTHOR** Lewis, Eugene; And Others  
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**ABSTRACT**

Presenting concepts generally applicable only to small rural regions or to local economies, this publication explains multipliers, shows how they are used in calculating impacts, and provides some criteria for determining whether a given multiplier can be used in a specific situation. Following a discussion of aggregate multipliers, which lump different types of businesses together, and disaggregate models, which divide the economy into sectors with a multiplier for each sector, is a review of problems frequently encountered in applying multipliers to community change (interchanging multipliers, double counting, pyramiding, and confusing multipliers with other economic measurements, e.g., turnover and value added). The criteria stated for determining the appropriateness of a multiplier include the basis for the multiplier, i.e., local data, primary or secondary data; aggregate versus disaggregate multipliers; the basis for an employment multiplier, e.g., number of jobs or full-time equivalent; the base year on which the economic model was formulated; the function of a multiplier; the extent of the impact in relation to the size of the affected industry on which the multiplier is based; the calculator of the multiplier; and the inclusion of household income as a sector similar to the business sectors in the local economic model. (NQA)

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# Economic Multipliers: Can a rural community use them?

**Eugene Lewis, Manager/Load  
Forecasting, Montana Power Co.**

**Russell Youmans, Director,  
Western Rural Development Center**

**George Goldman, Extension  
Economist, University of California**

**Garnet Premer, Extension  
Economist, University of Wyoming**

Rapid growth and development is affecting an increasing number of western rural communities. Rapid economic and social changes often require local decision-makers serving on planning boards, county commissions, and city councils to handle increased workloads in shortened periods of time. Although few of these people are trained in economics, they are often required to decipher complex economic data.

One expression frequently used in such situations is the *economic multiplier*. Because multipliers yield quick results, they are often used in generalizing the economic impacts of change. Decisionmakers need to know whether a multiplier will provide useful information—or whether it will render misinformation. This publication will attempt to explain multipliers, show how they are used in calculating impacts, and provide some criteria for determining whether a given multiplier can be used in a specific situation. The concepts presented here are generally applicable only to small rural regions or to local economies.

## Economic multipliers

Development in a community can have economic multiplier effects beyond the direct impacts of the original project. Multipliers arise from the fact that local businesses, households, and governmental agencies purchase goods and services from one another. Such interaction within the local economy resulting from the stimulus of a new development creates indirect or multiplier effects.

The multiplier is a single number that summarizes the total direct and indirect responding effects of a given change in the local economy.

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Western Rural Development Center  
Oregon State University  
Corvallis, OR 97331  
(503-754-2621)

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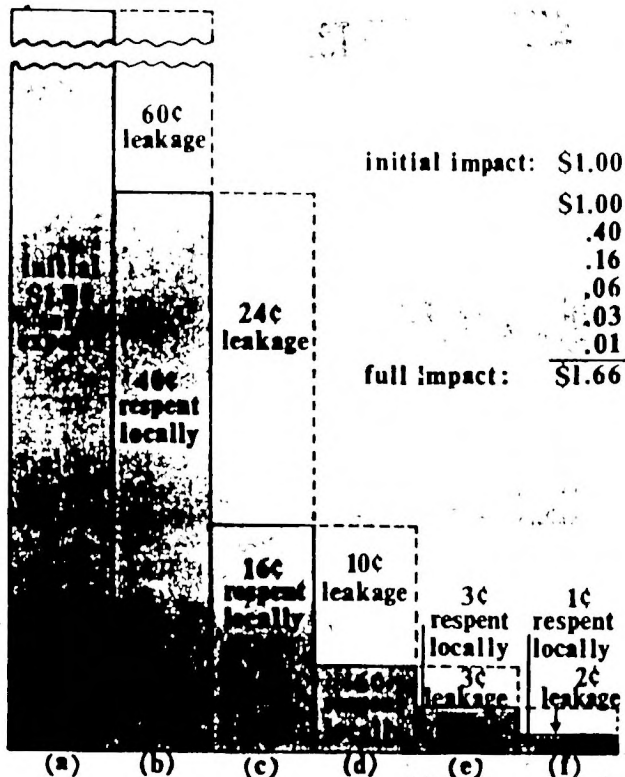


Figure 1. The multiplier concept of local responding patterns.

Figure 1 demonstrates how this concept applies. Consider a local economy in which all businesses, government agencies, and households spend 40 percent of all the money they receive on goods and services (including paying local taxes) within the area. The other 60 percent of these dollars is spent outside the community (leakage). Any dollar entering the area will stimulate an initial or direct dollar's worth of local economic activity (Figure 1(a)). As that dollar is respent, 60 percent may leave the area, and 40 percent will go to other local businesses or households (b). Thus, an additional 40¢ of local business activity will have been generated. As Figure 1 shows, the process continues with local respending of this 40¢ in the third round: 16¢ is respent in local business activity and 24¢ is leakage (c). After six successive respending, the money that circulates inside the area is less than 1¢. Totalling all these additions to local economic activity yields a total impact of \$1.66. In this case, the business multiplier for this simple economy would be 1.66 ( $1.66 \times \$1 = \$1.66$ ). That is, for every additional outside dollar that enters the local economy, a total of \$1.66 of local economic activity results.

Through the use of multipliers, then, it is possible to estimate the magnitude of the total economic effect of a given change. When doing impact analysis or some similar predictive study, it is clearly desirable to estimate the combined direct and indirect effects of a particular project.

There are many different types of multipliers, including multipliers for business, income, and employment. Most multipliers are estimated in the following way:

$$\text{multiplier} = \frac{\text{total change}}{\text{initial change}}$$

In whatever units are being considered: business dollars, number of jobs, etc. A *business multiplier* is defined as the total-change in business sales in the community resulting from the initial change in sales.

An *income multiplier* is the total change in personal income (wage and salary changes) resulting from a development. And *employment multipliers* refer to the total additional employment stimulated by the new activity.

Multipliers require an estimate of the total change produced; these estimates can range from guessing to using sophisticated economic models. The accuracy of the multiplier is a function of the kind of economic model used—how closely the model describes the economic reality of the community, and the assumptions of that specific study.

There are two general categories of multiplier models: aggregate and disaggregate. *Aggregate* multipliers lump many different types of businesses together. *Disaggregate* models divide the economy into sectors and provide a multiplier for each sector. One type of disaggregate model is referred to as an input-output model. These community economic models divide the economy of a region into separate business sectors, and estimate what each sector buys and sells from all other sectors.

For best results, a sector is composed of businesses that have similar purchase and sales patterns. This is important since different types of businesses within the community have different purchasing and sales patterns, and hence different multipliers. From this, it is possible to derive multipliers that estimate total changes in the economy caused by an increase or decrease in sales of any one sector. For example, an aggregate (economic base type) model might provide only one employment multiplier which would be expected to represent the total employment effect resulting from any outside stimulus to the economy. A disaggregate model, such as an input-output study, would provide an employment multiplier for each different economic sector.

Because disaggregate multipliers are much more specific, they are generally more trustworthy than aggregate multipliers. Accuracy required, as well as time and money available, determine whether the model will be aggregate or disaggregate. In many cases an aggregated rough estimate may be sufficient.

Economic sectors are usually further identified as basic or nonbasic. *Basic sectors* include those businesses which predominantly sell their goods and services to individuals and businesses residing or headquartered outside the local economy (export). By bringing outside dollars into the local economy, these sectors stimulate economic growth and development. *Non-basic sectors* include those businesses that exist primarily to serve local residents and business establishments. These sectors support the basic sectors and are a consequence of growth.

Although disaggregate economic multipliers can be derived for all sectors, only those for the basic sectors are relevant for estimating the total impact of a proposed development or economic change.

## Misuse of multipliers

Multipliers are often misused or misunderstood. Problems frequently encountered in applying multipliers to community change include: (1) using different multipliers interchangeably; (2) double counting; (3) pyramiding; and (4) confusing multipliers with other economic measurements, such as turnover and value added.

(1) *Interchanging Multipliers.* As mentioned earlier, multipliers can be estimated for changes in business

output, household income, and employment. These different multipliers are sometimes mistakenly used interchangeably. This should not be done, as the sizes of the multipliers are different—and they measure totally different types of activity.

(2) **Double Counting.** Unless otherwise specified, the direct effect or initial change is included in all multiplier calculations. Consider, for example, a mining business multiplier of 2.20. The 2.20 represents 1.00 for the direct effect, and 1.20 for the indirect effects. The direct effect is thus accounted for by the multiplier and should not be added into the computation (double counted). A \$440,000 total impact resulting from an increase of \$200,000 in outside income (using the above 2.20 multiplier) includes \$200,000 direct spending, plus \$240,000 for the indirect effects. The multiplier effect is sometimes thought to refer *only* to the indirect effect. In this case, the initial impact is added to the multiplier effect, and is thereby counted twice—yielding an inflated estimate of change.

(3) **Pyramiding.** A more complicated error in using multipliers is pyramiding. This occurs when a multiplier for a nonbasic sector is used, in addition to the appropriate basic sector multiplier.

For example, sugar beet processing has been a major contributor to exports in many western rural counties. Assume the local sugar beet processing plant were closed, and local officials wanted to determine the economic effect of the closing, as well as the subsequent effect upon local farmers. The multiplier for the sugar beet processing sector includes the effect upon farms raising sugar beets, because the sugar beet crop is sold to local processors and not exported. Therefore, the processing multiplier should be used to measure the impact of changes in the sugar industry on the total economy. The impact estimate would be pyramided if the multiplier for farms, whose effect had already been counted, were added to processing.

Double counting and pyramiding are particularly serious errors because they result in greatly inflated impact estimates. If inflated estimates are used in making decisions about such things as school rooms or other new facilities, the results can be very expensive, indeed.

(4) **Turnover and Value Added.** Economic measurements incorrectly used for multipliers also result in misleading analysis. Two such examples are turnover and value added. Turnover refers to the number of times money changes hands within the community. In Figure 1, for example, the initial dollar "turns over" five times; however, only part of the initial dollar is respent each time it changes hands. Someone confusing turnover with multiplier might say the multiplier is 5, when the multiplier is actually only 1.66.

Value added reflects the portion of a product's total value or price that was provided within the local community. The value added would consider the value of a local raw product—like wheat delivered to the mill—and subtract that from the total wholesale value of the flour, then figure the ratio between the two. With cleaning losses, labor, bagging, milling, etc., the wholesale value may represent several times the value of the raw product and may be a fairly large number.

## Evaluating multipliers

The determination of whether a multiplier is accurate can be a complicated procedure requiring time, extensive research, and the assistance of a trained econo-

mist. On the other hand, there are several questions that anyone who uses multipliers should ask. Essentially the test of accuracy for a multiplier is: *How closely does that multiplier estimate economic relationships in the community being considered?*

(1) **Is the multiplier based on local data, or is it an overlay?** Often, multipliers are used that were not developed specifically from data for that area. These multipliers are *overlayed* onto the area on the assumption that they will adequately reflect relationships in the economy. An example would be using the mining multiplier from a county in northwestern Wyoming to estimate a mining impact in northeastern Nevada.

A multiplier is affected by the economy's *geographic location* in relation to major trade centers. Areas where the trade center is outside the local economy have smaller multipliers than similar areas containing trade centers. Geographic obstacles enroute to trade centers also affect a local economy. Multipliers for small plains towns are smaller than those for apparently comparable mountain towns, since plains residents usually do not face the same travel obstacles as mountain residents. More services will characteristically develop in the mountain area because of the difficulty in importing services; the larger service base will lead to a large multiplier effect.

The size of the economy will influence multiplier size. A larger area generally has more businesses; thus, a given dollar is able to circulate more times before leaking than would be the case in a smaller area.

Two economies with similar population and geographic size may have quite different multipliers, depending on their respective economic structures. For example, if two areas have similar manufacturing plants, but one imports raw materials and the other buys materials locally, then the manufacturing multiplier for the two areas would be quite different.

The overlaying practice, when used appropriately, can save money and time—and produce very acceptable results. However, an area's dollar flow patterns may be so unique that overlaying will not work. Also, it is often difficult to find a similar area where impact studies have been completed so that multipliers can be borrowed readily. It is, however, worth checking.

(2) **Is the multiplier based on primary or secondary data?** Usually, there is more confidence in a multiplier estimated from data gathered in the community, as opposed to published or already collected data.

Primary data collection is expensive and time consuming. Recent research has indicated that, in some cases, there is little difference between multipliers estimated by primary or secondary data. In fact, primary data multipliers are not necessarily better than secondary data multipliers. While the type of secondary data needed for estimating multipliers may be available from existing sources, the format and/or units of measurement may not permit some multipliers to be estimated. The resulting adjustments made to use the existing data may cause errors. If secondary data is used, it may be advisable to consult individuals familiar with the data regarding its use.

(3) **Aggregate versus disaggregate multipliers.** As mentioned earlier in this publication, disaggregate multipliers are much more specific and therefore generally more trustworthy than aggregate multipliers. The accuracy required, and the time and money available most likely will determine whether the model will be aggregate or disaggregate. In many cases, an aggregated rough estimate may be sufficient.

(4) If you are dealing with an employment multiplier, is it based on number of jobs or full-time equivalent (FTE)? Employment multipliers are often considered to be the most important multipliers used in impact analysis. This is because changes in employment can be transmitted to changes in population, which in turn affect social service needs and tax base requirements. Employment multipliers can be calculated on the basis of number of jobs or on FTE. One FTE equals one person working full-time for one year.

When multipliers are calculated on a number-of-jobs basis, comparisons between industries are difficult because of different definitions of part-time workers. For example, part-time work in one industry might be four hours per day, while in another it might be ten hours per week. If calculations were based on number of jobs, a comparison of multipliers would be misleading. The conversion of jobs to FTE also helps adjust for seasonal employment in industries such as agriculture, recreation, and forestry.

(5) What is the base year on which the economic model was formulated? Inflation can affect multipliers in two ways: (1) through changes in the prices of industry inputs, and (2) through changes in the purchasing patterns produced by inflation. Each input-output multiplier assumes that price relationships between sectors remain constant over time (at least for the period under consideration). In other words, the studies estimating multipliers assume that costs change proportionally: utility prices change at nearly the same rate as the cost of food, steel, and other commodities. If some prices change drastically in relation to others, then purchasing patterns and multipliers will likely change.

Marketing patterns change slowly, however, and while they must be considered, they usually do not present a major problem unless the multiplier is several years old. The rate of growth in the local area will influence the period of use for the multipliers.

(6) What can a multiplier do? The multipliers discussed here are static in nature, as are most multipliers encountered by local decisionmakers. Static means that a multiplier can be used in "if/then" situations; they do not project the future. For example, if a new mine that employs 500 people comes into a county, then the total employment increase would be the employment multiplier times 500. A static model cannot be used to make projections about the time needed for an impact to run its course, or about the distribution of the impact over time. Static multipliers only indicate that if X happens, then Y will eventually occur.

(7) How large is the impact in relation to the size of the affected industry on which the multiplier is based? Dramatic changes in an industry's scale will usually alter markets, service requirements, and other components of an industry's spending patterns. Assume a mining sector employment multiplier of 2.0 had been developed in a rural economy having 132 FTE. If a mine were proposed several years later with an estimated 300 FTE, the multiplier of 2.0 would probably not ac-

curately reflect the change in employment because of the scale of the project relative to the industry existing when the multiplier was developed. In essence, the new industry would probably change the existing economic structure in the local area.

(8) Who calculated the multiplier—and did the person or agency doing the calculation have a vested interest in the result? Multipliers are calculated by people using statistics, and as such, there is always the opportunity to adjust the size of the multiplier intentionally. Before accepting the results of a given multiplier, take time to assess the origin of the data. Studies conducted by individuals or firms having a vested interest in the study's results deserve careful examination.

(9) Is household income included as a sector similar to the business sectors in the local economic model? The decision to include household income in the model depends upon whether or not the household sector is expected to react similarly to other sectors when the economy changes, or whether personal income is largely produced by outside forces. Discussion of this issue is too lengthy for this publication, but the important point is that multipliers from models that include household sectors are likely to be larger than those from models without household sectors.

## Conclusion

The list of questions presented here should provide a basis for evaluating the accuracy and appropriateness of a multiplier in a given situation. To make decisions in very important cases—or in cases where a multiplier appears to be problematic—it is advisable to consult someone trained in the calculation, evaluation, and use of economic multipliers.

Although multipliers must be used with care, they are helpful in evaluating economic changes within communities. They are particularly enlightening in evaluating the distribution of impact throughout a community—to identify who stands to benefit from a particular economic change—and where some concerns may lie.

This publication is part of the "Coping with Growth" series produced by the Western Rural Development Center. Other titles in the series include:

- Minimizing Public Costs of Residential Growth
- Evaluating Fiscal Impact Studies: Community Guidelines
- Coping with Rapid Growth: A Community Perspective
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