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# Expanding the Economic Base Model to Include Nonwage Income

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**Abstract.** As baby boomers retire over the next decade, the size of the population relying primarily on nonwage income will likely grow considerably. This study argues that it is important to include these income sources in descriptions of regional economies. I modify the location quotient method of calculating the base multiplier to compare the effect of nonwage income with wage and salary income. The location quotient in the expanded model changes from the traditional model by a constant factor related to the relative size of the nonwage income in the region. I demonstrate the model in six commuting zones with different compositions of personal income.

## 1. Introduction

Economic base theory has been a popular way for economic development officials, city planners, and others to describe the driving forces of a regional economy since its development in the late 1930s. Perhaps this is because, compared to other economic measures, it is easy both to calculate and to interpret. It usually uses free data published by state and federal governments and relies on the manipulation of ratios to create indices and multipliers. It is taught in schools for urban and regional planning and is included in most textbooks on economic development. It is used in some form by almost every government or other local or regional organization trying to illustrate its economy. As it is usually applied, using employment as the measure of economic activity, the model misses potential economic drivers. Nonwage income is not included in the model, yet it can be a significant factor in a regional economy. As baby boomers retire in the coming decades and rely increasingly on their investments, Social Security, and pensions for support, this form of income will become even more important to regional economies. This is particularly true for

retirement destinations and places experiencing an outmigration of younger people.

Measures can be improved, without making them more difficult to compute or interpret, by including more forms of income in the calculation. The idea of including nonwage income in economic base calculations is not new (see, for example, Sirkin, 1959). In this study I develop a practical method for doing this and demonstrate the impact it can have on the understanding of an economy.

At the foundation of economic base theory is the idea that a regional economy is supported by exports outside the region.<sup>1</sup> The exports bring money into the region and fuel economic growth. Economic growth is measured in flows, not stocks: the change in jobs, output, or personal income, not the change in the value of land, companies, or other assets. The theory assumes that an increase in exports will increase the size of the regional economy by some factor (the base multiplier). Income made by people in a region is divided into “basic” (or “non-local” or “exogenous”) income that comes

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<sup>1</sup> The veracity of this theory is debated in the conversation between Charles M. Tiebout and Douglas C. North in *The Journal of Political Economy* in April 1956.

from outside the region, and “non-basic” (or “local” or “endogenous”) income that originates inside the region. In theory, the basic income causes the region to grow economically as a portion of the income coming into the region will be spent in the local area. Most people and agencies calculating a region’s economic base focus on earned income; however, many people have noted that unearned income (income from investments, property rental, Social Security, and other transfer payments or investments) plays a part in regional economies as well (Forward, 1982; Hirschl and Summers, 1982; Mulligan and Gibson, 1984; Nelson, 1997; Nelson and Beyers, 1998; Roberts, 2003; Sirkin, 1959).

The traditional way to make economic base calculations is to use employment as the measure of economic activity. The assumption in using employment is that local jobs are associated with local income. The obvious problem when nonwage income is included is that it is not derived directly from a job. Therefore, in regions with high nonwage income the traditional method will show local industries such as restaurants or retail as basic instead of the true basic “industry”: income from nonwage sources. Using personal income instead of employment as the measure of economic activity avoids this problem. The principle is the same for employment and income: income from outside allows people to spend locally, thereby creating jobs and generating more local income (Isard, 1960). By including all income instead of only earned income (which is implied in using employment) the impact of other kinds of income becomes apparent and comparable to earned income. The expanded model presented in this study is a modified version of the location quotient method for creating an economic base model that is in common use. Like that model, it can be used to create a multiplier or it can be taken apart for industry comparison.

Across the U.S. in 2011, 34 percent of income came from nonwage sources: 18 percent from transfers such as Social Security, unemployment, Temporary Assistance for Needy Families (TANF), and other forms of income support; and 16 percent from investments such as stocks, mutual funds, savings accounts, or rent on personal or intellectual property. There is another type of nonwage income: proprietors’ income. This type of income is similar to wage and salary income in that it is earned within an industry but is not the compensation for work performed. In this paper, I treat proprietors’ income as wage and salary income and use the term nonwage income to refer only to transfer or investment

income. Counties ranged from a low of 16 percent from nonwage sources to a high of 69 percent from nonwage sources. Of the ten counties with the highest percentage of income from nonwage sources, four are in Florida. Except for three of the Florida counties, all are outside metropolitan areas.<sup>2</sup>

The county level is not the best level of analysis for economic base calculations. The model assumes that the area of analysis is a unified labor market where people both live and work. Labor markets around cities, called metropolitan or micropolitan areas, are defined based on commuting patterns (2010 Standards, 2010). Historically, the entire U.S. has been divided into “commuting zones” based on the commuting patterns reported in the decennial census tables (Tolbert and Sizer, 1996). These areas have not been updated since the mid-1990s. I have created current commuting zones using the methodology of Tolbert and Sizer (1996) and the 2006-2010 American Community Survey (ACS) 5-Year dataset. The result is 577 commuting zones that include all counties in the U.S. The commuting zones ranged from a low of 20 percent of income from nonwage sources to a high of 63 percent of income from nonwage sources. Like counties, commuting zones dependent on nonwage income also tend to be outside of metropolitan regions. Of the ten commuting zones with the highest percentage of income from nonwage sources, only two are in metropolitan areas: the Fort Meyers (Florida) Region and the Palm Beach (Florida) Region.

Including nonwage income in economic base calculations gives a more holistic view of a regional economy. This is particularly important in places with high nonwage income. In these places, it is not only the spending of workers’ income that drives residentiary businesses. It is also the spending of nonwage income. By excluding nonwage income, the traditional model overstates the impact of export industries in areas with above average nonwage income.

To illustrate the difference nonwage income can make in economic base calculations, I compare the traditional calculation with the expanded calculation in six commuting zones. I selected three categories of income: high investment income, high transfer income, and high wage and salary income. For each category, I selected a metropolitan area and a nonmetropolitan area. The commuting zones span the country: San Juan (Washington) Region, Fort

<sup>2</sup> Bureau of Economic Analysis, Local Area Personal Income and Employment, Table CA04 (2011).

Meyers (Florida) Region, Hazard (Kentucky) Region, Edinburg-McAllen (Texas) Region, Williston (North Dakota) Region, and Washington (D.C.) Region.

## 2. Economic base theory and conventional application

The premise of economic base theory is that external demand for a region's products – and the resulting income – drives its economy. Though income can enter the region through any number of channels, researchers and practitioners usually describe income by quantifying the value of exported goods and services to locations outside of the region. The value of local output can be measured in many ways (e.g., sales or revenues) but most textbooks recommend using employment<sup>3</sup> (Blair, 1995; Blakely and Bradshaw, 2002; Isard, 1960; Isard et al., 1998; Klosterman, 1990; Malizia and Feser, 1999; Richardson, 1979). The implicit idea behind this is that companies (or industries) producing more goods will hire more employees.

The economic base theory can be applied in many ways. Originally, the focus was on using the base multiplier, a calculation of how many total jobs each new basic job will create, as a forecasting tool. However its application has changed over the years (Isserman, 2000). Today, its usefulness as a forecasting tool is limited. Economic development officials and others most often use elements of the base multiplier – the location quotient and the number of basic jobs – to describe the regional economy. Its relevance as a descriptive tool is substantiated by its continued presence in economic development curricula. Most of the more recent textbooks focus on the creation and interpretation of location quotients and basic employment and less on the base multiplier as a forecasting tool.

The base multiplier is a ratio of all economic activity to all basic economic activity:

$$BM = \frac{E}{E_b} \quad (1)$$

where  $BM$  is the base multiplier,  $E$  is total economic activity, and  $E_b$  is basic economic activity. To determine the basic economic activity, each industry is parsed into production and consumption. If pro-

duction is higher than consumption, then the industry must be exporting. If consumption is higher, then the industry must serve only the local area. Measured in terms of employment, the ratio of regional employment in the industry to national employment in the industry is a proxy for production. The ratio of total regional employment to total national employment is a proxy for consumption. If a region has one percent of the nation's employment, to meet demand for a given product, for example salad dressing, it is expected that it will also have one percent of the employment in the salad dressing industry. If it has greater than one percent, then the region must be exporting. These ratios are then multiplied by the total employment in an industry to return the measurement unit to employment:<sup>4</sup>

$$b_i = E_i \left( \frac{e_i}{E_i} - \frac{e}{E} \right) \quad (2)$$

where  $b_i$  is the basic employment in industry  $i$ ,  $E_i$  is the national employment in industry  $i$ ,  $e_i$  is the regional employment in industry  $i$ ,  $E$  is total national employment, and  $e$  is total regional employment.

Basic employment is a measure of the size of an industry's impact on the local economy. Another way to look at a region's economy is to see what it is most specialized in. The location quotient compares the percent of regional employment in an industry with the percent of national employment in that industry.

$$LQ_i = \frac{e_i/e}{E_i/E} \quad (3)$$

where  $LQ_i$  is the location quotient for industry  $i$  in the region and  $E_i$ ,  $e_i$ ,  $E$ , and  $e$  are the same as in the previous equation.

The basic employment in an industry is the number of jobs that are above the national average given the size of the region. For example, if an industry has a location quotient of 2 and 100 employees in the industry in the region, then basic employment is 50. In other words, the national average is 50 and the region has twice that number: 50 residential jobs and 50 basic jobs. If an industry has a location quotient equal to or less than 1, it does not have any basic employment. Basic employment is related to the location quotient through this formula

<sup>3</sup> Another related measure that is sometimes used is annual payroll, which can correct for some productivity bias if we assume that more productive employees get paid more (Klosterman, 1990). Isard (1960) details reasons for choosing other measures, including income, in his book (pp. 124-125).

<sup>4</sup> There are other ways of calculating the base multiplier such as the minimum requirements method and the assumption method. I use the location quotient method because it is more theoretically consistent with the use of unearned income in the model. For a comparison of these methods, see Isserman (1980).

for all industries with a location quotient greater than 1.0:

$$b_i = e_i \left(1 - \frac{1}{LQ_i}\right) \quad (4)$$

There are a number of modifications that can be made to address some of the assumptions made in this model. For a fuller discussion of calculating location quotients, basic employment, the base multiplier, and the assumptions made in this model, see Isserman (1977), Isserman (1980), and Klosterman (1990). They outline several ways to relax the assumptions and make the model a better reflection of reality. Even without those adjustments, the model has proven useful for describing a regional economy. For simplicity, this study describes the model without any adjustments.

The location quotients are the most popular part of the economic base calculation and are predominantly used to describe (as opposed to forecast) local and regional economies. For example, the Washington Economic Development Commission published an economic development plan entitled “Driving Washington’s Prosperity.” To identify the state’s driving industries, they use location quotients paired with growth in the industry. They call these “anchor sectors,” and their economic development policy is written with these industries as key players in the future growth of the state (Milbergs et al., 2013) but there is no attempt to forecast the future growth of the industries based on economic base calculations.

Another popular use of the location quotient is to detect or define industry clusters. Isserman (2000) notes that the “emphasis on industrial districts, clusters of industries, innovation, and competitive advantage has affected the vanguard of planning practice in economic base analysis” (p. 184). The concept of businesses within an industry and their suppliers locating close to one another is over a century old (Marshall, [1890] 1961). It has regained currency within economic development through the work of Piore and Sabel (1984), who wrote about industrial districts in northern Italy, and, more recently, through Porter (1990), who wrote that regions become more competitive by specializing and supporting a cluster. The Washington State Office of Trade and Economic Development commissioned a report on clusters in the state (Sommers, 2001). They used location quotients in conjunction with other methods, such as interviews and focus groups, to identify the clusters in the state and define their regional

centers. The use of location quotients helped the analyst identify the major industries in the state and find their primary locations.

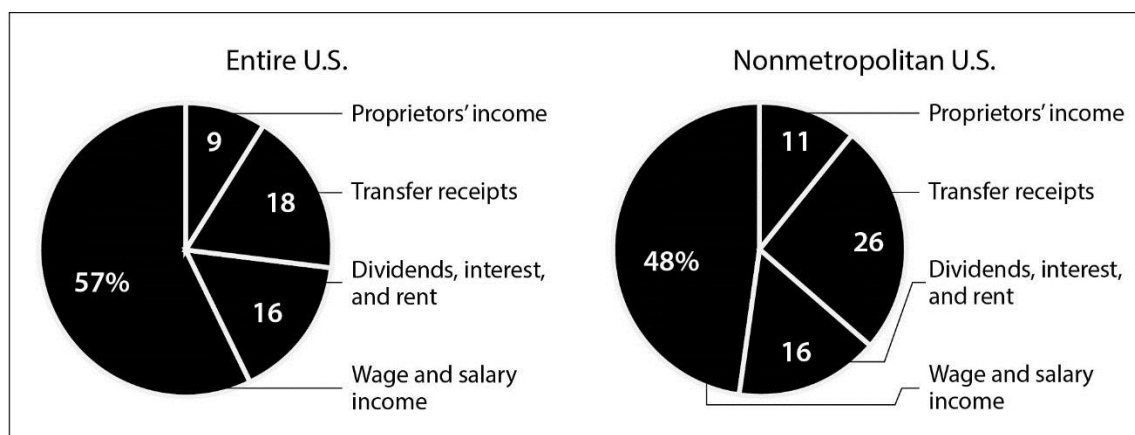
The importance of economic base theory to economic development is obvious through economic development curricula. Edwards and Bates (2011) surveyed accredited urban and regional planning departments and found that a majority of them required a course in planning methods that involved some sort of economic base analysis such as input-output. This requirement was a bit less than the requirement Kaufman and Simons (1995) found. They surveyed planning schools and practitioners about the quantitative and research methods they taught or used. They found that about 76 percent of schools taught economic base analysis, and about the same percent of practitioners responded that it was used in their office. It was one of a handful of methods that was both taught pervasively in planning programs and used throughout planning offices. Kaufman and Simon’s survey was based, in part, on a survey by Contant and Forkenbrock a decade earlier (1986). Contant and Forkenbrock also found that economic base theory was taught by over 75 percent of schools, and over 75 percent of practitioners surveyed had a high preference for the skill in their offices. They reported a similar finding by another survey in 1974 of MIT Urban Studies alumni (Schon, 1976, cited in Contant and Forkenbrock, 1986). Though some methods have changed in their prominence in planning curricula over the years, for example geographic information systems, the consistently pervasive teaching and use of economic base theory indicates its continued relevance to economic development.

Economic base theory has been an enduring part of economic development practice since its widespread use began in the middle of the 20<sup>th</sup> century. Its use has changed over the years from a way to forecast economic growth to a tool of description. The application of the method, however, can be expanded to include more than just economic activity associated with employment. The focus on employment can be misleading in some places. It may make local industries look like they are basic instead of recognizing that the true basic “industry” is not an industry at all but a form of nonwage income. In the following sections I address the importance of this type of income to many locations and illustrate how to include it in the familiar economic base model.

### 3. The impact of nonwage income on local economies

The goal of any economic base model is to describe the causes of growth in an economy. Tiebout (1956), in his response to North's 1955 paper on export base, notes that, "In defining exports allowance is made for such items as the earnings of commuters, capital flows, government transfers, and linked industries" (p. 160). The traditional method of calculating export base, however, doesn't incorporate these other forms of economic activity. A number of

researchers have found nonwage income to be important to a regional economy in empirical studies of urban and nonurban areas. In analyses of traditional economic drivers, researchers have found it as the absence of other economic activity (Walden, 2012) or as migration causing job growth (Cebula and Alexander, 2006). Some researchers have created or used complex models to include nonwage income. This study, in contrast to earlier studies, modifies a simple model that is familiar to economic development practitioners and compares the results of the traditional and expanded models.



**Figure 1.** Sources of income (2011).

From Bureau of Economic Analysis, Local Area Personal Income and Employment, Table CA04.

Wages and salaries made up about 57 percent of all personal income in the U.S. in 2011.<sup>5</sup> The rest came from nonwage sources such as dividends, interest, rent, royalties, Social Security, welfare, unemployment, and proprietorship. Nonwage income is particularly significant in nonmetropolitan areas, where an even smaller portion of personal income is made from wages and salaries. In these areas, wages and salaries made up about half (48 percent) of all personal income in 2011, and a greater portion of personal income came from transfer receipts (Figure 1).

Some types of income are exogenous of the local area while others come partially or primarily from within:

- Dividend and interest income, in most cases, flows into the area from other places in the U.S. or internationally. Even interest paid

by a local bank is often generated outside the area.

- Some income from rental property comes from within the region, for example from the renting out of an apartment by a local landlord, while other rental income comes from outside the region, for example from the royalties for a book or patent.
- Proprietors' income is income earned by sole proprietorships (a business owned by one person), partnerships (a business owned by two or more people), and tax-exempt cooperatives (a nonprofit business owned by its members). This includes farms as well. Some of these businesses sell goods and services outside the region, for example, a farmer's produce may be sold to markets across the country, while others sell their products primarily within the region, for instance a day-care provider.

<sup>5</sup> Regional Economic Information System, Bureau of Labor Statistics, Table C04 (2011).

- Transfer payments, or transfer receipts, are payments to individuals for which no service is performed. Most types of transfer payments come from outside the area. Transfer payments from the federal government to individuals include retirement and disability payments (Social Security), medical benefits (Medicare and Medicaid), unemployment, income maintenance (TANF), veterans' benefits, and grants to students. Transfer payments from businesses to individuals include liability payments for personal injury.<sup>6</sup>

Researchers have included nonwage income in other (primarily regression) models of economic base and found it to be helpful in understanding the dynamics of local economies (Forward, 1982; Hirschl and Summers, 1982; Kendall and Pigozzi, 1994; Nelson, 1997; Nelson and Beyers, 1998). These models are useful in demonstrating the importance of nonwage income to local economies. As Nelson (1997) observed of some nonmetropolitan areas in the western U.S., "While there does not appear to be a visible economic base supporting...recent growth, individuals with nonearnings income...can themselves provide an economic base to receiving communities" (p. 428). While Nelson (1997) and Nelson and Beyers (1998) focus on nonmetropolitan regions, other researchers found nonwage income to be important in metropolitan regions as well.

Hirschl and Summers (1982) and Kendall and Pigozzi (1994) found nonwage income to be a significant factor in both nonmetropolitan and metropolitan counties in the U.S. Hirschl and Summers (1982) ran two ordinary least squares regressions with nonbasic income as the independent variable, based on data for a random sample of 170 counties. They conclude that cash transfers such as Social Security should be included in economic base models. Kendall and Pigozzi (1994) created two models and applied them to Michigan's 83 counties across the years 1959 to 1986. They concluded that recipients of nonemployment income had a propensity to spend it locally, thereby growing the local economy.

Forward's (1982) study focused on metropolitan areas and indicated that nonwage income can have different effects in different places. He classified select Canadian cities of varying sizes, from Thunder Bay to Toronto, into three groups based on the type of nonwage income that was prevalent in the

area. The first group had nonwage income from pension-government (similar to transfer payments in the U.S.) and investment as a percentage of total income close to the average for Canadian cities. The second group had a high percentage of total income from pension-government but a low percentage from investment. The third group was just the opposite with a high percentage from investment but a low percentage from pension-government. He noted that both types of nonwage income are increasing.

This analysis implies a need for a method that will demonstrate its impact in comparison to wage and salary income. A few researchers have attempted this by incorporating nonwage income into economic base models of regional economies. Roberts (2003) included nonwage income in a multisector social-accounting matrix (SAM) model to demonstrate the remarkable effect of nonwage income in the Western Isles in Scotland. Mulligan and Gibson (1984) created a regression model to calculate the size of the export base and the base multiplier for small communities based on employment and data on income transfers.

Roberts (2003) found that the Western Isles relies on many types of income in addition to wage and salary income. In addition to dividends, interest, rent, and pensions, which are grouped together under the heading "private income transfers or extraregional earnings," and Social Security and other government transfers, which are included in the category "payments from government to local households," Roberts also includes other kinds of exogenous nonwage income, including payments from the Federal government to specific sectors, other Federal expenditures in the region, the wages of Federal employees in the region, and the expenditures of nonresidents when they visit the region. The drawback of input-output is that while the resulting multipliers are easy to interpret, the process of creating them requires more advanced mathematics than the location quotient method of calculating economic base.

Mulligan and Gibson (1984) outline a regression method for calculating a base multiplier for small communities based on employment and transfer payments. Mulligan (1987) applies this method to communities in Arizona and finds that transfer payments significantly affect the size of the nonbasic workforce and the base multiplier. Though quite useful, this method, as with the SAM table, requires more advanced math to calculate, and regression results can be tricky to interpret for the nonexpert.

<sup>6</sup> These definitions are based on those used by the Bureau of Economic Analysis for the Regional Economic Accounts tables.

One of the most attractive features of the location quotient method is that it can be carried out by nearly anyone with a little training and the results can be interpreted readily. Incorporating nonwage income into this simple model makes it even more useful in describing an economy.

#### 4. An economic base model that includes nonwage income

To incorporate economic activity not associated with jobs, it must be measured in dollars instead of employment. I use the location quotient method for finding basic activity since that is most compatible theoretically with nonwage income.<sup>7</sup> Just as basic activity within an industry is determined by production versus consumption, nonwage income is also broken into investment versus return on investment or taxes versus services, depending on the type of income. A base multiplier that includes nonwage income can also be constructed. This, too, more accurately reflects the range of the entire economy, since the numerator includes all economic activity. Wage and salary income supports investments and entitlement programs and vice versa.

Using the Bureau of Economic Analysis' Local Area Personal Income and Employment tables, personal income can be divided into wage and salary income (which can further be divided into industries), proprietor income (which is included in the industry figures reported in Local Area Personal Income and Employment tables), transfer income, and dividends, interest, and rent. To find basic economic activity in each industry, the formula is theoretically the same as when employment is the unit of measurement. The proxy for regional production is, instead of the region's percent of national *employment* in the industry, the region's percent of national *income* in the industry. The proxy for consumption is, instead of the region's percent of all employment nationally, the region's percent of all personal income nationally. If the region is receiving one percent of the total income of people in the industry nationwide and has less than one percent of the total national income, then the region will have some

basic activity. To return the units to personal income dollars, the difference in the ratios is multiplied by total national income in the industry if the difference is positive. If the difference is negative, the basic income is zero.

Nonwage income is not a result of production and so the model of production and consumption is not a good one. However, the same structure can be used, but the theory is different depending on the type of income. Transfer income is primarily a result of taxes. People pay taxes to the federal government and the money is used, in part, to pay Social Security, unemployment, and welfare. The nature of taxes is that some locations pay more in taxes than the benefits paid to people in the community while others pay less in taxes and receive more benefits. If a location is paying about the same percent of national taxes as the percent of benefits it is receiving, then it does not have any basic activity in this sector. However, if the locality is receiving proportionally more in benefits than it is paying in taxes, then there is some basic activity related to transfer income. To put this into the terms of personal income, the region's percent of national transfer income is a proxy for federal benefits and the region's percent of total national personal income is a proxy for the amount of taxes paid. If the benefits ratio is higher than the taxes ratio, then the location is receiving more benefits than it is paying in and therefore has basic activity from transfer income. If the difference in the two ratios is positive, then it is multiplied by total national personal income to get the amount of basic income from this source.

These proxies are not perfect. The U.S. taxes income differently for different funds. For example, Social Security is funded by a flat payroll tax that is capped (taxes are collected only up to a given amount), while welfare and other income maintenance programs are funded by a graduated income tax. This model assumes that personal income is distributed and taxed in the same way in all places. This is a reasonable assumption since much of the transfer payments are made from Social Security, which is not a graduated tax and is related to the recipient's previous income level. Another issue is that the residents may be paying taxes into one fund and receiving benefits from another fund. It is less of an issue for this type of income than for other types (since most people pay Social Security, Medicare, and other federal taxes in similar proportions) but should still be noted. While these payroll taxes are fairly uniformly applied to all earned income, aggregate income does not accurately reveal the

<sup>7</sup> There is a compelling argument to make income from some industries entirely basic (such as accommodation) or entirely nonbasic (such as local government). The difference this makes has been explored in Isserman (1980) and Klosterman (1990). They both have mixed conclusions about doing this, and therefore I leave the decision up to the practitioner. For the sake of simplicity and clarity, I use the same method to calculate basic income for all industries and do not automatically assign all income in any industry to the basic or nonbasic category.



amount of personal income tax paid. A region of 10 people earning \$10,000 would pay approximately \$630 in federal personal income tax (IRS 1040 Instructions 2013; IRS 2013 Tax Table). Four people earning \$25,000 each would pay a total of approximately \$13,282 (IRS 2013 Tax Table) and one person earning \$100,000 would pay approximately \$21,286 (IRS 2013 Tax Table). Therefore two regions with the same aggregate income could be contributing different amounts in taxes depending on the structure of the income in the region.

The other category of nonwage income is investment income. This income comes from dividends, interest, and rent. The model of production and consumption is apt for this category as well, but instead of production and consumption the model compares return on investment with investment. There are some local investment opportunities such as municipal bonds, local businesses, and local property rental that are available throughout the U.S. The return on investment for these would be local income and would be proportional to the local investment. Similarly, people invest in national and international businesses that have a local presence. Think of investing in Starbucks. The profits from a local Starbucks establishment go back to the headquarters in Seattle and the dividend is paid to the investor. The size of the dividend depends on the profitability of all Starbucks, not just the local establishment. In theory, the small contribution of the local Starbucks to the overall profit is proportional to the small dividend paid back to that community. Now let's say someone moves in from another location with a portfolio that includes some other municipal bonds, dividends from Alpina Snowmobiles, and royalties from a book. The local investment has not changed but the return to all investment has increased. In the terms of personal income, the region's percent of national income from dividends, interest, and rent is a proxy for return on investment, and the region's percent of all national personal income is a proxy for local investment. To put it into dollar terms, if the difference is positive it is multiplied by national personal income from dividends, interest, and rent.

As with taxes and benefits, these proxies are not perfect. Not all people and locations invest in the same way. Therefore the proxy for investment may not reflect exactly how a location is investing. Also, the problems related to investment and returns are more significant with this type of income. For example, the residents may be investing in property, while the return on investment is coming from

diversified mutual funds. This model lumps them into one category. It is also important to point out here that this is a model of flows, not stocks. A person who is not renting an apartment complex while it is being remodeled is earning no investment income although he or she may have considerable wealth due to the asset. Neither the traditional model nor the expanded version I am presenting here accounts for the wealth of a region.

The final type of nonwage income is only nominally nonwage. Income from proprietorships is very similar to wage and salary income in that something is produced in exchange for the income and residents or others consume the product. Some data sources include proprietor's income in all earnings income when listing personal income by industry (for example, Local Area Personal Income and Employment tables) while others do not (for example, Quarterly Census of Employment and Wages). Since it is essentially the same as wage and salary income in theory, it can be treated as the same when calculating basic activity. If it is listed separately, it can be calculated separately in the same way as wage and salary income. If proprietor's income is not broken down by industry, it has considerable problems with cross-hauling. Essentially, if the percent of income from proprietors is higher in a region than the percent of total personal income, then the region is exporting something, though we can't say what. It could just be that the percent of income from proprietorships in one industry is high, while other industries have little income from proprietorships. For many applications the ideal would be to combine income from proprietorships by industry with wage and salary income by industry.

As stated earlier, the location quotient is found by creating a ratio of the percent of national personal income in that industry (or income type) to the percent of total national personal income. The equation is identical to equation 3 with income replacing employment:

$$LQ_i = \frac{y_i/y}{Y_i/Y} \quad (5)$$

where  $LQ_i$  is the location quotient for industry  $i$ ,  $Y_i$  is the personal income in industry  $i$  nationally,  $y_i$  is the income in industry  $i$  in the region,  $Y$  is all personal income nationally, and  $y$  is all personal income in the region. It is related to the basic income calculation through equation 4 with personal income replacing employment.

The traditional model includes only wage and salary income by industry. An expanded model includes wage and salary income as well as other types of income from nonwage sources. When personal income is used in both the traditional and expanded methods, the difference between the two location quotients will be proportional to the ratio shown below:

$$LQ_{expanded} = aLQ_{traditional} \quad (6)$$

$$a = \frac{y(Y+N)}{Y(y+n)} \quad (7)$$

where  $y$  and  $Y$  are the same as in equation (5),  $n$  is all nonwage income in the region, and  $N$  is all nonwage income in the nation.

A base multiplier can be constructed by dividing all personal income in a region by the sum of basic income in all industries. A traditional multiplier using industry incomes is:

$$BM_{traditional} = \frac{y}{\sum_{b_i > 0} b_i} \quad (8)$$

where  $BM$  is the base multiplier,  $y$  is all personal income in the region, and  $b_i$  is the basic income in industry  $i$ . This multiplier may be less useful than the basic income or the location quotient calculations, since it is no longer used much in forecasting growth. However, it may still be useful for rough estimates of the effect of new jobs and, since it is measured in dollars, it may be a better gauge for the effect. The formula for the expanded base multiplier is the same except that it includes all nonwage income in the numerator on the top and all basic nonwage income on the bottom:

$$BM_{expanded} = \frac{y+n}{(\sum_{b_i > 0} b_i) + (\sum_{b_s > 0} b_s)} \quad (9)$$

where  $BM$ ,  $y$ , and  $b_i$  are as described above and  $n$  is all nonwage income,  $b_s$  is basic income in nonwage income source  $s$ . The base multiplier can increase or decrease with the addition of nonwage income. If the ratio of wage and salary income to basic wage and salary income is identical to the ratio of nonwage income to basic nonwage income, the base multiplier will remain the same. If the wage and salary ratio is larger, the base multiplier will be smaller with the addition of wage and salary income. If the nonwage ratio is larger, the base multiplier will be larger with the addition of nonwage income.

In the next section I will apply this model to six diverse commuting zones around the United States to illustrate the properties of the model described in this section and put it in the context of actual labor markets. The most important and novel aspect of this new model is the inclusion of nonwage income. Therefore I use income as the measure for both the traditional model and the expanded model.

## 5. An application of the model to six commuting zones

Across the country, nonwage income accounts for 34 percent of all income, and proprietor's income accounts for 9 percent of income (Figure 1). In non-metropolitan counties, nonwage income and proprietor's income accounts for 42 and 11 percent, respectively. Most metropolitan areas are close to the national average but many rural areas get a lot of their personal income from transfers, investments, or both. This may be due, in part, to the demographic shift that has taken place over the past few decades. Older adults and retired people get more income from nonwage sources. In some parts of the country, outmigrating younger people are leaving a primarily older population behind. In other areas, retired people are moving in to take advantage of a different lifestyle from their working life. Even places with little migration are seeing an aging population as baby boomers edge into retirement and their children give birth at lower rates.

### 5.1. Commuting Zones

While data is readily available on employment and income at the county level (for example, from the BEA Regional Economic Accounts, County Business Patterns, and the Quarterly Census of Employment and Wages), the county is rarely the ideal unit of analysis. One of the assumptions of the base multiplier is that people are living and working in the same area. Indeed, even the location quotient, which simply describes the relative concentration of industries, must be qualified if it is applied to, say, a residential suburb of a city. For cities, these labor markets are approximated by metropolitan and micropolitan areas, defined as groups of counties by the U.S. Office of Management and Budget (2010 Standards, 2010).

In nonmetropolitan counties, the county unit serves as a good approximation of the labor market when the largest city is still fairly small, the county is large, the largest city is located near the center of the county, and there are no other cities close by. It

is not a good approximation when the largest cities are close to or straddling the borders of counties. Shortly after the 1980 U.S. Census and after the 1990 U.S. Census, the U.S. Department of Agriculture's Economic Research Service created commuting zones based on the journey to work data from the decennial censuses (Tolbert and Sizer, 1996). These commuting zones essentially created labor market areas<sup>8</sup> for the entire U.S., not just the areas around cities.

I used the methodology outlined by Tolbert and Sizer (1996) for the 1990 U.S. Census (which was based on the methodology used for earlier censuses) to create commuting zones based on the county-to-county commuting flows data published by the Census Bureau for the 2006-2010 ACS (U.S. Census Bureau, 2013). I created 577 commuting zones, a decrease of 164 from Tolbert and Sizer's 741 commuting zones. This may reflect the increase in connectivity over the past 20 years or, perhaps, the increase in sprawling development. Around cities, the commuting zones share many of the counties with the metropolitan and micropolitan areas, but they are not identical.

## 5.2. Residence adjustment

I use the BEA's Local Area Personal Income because it is the one source that reports both wage and salary income and nonwage income for counties within one table (CA05N). In reporting wage and salary information, the BEA publishes a residence adjustment for the employment-related data. The adjustment is made by subtracting the outflow of wage and salary income from the inflow of wage and salary income (US Bureau of Economic Analysis, 2012). The adjustment for all counties ranges from -91 percent of wage and salary income (minus contributions to federal insurance programs) to 538 percent, with 95 percent of the counties between -70 and 123 percent. Ideally, the commuting zones should make this residence adjustment close to zero since both the place of residence and the place of work are now in the same region. By summing residence adjustment across all the counties in a commuting zone, residence adjustment as a percent of wage and salary income (also summed across counties, minus the contributions to federal insurance programs) is reduced. It ranges from -55 percent to

86 percent with 95 percent of commuting zones falling between -17 percent and 21 percent of the wage and salary income.

In this study, I adjusted wage and salary income to the place of residence by multiplying the wage and salary income in the industry by the residence adjustment ratio (RAR):

$$RAR = \frac{w-f+r}{w} \quad (10)$$

where  $w$  is the total wage and salary income summed across all the counties in the commuting zone,  $f$  is the total contributions to federal insurance programs, also summed across all the counties, and  $r$  is the residence adjustment, summed across counties. The RAR ranges from 0.40 (Bristol Bay Alaska Region, 1 county) to 1.67 (Charlottesville Virginia Region, 9 counties/cities) with 95 percent of commuting zones falling within the range 0.77 to 1.08.

## 5.3. Results in six commuting zones

I illustrate this method with regions at the extremes of these income sources: two are among the regions with the largest percent of income coming from investments; two are among the regions with the largest percent of income coming from transfers; and two are among the regions with the largest percent coming from wage and salary income. Within these three categories, I chose one metropolitan area and one nonmetropolitan area (Table 1). By using extreme regions, the differences between the two models will be most clearly illustrated.

The location quotients calculated the traditional way (using income instead of employment as the measure) reflect the industrial specializations of each location. Calculated with nonwage income included as well, the specializations changed by the ratio in equation (8). The order from most specialized to least did not change, but now the nonwage income is comparable to wage and salary income from industries (Table 2). Places with proportionally higher income from nonwage sources see location quotients above 1.0 for those types of nonwage income. The Washington D.C. Region and the Williston Region have proportionally less income from nonwage sources and so their location quotients for these income sources are below 1.0. The location quotients for the industries increased with the addition of nonwage income. Even though they are not specialized in nonwage income sources, the addition of the nonwage income gives a more accurate picture of just how dependent the economies are on the major industries.

<sup>8</sup> Tolbert and Sizer (1996) also create entities called labor market areas that are aggregations of commuting zones into regions of at least 100,000 people. I did not do this. I use both terms (commuting zone and labor market area) to refer to the commuting zones created using the Tolbert and Sizer methodology.

**Table 1.** Sources of personal income for select commuting zones (2011).

		Commuting Zone	Total Income (thousands of dollars)	Percent from wages & salaries	Percent from dividends, in- terest, & rent	Percent from transfers	Percent from proprietors*
High DIR Income	Non	San Juan Region San Juan County, WA	830,842	28.3	47.5	15.9	8.4
	Metro	Fort Meyers Region Charlotte County, FL Collier County, FL DeSoto County, FL Lee County, FL Manatee County, FL Sarasota County, FL	86,967,935	33.6	41.3	18.8	6.3
High Transfer Income	Nonmetro	Hazard Region Breathitt County, KY Knott County, KY Lee County, KY Leslie County, KY Letcher County, KY Owsley County, KY Perry County, KY Wolfe County, KY	3,238,450	45.0	7.8	43.0	4.2
	Metro	Edinburg-McAllen Region Brooks County, TX Cameron County, TX Duval County, TX Hidalgo County, TX Jim Wells County, TX Kenedy County, TX Kleberg County, TX Starr County, TX Willacy County, TX	32,027,423	47.9	9.5	32.2	10.4
High Wage & Salary Income	Nonmetro	Williston Region Richland County, MT Burke County, ND Divide County, ND McKenzie County, ND Mountrail County, ND Williams County, ND	3,633,490	73.8	12.0	9.2	5.0
	Metro	Washington D.C. Region District of Columbia Calvert County, MD Charles County, MD Prince George's County, MD St. Mary's County, MD Arlington County, VA Caroline County, VA Fairfax County, VA Fauquier County, VA King George County, VA Prince William County, VA Rappahannock County, VA Spotsylvania County, VA Stafford County, VA Warren County, VA Alexandria City, VA Fairfax City, VA Falls Church City, VA Fredricksburg City, VA Manassas City, VA Manassas Park City, VA	138,454,821	70.0	13.1	11.3	5.7

\* The personal income from proprietorships is not included in the wage and salary figure. Source: Bureau of Economic Analysis, Local Area Personal Income and Employment, Table CA05N (2011).

**Table 2.** Location quotients using the traditional and expanded methods (2011).

Fort Meyers Region			San Juan Region		
	Traditional	Expanded		Traditional	Expanded
Dividend, interest, and rent		2.55	Dividend, interest, and rent		2.94
Transfer receipts		1.05	Transfer receipts		0.88
Proprietor*		0.66	Proprietor*		0.76
Industries			Industries		
Amusement, gambling, and recr.	4.11	2.49	Accommodation	8.49	4.72
Scenic and sightseeing transp.	2.60	1.57	Private households	7.68	4.27
Private households	2.29	1.39	Construction of buildings	4.81	2.67
Furniture and home furn. stores	2.27	1.37	Food and beverage stores	4.26	2.37
Lessors of nonfin. intang. assets	2.14	1.29	Amusement, gambling, and recr.	3.61	2.01
Real estate	2.11	1.28	Bldg. matl. & garden sup. stores	3.45	1.92
Ag. and forestry support activities	2.04	1.24	Utilities	3.36	1.87
Clothing and clothing access.	1.93	1.17	Personal and laundry services	2.51	1.40
Nursing and res. care facilities	1.85	1.12	Specialty trade contractors	2.25	1.25
Accommodation	1.81	1.10	Gasoline stations	2.10	1.17
Edinburg-McAllen Region			Hazard Region		
	Traditional	Expanded		Traditional	Expanded
Dividend, interest, and rent		0.59	Dividend, interest, and rent		0.48
Transfer receipts		1.80	Transfer receipts		2.40
Proprietor*		1.13	Proprietor*		0.44
Industries			Industries		
Support activities for mining	8.86	7.83	Mining (except oil and gas)	105.79	78.99
Fishing, hunting, and trapping	4.54	4.02	Gasoline stations	2.92	2.18
Pipeline transportation	3.54	3.13	Support activities for mining	2.73	2.04
Ag. and forestry support activities	3.40	3.01	Rail transportation	2.55	1.90
Private households	2.47	2.19	Health and pers. care stores	2.52	1.88
Truck transportation	2.25	1.99	Truck transportation	1.87	1.40
Social assistance	2.12	1.87	General merchandise stores	1.79	1.33
Local government	2.09	1.85	Local government	1.49	1.11
Support activities for transp.	2.04	1.80	State government	1.46	1.09
Motor vehicle and parts dealers	2.02	1.79	Food and beverage stores	1.36	1.02
Washington D.C. Region			Williston Region		
	Traditional	Expanded		Traditional	Expanded
Dividend, interest, and rent		0.81	Dividend, interest, and rent		0.74
Transfer receipts		0.63	Transfer receipts		0.52
Proprietor*		0.82	Proprietor*		0.57
Industries			Industries		
Federal, civilian	8.42	9.67	Support activities for mining	84.87	101.37
Membership assoc. and orgs	3.86	4.44	Truck transportation	9.89	11.82
Military	2.12	2.43	Heavy and civil eng. constr.	5.98	7.15
Professional, sci., and tech. serv.	2.08	2.39	Rental and leasing services	5.57	6.66
Other serv., except pub. admin.	1.80	2.07	Fishing, hunting, and trapping	4.73	5.65
Educational services	1.54	1.77	Gasoline stations	2.33	2.79
Other information services	1.40	1.61	Forestry and logging	1.78	2.13
Accommodation	1.25	1.44	Pipeline transportation	1.76	2.10
Real estate	1.02	1.17	Specialty trade contractors	1.73	2.07
Scenic and sightseeing transp.	0.99	1.13	Wholesale trade	1.66	1.98

\* The personal income from proprietorships is included in the industry figures. It is also broken out here for ease of comparison. Source: Bureau of Economic Analysis, Local Area Personal Income and Employment, table CA05N (2011).

Among the extreme regions specialized in non-wage income, it is clearly a major part of the economy: a nonwage income source is in the top 10 specializations under the expanded method. The San

Juan, Fort Meyers, Hazard, and Edinburg-McAllen Regions all saw the location quotients for their traditional industries go down when nonwage income was added. On the other hand, in the Williston and

the Washington D.C. Regions, the location quotients went up with the addition of nonwage income. This is because the ratio described in equation (8) is under 1.0 for those regions with nonwage specialization and over 1.0 for those areas without nonwage specialization.

The calculations of the size of the economic base (Table 3) tell a different story than the location quotients. The traditional calculations show the amount of basic income that the industry is bringing into the region. The calculations that include nonwage income change the size of the basic income in each industry as well as the relative size order of the industries. This is because some industries have more income in total. A change in the location quotient will affect industries differently. For example, an industry with a small location quotient (above 1.0) but large total personal income will experience a greater reduction in the size of the economic base when the location quotient goes down than an industry with a large location quotient (above 1.0) and small total personal income. For instance, the Private Household industry in the San Juan Region had a location quotient of 7.68 in the traditional method. That dropped to 4.27 with the expanded method. The total personal income in this industry was 4.1 million. Using equation (4) this results in basic income of 3.6 million under the traditional method and 3.1 million under the expanded method. Also in the San Juan Region, the industry Specialty Trade Contractors had a location quotient of 2.25 under the traditional method and 1.31 in the expanded method. It had 21.5 million dollars in personal income. This results in 11.9 million in basic income under the traditional method and 4.3 million under the expanded method. It is possible that the addition of nonwage income will cause some location quotients that had previously been above 1.0 to dip below it, eliminating any basic income in the industry. In regions without a concentration in nonwage income, its addition can cause the opposite: industries that were below 1.0 may move above it. This adds more basic income to the base multiplier.

The inclusion of nonwage income in calculating the size of economic base activity allows the user to compare nonwage activity to wage and salary activity. The difference between the traditional model and the expanded model was dramatically illustrated in these extreme regions. Most regions have income sources much closer to the national average. If a region's proportion of personal income from nonwage sources is close to the national average, its addition will not affect the outcome of economic base

analysis greatly. However, for many areas, especially nonmetropolitan areas that are experiencing out-migration of working-age people or the in-migration of retirees, nonwage income plays a role in the regional economy.

## 6. Summary and conclusions

Including nonwage income in economic base calculations creates a more holistic picture of a region's economy. Its inclusion has been recommended by many researchers and has long been a part of the theory of economic base. The model developed in this study manifests that theory in a simple, easy to interpret model. For some locations, such as the San Juan Region, the inclusion of nonwage income makes a big difference in the location quotients of industries and the economic base calculations. Even regions like the Washington D.C. Region and the Williston Region that have highly wage-dependent economies get a clearer picture of the lack of the potentially stabilizing sources of nonwage income.

Based on the analysis, nonwage income can have a large impact on the results of economic base analysis, and its inclusion could lead to different public policies. There is a predictable relationship between the traditional and expanded location quotient models. The increase (or decrease) factor is based on the relationship between wage and salary income and nonwage income at the regional and national levels. Similarly, the base multiplier will change based on the size of the nonwage income and basic nonwage income in relationship to the wage and salary income. This means that the inclusion of nonwage income is important to places with more nonwage income than the national average, but it also means that its inclusion is important to places that are not specialized in nonwage income.

As baby boomers begin retiring over the next decade, the size of the population relying primarily on nonwage sources of income will grow. This will have many impacts on places. These impacts will be felt most acutely in rural areas without diversified economies, as people either flock to places in beautiful settings or abandon shrinking economies. The expanded model will illustrate the impact of these footloose people and allow for direct comparison between their sources of income and the wage earners.

**Table 3.** Size of economic base (in thousands) using the traditional and expanded methods.

Fort Meyers Region			San Juan Region		
	Traditional	Expanded		Traditional	Expanded
Base multiplier	5.01	3.67	Base multiplier	2.92	2.64
Dividend, interest, and rent		\$21,813,910	Dividend, interest, and rent		\$260,4374
Transfer receipts		790,671	Transfer receipts		0
Proprietor*		0	Proprietor*		0
Industries			Industries		
Ambulatory health care serv.	\$1,292,034	71,807	Local government	\$19,024	0
Local government	1,127,659	0	Construction of buildings	16,145	12,757
Food serv. and drinking places	546,810	16,897	Accommodation	15,689	14,015
Real estate	491,145	203,812	Specialty trade contractors	11,939	4,287
Specialty trade contractors	471,778	0	Food and beverage stores	9,587	7,236
Amusement, gambling, and rec.	452,254	357,667	Food and drinking places	6,657	954
Nursing and res. care facilities	358,421	83,520	Utilities	5,985	3,958
Administrative and support	323,344	0	Personal laundry services	4,889	2,308
Motor vehicle and parts dealers	287,099	42,478	Building material stores	3,627	2,442
Food and beverage stores	256,820	38,402	Private households	3,554	3,129
Edinburg-McAllen Region			Hazard Region		
	Traditional	Expanded		Traditional	Expanded
Base multiplier	3.36	3.48	Base multiplier	2.85	2.59
Dividend, interest, and rent		\$0	Dividend, interest, and rent		\$0
Transfer receipts		4,573,651	Transfer receipts		811,724
Proprietor*		379,332	Proprietor*		0
Industries			Industries		
Local government	\$1,801,045	1,585,072	Mining (except oil and gas)	\$369,231	368,036
Ambulatory health care serv.	906,057	774,024	Local government	68,595	20,849
Support activities for mining	506,562	498,119	Ambulatory health care serv.	25,836	0
Hospitals	376,238	291,046	State government	25,049	6,748
Truck transportation	243,897	218,370	Truck transportation	14,514	8,870
Motor vehicle and parts dealers	206,414	179,945	Health and personal care stores	11,714	9,092
Social assistance	196,546	173,452	General merchandise stores	11,351	6,461
General merchandise stores	120,012	97,894	Gasoline stations	9,909	8,156
Food and drinking places	115,234	57,895	Support activities for mining	9,527	7,660
Membership assoc. and orgs.	101,220	66,729	Food and beverage stores	5,611	386
Washington D.C. Region			Williston Region		
	Traditional	Expanded		Traditional	Expanded
Base multiplier	2.29	2.85	Base multiplier	1.21	1.49
Dividend, interest, and rent		\$0	Dividend, interest, and rent		\$0
Transfer receipts		0	Transfer receipts		0
Proprietor*		0	Proprietor*		0
Industries			Industries		
Federal, civilian	\$26,867,205	27,333,800	Support activities for mining	\$828,306	829,913
Professional, sci. & tech. serv.	11,131,810	12,460,136	Truck transportation	265,524	270,385
Membership assoc. and orgs	4,231,465	4,422,003	Heavy & civil eng. constr.	104,464	107,876
Other serv., except pub. admin.	3,073,468	3,567,536	Specialty trade contractors	65,615	80,264
Military	2,262,492	2,523,067	Rental and leasing services	61,490	63,679
Education services	931,483	1,154,492	Construction of buildings	23,019	29,505
Accommodation	183,545	276,503	Gasoline stations	12,362	13,872
Other information services	87,121	114,945	Pipeline transportation	4,293	5,212
Real estate	30,307	202,057	Repair and maintenance	3,080	7,787
Scenic and sightseeing transp.	0	1,588	Fishing, hunting, and trapping	2,999	3,130

\* The personal income from proprietorships is included in the industry figures. It is also broken out here for ease of comparison.

Source: Bureau of Economic Analysis, Local Area Personal Income and Employment, Table CA05N (2011).

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