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Local Multiplier and EconomicBase Anlysis

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Local multiplier and economic base analysis[1]

Per Thulin, October 2014

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1. Introduction

The economic base model and the associated local multiplier were developed during the twentieth century and may now be considered basic tools in urban and regional economics. The model is built on the observation that production is either sold locally or exported to other regions or countries. Economic activity can therefore be categorized as either belonging to the basic or the non-basic sector, where the former label is used for sectors primarily producing for the export market and the latter for sectors producing for the local market. Export draws new income and purchasing power into the local area, which gives rise to higher demand for non-traded goods and services in the region. Expanding the basic sector is therefore considered to be crucial for the region's overall economic development.

The economic base model gives a snapshot view of a region's aggregated industrial structure, but is mainly used to explain and predict overall growth effects due to exogenous shocks to the local economy. What is the total effect on the local economy when a new firm in the basic sector sets up shop in the region? To what extent will local employment be affected by the firm entry? How will local purchasing power and future housing demand be affected? Questions like these are of great importance for local politicians and businessmen who need to make plans for the future. The economic base model and the local multiplier have been developed to aid in assessing these and similar questions and, hence, help local agents to make better informed decisions.

The main assumption behind the economic base model is that all economic activity (*T*) can be sorted into two mutually exclusive sectors – one basic (*B*) and one non-basic (*NB*) sector (McCann, 2001).[2]

$$T = B + NB \tag{1}$$

The defining difference between the two sectors is their geographical range of operation, where the basic sector is assumed to operate on a much larger geographical scale than the non-basic sector. In effect, the extent and well-being of the basic sector is mainly governed by factors located outside the local area while the non-basic sector primarily is driven by local factors. Hence, firms belonging to the former sector export their goods and services across regional and sometimes national borders while firms belonging to the latter sector are engaged in serving residents and firms in the local area. Activities belonging to the basic sector are typically found in manufacturing, agriculture, mining and tourism while examples of industries mostly comprising non-basic activities include retail and personal services. One must keep in mind, though, that even fairly disaggregated industries, or even individual jobs, often include elements of both basic and non-basic activities, which of course complicates the classification into basic and non-basic sectors.

The size of the non-basic sector is to a large extent dependent on the basic sector. The connection between the two sectors is mainly attributed to different kinds of demand linkages. Increasing the number of workers in the basic sector implies that the

[2] Basic and non-basic sectors are also known as tradable and non-tradable sectors or export and non-export sectors in the literature.

aggregated purchasing power of the region will be higher and so will the demand for goods and services sold locally. The non-basic sector's dependence on the local economy can formally be captured by the expression,

$$NB = \alpha T, \qquad \alpha \in [0,1] \tag{2}$$

where α is the share of overall economic activity belonging to the non-basic sector and, hence, provides a measure of the sensitivity of economic activity in that sector to changes in the overall local economy. The base multiplier (M), defined as the ratio of total local economic activity to the economic activity in the basic sector, is obtained by combining equation (1) and (2),

$$M = \frac{T}{B} = \frac{1}{1-\alpha}. \tag{3}$$

It is easy to see how the multiplier provides us with a way of assessing total changes in the local economy originating from changes in the basic sector. If the economic base increases by ΔB, then the multiplier tells us that the total change in local economic activity will be,

$$\Delta T = M \Delta B. \tag{4}$$

A larger multiplier means that initial changes in the basic sector generate more additional overall economic activity in the region. It is because of the non-basic sector's

dependence on these linkages that the basic sector generally is regarded as the engine of local economic activity and growth. Means of strengthening and growing the local economy is therefore to develop and enhance its basic sector. However, it is important to realize that a policy aimed at attracting and retaining firms belonging to the basic sector would also have to include measures to promote good conditions for the non-basic sector. The basic sector needs the supporting services provided by the non-basic sector in order to function properly. A failure of the non-basic sector to respond appropriately to the increased demand caused by an expanding basic sector could result in a loss of basic activity and to a decline of the local economy.

The economic base theory and the local multiplier might appear seductively easy to use empirically, but as we will see they rely on rather strict assumptions and careful attention must be given to data and variable selection as well as to the difficult task of sorting economic activities into basic and non-basic sectors.

The rest of the chapter is organized as follows. Section 2 provides a short description of the historical origin of the economic base model and the local multiplier. Section 3 discusses issues pertaining to data and data selection, while Section 4 describes different ways of classifying local economic activity into basic and non-basic sectors. The economic base model has received a fair amount of critique over the years, mainly targeted towards the strict assumptions underlying the model, and many attempts have been made to modify the model in response to the critique. This is the topic of Section 5, which is devoted to weaknesses and extensions of the simple economic base model. Finally, some concluding words are given in Section 6.

2. A short historical review

This section is not intended to give a complete description of the history of the economic base model, but rather provide the reader with a number of early milestone events that helped shape the theory into what it is today. The idea that economic activity can be divided into two distinct sectors can be traced back to at least the latter part of the eighteenth century and to the physiocrats, who regarded agriculture as productive and all other economic activity as sterile. Adam Smith, of many considered to be the father of modern economics, argued that it was only the production of tangible goods that were productive while services and government was regarded as unproductive. The connection to the economic base theory is clearly visible.

The history of the modern economic base model dates back to the early twentieth century and to the writings by Werner Sombart (1916), a German economist, who distinguished between town builders (Städtegründer) and town fillers (Städtefüller).[3] Town builders were those who earned their income from outside the city while town fillers referred to those serving the local market. It was the town builders who draw income into the city and used it to purchase goods and services from the town fillers. Hence, the town fillers depended on the town builders for their livelihoods. Another early pioneer was Aurousseau (1921), who distinguished between different types of occupations for explaining the strong observed growth of cities:

> The primary occupations are those directly concerned with the function of the town. The secondary occupations are those concerned with the maintainance [*sic!*] of the well-being of the

[3] See Krumme (1968) for a review of Werner Sombart's work.

> people engaged in those of primary nature. The more primary citizens there are, the more secondary in a relation something like compound interest. (p. 574).

The work by Sombart and Aurousseau contained the seeds of the economic base theory and has been the foundation for its later development. Sombart is also considered to be one of the first economists who attempted to calculate the actual number of workers engaged in activities targeted for exports and production mainly supported by local demand. Using employment statistics for Berlin in 1907, Sombart (1927) estimated that 48.3 percent of the gainfully employed population was engaged in export activities and, hence, belonged to the town builders. Sombart's estimates imply a multiplier of approximately 2.07, i.e. there were 1.07 town fillers per town builder in Berlin year 1907 (Krikelas, 1992).[4]

Other early seminal studies of basic and non-basic sectors include Hartshorne (1936) who used employment data from secondary sources to quantify the fraction of manufacturing production that was produced for non-local consumption and the Oskaloosa study (Fortune, 1938). The latter study used census data over an entire city to calculate the origin and destination of income flows within the city as well as the destination of the business sectors' output. Especially the Oskaloosa study is still considered to be one of the most rigorous attempts to estimate local export activities yet undertaken.

One of the more complete statements of the early urban economic base model can be found in Weimer and Hoyt (1939) and Hoyt (1941), who presented the idea of a

[4] Sombart's estimates imply that the sensitivity parameter α in equation (3) is equal to 0.517.

formal mathematical relationship between employment in the basic and non-basic sector and suggested how the relationship could be used to forecast future city growth. The methodology developed by Weimar and Hoyt was quickly adopted by local authorities and planning commissions who needed a tool to estimate future population and housing demand in cities.

Kahn (1931) is one of the first studies that clearly formulate the idea of a multiplier defined as the ratio of secondary employment to primary employment. The multiplier is derived as a geometric series where part of the income earned by additional primary employment is used for payments on locally produced goods and services which in turn give rise to more secondary employment. Then part of the first round of spending is again used in a second round of spending to pay for locally produced goods and services which give rise to additional secondary employment and so on. According to Kahn (1931, p. 183) "It follows that for each man placed in primary employment, the number who receive secondary employment is $k + k^2 + k^3 + \mathrm{L} = \frac{k}{1-k}$". If we reformulate Kahn's multiplier to show the ratio of overall employment to primary employment instead of secondary to primary employment, i.e. formulated as in equation (3), we find that parameter k is equivalent to the sensitivity parameter α.

Despite the progress made during the first part of the twentieth century, the economic base model and the ensuing multiplier could hardly be regarded as a final and coherent economic theory. In an attempt to take stock of the evolution and the current state of the model and in order to highlight the strengths and weaknesses of the model, Richard B. Andrews published a series of articles in the journal *Land Economics* during the first part of the 1950s (Andrews, 1953a-c, 1954a-d, 1955 and 1956). This was a most welcome contribution to the theory of the economic base model and helped bring

together and clarify the sometimes straggly pieces of the model. In effect, Andrews' work was not only beneficial for the current understanding of the economic base model, but it also pointed out future challenges for the theory.

3. Unit of measurement and regional delimitation

In the introduction to this chapter we saw that one of the assumptions underlying the economic base model is that local economic activity (*T*) can be divided into two mutually exclusive parts – basic activity (*B*) and non-basic activity (*NB*). Hence, one of the first things we need to do if we want to use the model empirically, is to decide how to measure economic activity. Several possible units of measurement are conceivable such as employment, wages, value added, sales, gross regional product etc. It is important, though, to realize that different measurement units have their own pros and cons and it is vital to understand, or at least to be aware of, the limitations and assumptions they carry with them. The result of the analysis may differ substantially depending on which unit of measurement the analysis is based upon. As a general rule it is therefore recommended to use more than one unit of measurement if possible in order to enrich the analysis and provide better decision support for local politicians and practitioners. The presentation in this section focuses on two of the most widely used units of measurements – employment and wages – but much of the discussion is also valid for other measurement units. The section ends with a short discussion of some of the issues involved when defining regional boundaries in economic base analysis.

3.1 Employment data

Historically, and mainly due to readily available data, most economic base studies use employment as a unit of measurement when determining the size of basic and non-

basic economic activity. The number of employed has the advantage of being directly relevant for many planning purposes – infrastructure, housing etc. – but it also suffer from a range of weaknesses when used as a measure of economic activity. Some of the most obvious include the lack of distinguishing between full- and part time work, different levels of human capital and employment within different kinds of production. It is likely that full-time workers, better educated workers and those working in high-technology industries have higher wages and, as a consequence, will exert a stronger demand pressure on locally produced goods and services from the non-basic sector. In all of these cases we could therefore expect that the relative size of the non-basic sector and the multiplier to be larger. However, in an attempt to estimate the bias introduced by not adjusting employment data for differences in work time, Gibson and Worden (1981) used extensive survey data from communities in Arizona and concluded that "Analysis of multipliers generated on the basis of FTE [full-time equivalent] employment as opposed to multipliers based on data not converted to an FTE standard suggests that the FTE conversion may not in fact be essential" (p. 150).

Another less obvious problem with employment statistics is the neglect to account for asymmetric productivity changes that may cause the relative size of the basic and non-basic sectors to change over time. The manufacturing sector in particular has seen huge increases in productivity over time while the local service sector generally is characterized by none or only small productivity increases – it takes a barber approximately the same amount of time to cut hair today as it did in the beginning of the twentieth century! As production destined for export becomes relatively more productive, we can expect a given labor force employed in the basic sector to draw more income into the region and hence exert a higher demand pressure on non-basic

activities. In effect the multiplier will tend to increase over time due to asymmetric productivity changes in the local economy.

Yet another issue that needs to be taken into consideration is that employment in some industries fluctuates over the year and, hence, the point in time when the measurement is taken may also affect the estimated size of basic and non-basic employment. The tourist sector, for instance, may see much higher employment during the holiday season than during the remaining part of the year. The problem could potentially, at least to some degree, be remedied by using the average number of employment during a year or by using seasonally adjusted employment statistics.

Some of the drawbacks mentioned above can be corrected for by using full-time equivalents and estimating multipliers for different industries separately. However, it is crucial to be aware of these limitations when performing a base analysis of the local area.

3.2 Wage data

Another conceivable unit of measurement is wage sums. One advantage with this measure is that the distinction between part- and fulltime work as well as the difference between jobs requiring high- and low levels of human capital becomes less problematic. We can in effect view aggregated wages as employment weighted by hours of work and human capital intensity etc.

One problem with using wages as a measure of economic activity has to do with the purpose of performing the economic base analysis in the first place. Economic base and multiplier analysis are mainly implemented for forecasting purposes. Local politicians need to estimate the future population size or number of households to assess the demand for housing capacity, child care, schooling and other types of public

services. Using wage sums as a measure of the size of the economic base means that we need to convert between wages and employment when estimating future regional development. This raises additional questions such as how to take the income distribution into account.[5] For instance, workers earning higher income usually save a larger fraction of their income than those who have smaller incomes. Moreover, consumer preferences may differ between high income earners and low income earners. High income earners tend to spend a larger fraction of their income on locally produced personal services, generating a larger local multiplier. All this complicates the conversion between wages and employment. The use of wage sums, or any other monetary unit of measurement, also introduces the problem of separating between nominal and real changes. This in turn requires the use of price indices, which adds yet another source of uncertainty to the analysis.

Finally, wage data as well as employment statistics misses all unearned income such as interest payments, public transfer payments, rents and profits that will affect the relative size of the two sectors. The effect of this negligence may lead to severe bias in the estimates (Gibson and Worden, 1981; Mulligan, 1987 and 2010). One obvious advantage with wage statistics as compared to employment, though, is that it facilitates the adjustment for any unearned income since they both are measured in monetary terms (Leven, 1956).

3.3 Regional delimitation

Economic base analyses are highly dependent on the choice of regional delimitation. The choice of regional delimitation is to decide where the local market

[5] Andrews (1954a, p. 54) asks the question "For can the planner properly say that ten positions in the community each paying $50,000 are the economic equivalent of one hundred $5,000 positions?"

ends and the export market begins. In fact, the very phenomena of basic and non-basic activity can be viewed as endogenous with respect to the regional borders – a basic economic activity might very well become non-basic as we expand the geographical area. Since larger regions are more self-sustainable and consequently less dependent on trade across regional and national borders they are also more likely to have relatively smaller basic sectors than smaller regions. In effect, the ratio of overall regional activity to activity in the basic sector – the multiplier – will tend to be larger in larger regions and vice versa all else equal (Sirkin, 1959; Lane, 1966).

How to geographically define the region is of course important when performing an economic base analysis, but if the purpose of the analysis is to make comparisons between different regions, then it becomes imperative to implement a uniform area delimitation technique. There are several possible ways of defining the region, e.g. a city, a county, a metropolitan area, a state or a local labor market. The city in its purest form often tends to be too small to incorporate all city relevant economic activity within its borders, but it may serve as the regional unit of observation if we include its suburbs. A labor market, on the other hand, is a more coherent region generally defined as a geographical area where people can live and work without having to spend too long time commuting. The choice of regional unit is often hampered by data availability forcing the analyst to either stick with the available regional delimitation or having to collect costly data himself.

Vining (1949) provides an excellent theoretical discussion about the spatial distribution of economic activity and on the need to view larger regions or nations as the outcome of a system of smaller regions. Another study highlighting the importance of space is Neff (1949), who looks at the spatial distribution of the business cycle. Both

studies offer early theoretical considerations on the choice of area delimitations and are in that respect important contributions to the economic base theory.

4. Basic vs. non-basic sectors

The defining assumptions of the economic base theory are that all economic activity can either be classified as basic or non-basic in nature and that the non-basic sector is dependent on economic activity in the base sector. It is the theoretically motivated duality of regional economic activity that enables us to characterize a region according to its exporting–non-exporting behavior and to estimate its future development by implementing multiplier analysis. Unfortunately, the distribution of economic activities into two mutually exclusive sectors is not an easy task to do empirically. In fact, it is the most difficult task in performing an economic base analysis and is riddled by several complicating factors. For instance, firms belonging to a particular industry might sell their goods and services to customers both within the region as well as to customers in other regions. This forces the analyst to find methods to distribute the industry's overall production into the two distinct sectors. Various more or less sophisticated methods have been suggested and employed throughout the history of economic base analysis and this section describes some of the most frequently used techniques.

4.1 The assumption method

This is the easiest and least costly method of dividing economic activities into basic and non-basic sectors. Different economic activities, normally represented by broadly defined industries, are simply classified as either basic or non-basic based on the subjective judgment of the analyst. The method is both fast and inexpensive, but also susceptible to criticism due to its strong dependence on the analyst.

One recent study employing the assumption method is Moretti and Thulin (2013), who include extracting activities, mining and manufacturing industries in the basic sector and all remaining industries in the non-basic sector when estimating local employment multipliers for the US and Sweden.

4.2 The survey method

The survey method is the most straightforward, but also the most expensive method of dividing economic activity into basic and non-basic sectors. Instead of trying to estimate the size of the two sectors based on data from secondary sources, the survey method uses surveys, questionnaires and interviews to collect data from businesses and individuals directly.

One of the most famous and rigorous studies yet undertaken employing the survey method is the Oskaloosa study from 1938 (Fortune, 1938). The study investigates the circulation of money into, through, and out of the city of Oskaloosa, Iowa, USA. Data on the sources and amount of income were gathered by numerous interviews and questionnaires to both individuals and business firms. It was estimated that total business receipts were $13,942,000 of which $8,114,000 came from non-local buyers. Over $800,000 also came into the city from residents employed elsewhere (Alexander, 1954). Together this implies a local multiplier for Oskaloosa of approximately size 1.56, i.e. one additional dollar demand in Oskaloosa originating from non-local customers generates an additional demand for local goods and services of about 0.56 dollars.

The survey method is rarely used in economic base studies due to the high cost related to data collection and is probably most suited to the investigation of small single regions and not to multiple regions or more heavily populated geographical areas.

Another drawback of the method is that it gives data for just one year. If we want to have data for more than one year the costs will of course be even higher.

4.3 Location quotients

The practical problems of implementing the survey method and the assumption method's dependence on the analyst's judgment have called for additional, less costly and more objective, methods of distinguishing between basic and non-basic economic activities. One of the first pure statistical methods to be established was the use of location quotients. The location quotient, initially developed by Florence (1929), is "… a measure of the concentration of any particular industry in any given area by comparing the proportion of all occupied persons that were occupied in that industry in the given area with the corresponding proportion for the country as a whole" (Florence, 1937 p. 622). Even though both the original development of the concept as well as its later implementation normally is based on employment data, it is possible to use other measures of economic activity such as income or wages when calculating location quotients.

The location quotient for industry *i* in region *r* is computed as,

$$LQ_{i,r} = \frac{E_{i,r} / E_r}{E_{i,n} / E_n} \tag{5}$$

where E denotes employment and subscript n refers to nationwide (McCann, 2001). According to Richardson (1985), the use of location quotients to identify basic and non-basic economic activities is based on four assumptions. First, that consumption patterns are uniform across regions; second, that labor productivity is constant across regions;

third, that local demand is met by local production whenever possible and finally, fourth, that the nation can be viewed as self-sufficient economy. Given these assumptions we can interpret a location quotient greater than one as if the region produces more than it consumes locally and hence exports part of the production in that industry. Employment associated with the excess production is part of the region's basic employment whereas the remaining part belongs to the non-basic sector. We can determine region *r*'s amount of non-basic employment in industry *i* as,

$$E_{i,r}^{NB} = \left(\frac{E_{i,n}}{E_n} \right) E_r \tag{6}$$

Equation (6) states that employment used to produce goods and services for local consumption, i.e. non-basic employment $E_{i,r}^{NB}$, comprises the same share of regional employment as the industry does in the nation as a whole. The rationale behind this statement becomes clear once we recognize the assumption of a self-sufficient nation, which in turn implies that all employment is considered non-basic when we look at the nation as a whole. Basic employment in industry *i* and region *r* can then be obtained as the residual part of local employment,

$$E_{i,r}^{B} = E_{i,r} - E_{i,r}^{NB} \tag{7}$$

which we can rewrite by using equation (5) and (6) to obtain,

$$E_{i,r}^{B} = \begin{cases} \left(1 - \dfrac{1}{LQ_{i,r}}\right) E_{i,r} & if\ LQ_{i,r} \geq 1 \\ 0 & if\ LQ_{i,r} < 1 \end{cases} \tag{8}$$

We can interpret equation (8) as follows. A location quotient larger than one means that the region is relatively specialized in the corresponding industry and therefore exports part of the production to other regions within the nation. The larger the location quotient, the larger the degree of specialization and, hence, more of the industry's employment belongs to the basic sector. A location quotient smaller than one means that the region is an importer of goods and services and therefore has no basic employment in that particular industry.

Consider the hypothetical example in Table 1 to see how the location quotient method can be implemented to distinguish between basic and non-basic employment and how to use these estimates to obtain the local base multiplier.

Table 1. Locational quotients, basic and non-basic employment and the local multiplier – a hypothetical example

	Industry					
	1	2	3	4	5	Total
Local employment	7,072	3,969	2,865	880	9,649	24,435
National employment	29,748	41,375	16,436	32,990	33,365	153,914
Locational quotient	1.50	0.60	1.10	0.17	1.82	–
Basic employment	2,349	0	256	0	4,352	6,957
Non-basic employment	4,723	3,969	2,609	880	5,297	17,478
Local multiplier	–	–	–	–	–	3.51

The local region in Table 1 is specialized in industry 1, 3 and 5 and, hence, part of the industry employment belonging to these industries is devoted to export and therefore belongs to the basic sector. From the table it also follows that the local region is considered to be an importer of goods and services belonging to industry 2 and 4. Finally, the estimated multiplier suggests that one additional worker in the basic sector ultimately increases overall local employment by a total of 3.51 new jobs.

An early prominent study employing the location quotient technique is Hildebrand and Mace (1950). They estimated the size of what they phrased local and non-local employment for 37 non-consecutive months in Los Angeles County between 1940 and 1947 and then used the data in a simple linear regression to conclude that 10,000 additional workers in the non-local sector generate approximately 12,480 additional workers in the local sector. The precision of the estimate was rather good with an R-squared value of over 95 percent and a calculated 95-percentage confidence interval ranging between 11,500 and 13,400. The study by Hildebrand and Mace (1950) is considered to be a methodological breakthrough in that "… they made explicit reference to an established body of economic thought – and, by so doing, brought urban multiplier (or "base") analysis into the mainstream of economics" (Lane, 1966 p. 344).

More recent studies employing modified versions of the location quotient to identify basic and non-basic employment include Lesage and Reed (1989) who used a VAR-model to estimate the effect of basic employment on overall regional employment and Lesage (1990) and Nishiyama (1997) who estimated the relationship between basic and non-basic employment by error-correction models.

Even though numerous studies (e.g. Gibson and Worden, 1981; Davis, 1975; Isserman, 1980; Nijkamp, et al. 1986) have shown that multipliers based on the location

quotient technique tend to suffer from a substantial upward bias, the method is by far the most common way to distinguish between basic and non-basic employment. The upward bias might, however, be reduced if the analysis is based on more narrowly defined industry sectors – "The poor location quotient results stem from the use of highly aggregated census data. The overestimate may disappear if three- or four-digit SIC data were used" (Gibson and Worden, 1981 p. 156). Also Isserman (1977) highlights the importance of using disaggregated data in order to improve the estimates provided by the location quotient. Isserman (1977) further shows how employment data in LQ analyses can be adjusted in order to obtain more accurate employment multipliers.

4.4 Minimum requirement method

The minimum-requirements method, originally developed by Ullman and Dacey (1960), differs from the location quotients method described above in that it compares the local employment structure with a sample of similar sized regions rather than with the nation as a whole. The technique thus acknowledges that the relation between basic and non-basic economic activity may differ between regions of different sizes. While the use of location quotients requires industrial data for only the region under consideration and for the nation, the minimum requirements method is much more data demanding as it requires data for several comparable regions. However, the method has been a reliable tool in economic base analysis since "… it is inexpensive; it is fast; and it is reasonable accurate" (Moore, 1975, p. 350).

The first step in implementing the minimum requirements technique is to identify a number of similar sized regions. This can be done in a number of different ways ranging from the simple subjective decision by the analyst to more statistically based

methods such as the use of cluster analysis.[6] After the selection of comparable regions has been done, the next step is to calculate the relative size of industries within each region in order to find the smallest share across the set of regions for each industry – the minimum requirement. The magnitudes of the smallest shares are then identified as the minimum requirements for local consumption, i.e. non-basic economic activity. A share larger than the minimum requirement implies that part of that particular industry's production is destined for export to other regions. The hypothetical case shown in Table 2 helps explain the use of the minimum requirements method to estimate basic and non-basic activity.

Table 2a. Minimum requirements method – identifying the minimum employment shares across region A, B, C and D – a hypothetical example

	Employment				Share			
Industry	A	B	C	D	A	B	C	D
1	825	523	396	910	0.2728	0.1772	*0.1271*	0.2563
2	896	788	822	338	0.2963	0.2670	0.2639	*0.0952*
3	685	130	508	608	0.2265	*0.0441*	0.1631	0.1713
4	418	927	442	865	*0.1382*	0.3141	0.1419	0.2437
5	200	583	947	829	*0.0661*	0.1976	0.3040	0.2335
Total	3,024	2,951	3,115	3,550	1.0000	1.0000	1.0000	1.0000

Note: Minimum shares in italics.

The selection of comparable regions has already been done in Table 2 and left us with four approximately equally sized regions to perform the analysis on. The cells in italics in Table 2a indicate the minimum shares of workers for the five industries. Region C has the smallest share of workforce in industry one, 12.71 percent; region D has the smallest share in industry two and so on. The minimum requirement method thus assumes that 12.71 percent of a region's labor force is needed in industry one in order to just cover local demand for goods and services from industry one.

[6] See for instance Romesburg (2004) for an introduction to cluster analysis.

Consequently, a share larger than 12.71 percent indicates that the region exports goods and services produced in industry one. The excess labor is included in the basic sector while 12.71 percent of the labor force belongs to the non-basic sector.

Table 2b. Minimum requirements method – identifying basic and non-basic activities for Region A – a hypothetical example

Industry	Industry employment	Share	Minimum requirement	Basic employment	Non-basic employment
1	825	0.2728	0.1271	441	384
2	896	0.2963	0.0952	608	288
3	685	0.2265	0.0441	552	133
4	418	0.1382	0.1382	0	418
5	200	0.0661	0.0661	0	200
Total	3,024	1.0000	–	1,601	1,423

From Table 2b we find that region A employs 1,601 workers in the basic sector and 1,423 workers in the non-basic sector, which implies a ratio of overall employment to employment in the basic sector – the local employment multiplier – of approximately magnitude 1.89.[7]

According to Gibson and Worden's (1981) extensive comparative study of different ways to estimate local multipliers, the minimum requirements method is clearly superior as compared to location quotients. The difference between the estimated multipliers using this method and the ones based on the most elaborate adjusted survey data were within 15 percent (Gibson and Worden, 1981). They also found that the by far most accurate method of obtaining the minimum requirements is by using the so called

[7] Non-basic employment in industry *i* in region A is calculated as $E_{iA}^{NB} = MR_i \times E_A$, where MR_i denotes the minimum requirement for industry *i*. The remaining part of employment in industry *i* is consequently classified as basic.

Moore equation (Moore, 1975; Moore and Jacobsen, 1984). The method regresses the observed minimum employment share in industry i ($e_{i,r}^{\min}$) among similar sized regions on the log of median population among the same group r of regions P_r,

$$e_{i,r}^{\min} = \alpha + \beta \log P_r + \varepsilon_{i,r} \tag{9}$$

In his original study, Moore (1975) sorted all SMSAs in the US into 14 different size classes and ran regression (9) for both a number of different broad industry sectors separately as well as for the aggregated economy. The result showed a strong relationship with R-squared values ranging from 0.241 for "Retail trade" to 0.918 for "All manufacturing". The estimated relationship for overall economic activity was,

$$\hat{e}_{i,r}^{\min} = -0.20365 + 0.13783 \log P_r \tag{10}$$

with a R-squared value of 0.861. Note that we can express the multiplier in equation (3) as,

$$M = \frac{T}{B} = \frac{1}{1 - NB/T} \tag{11}$$

which enables us to use the estimated relationship between non-basic employment and regional size in equation (10) to calculate multipliers for regions of different sizes as,

$$M = \frac{1}{1-\left(-0.20365+0.13783\log P\right)} \tag{12}$$

Table 3 shows the estimated multipliers for the 14 different size classes identified by Moore (1975). The multipliers are, as expected, positively related to regional size. Larger regions tend to be more diversified and internalize a larger share of economic activity, which leads to a relatively smaller basic sector and therefore to larger overall activity in relation to basic economic activity.

Table 3. Estimated multipliers for SMSAs of different sizes in the US 1970 based on Moore's equation

Class	Median population	Multiplier
1	4,818,000	3.54
2	1,390,000	2.80
3	722,000	2.52
4	510,000	2.40
5	342,000	2.27
6	280,000	2.21
7	219,000	2.14
8	170,000	2.07
9	135,000	2.01
10	97,000	1.94
11	79,000	1.89
12	27,000	1.69
13	11,000	1.55
14	2,700	1.37

Source: Own calculations based on Moore (1975).

Despite the promising words provided by Gibson and Worden (1981), the minimum requirements technique suffers from several drawbacks. One of the most troublesome is that the method implies that all regions are exporting while no region is an importer (Pratt, 1968; Greytak, 1969; Pfister, 1980). This becomes obvious once we realize that the minimum requirement region is totally self-sufficient and that all other

regions have employment shares larger than the minimum requirement. The technique is, hence, based on the implicit assumption that all regions are fully self-sufficient in the sense that they produce goods and services to meet local demand without having to import anything from other regions.

Another drawback of the method is that overall local demand is reduced towards zero as we use more narrowly defined industries. It follows that what should be considered as an improvement in most situations – i.e. the use of more detailed data – actually may render the use of the minimum requirements method more or less useless as it makes almost all local production destined for export (Pratt, 1968).

The main difference between the minimum requirements method and the location quotient technique is that the former implies that the minimum level of activity is sufficient to meet local demand whereas the latter assumes that average activity levels are required to meet local demand. It is this difference that allows for import when using the location quotient technique but not when basing the analysis on minimum requirements.

4.5 Comparisons of methods to identify basic and non-basic activities

As illustrated above there are a number of different ways to distinguish between basic and non-basic activity when performing an economic base analysis – each method relying on its own set of more or less explicitly stated assumptions regarding local and national economic activity. The fastest and most inexpensive way to distinguish between basic and non-basic activity is the assumption method where the analyst simply decides where an economic activity belongs based on his own judgment. At the opposite end of the scale we find the survey method which gather primary data from surveys, questionnaires and interviews to estimate the size of local basic and non-basic

activity. The survey method is the most expensive and slowest method to use in an economic base analysis, but it is also the most straightforward way to obtain accurate measures of a region's production structure and multiplier. In between these two extremes lie the location quotient technique and the minimum requirements methods, both using data from secondary sources to identify the proportion of local employment needed to make the region self-sufficient. Base employment is then calculated as the residual part of overall employment, which enables the analyst to calculate the local base multiplier by comparing overall employment to employment in the basic sector.

Mathur and Rosen (1974) proposed the use of regression analysis as a new alternative way of distinguishing between basic and non-basic employment. They tested the method on the Cleveland SMSA for the period 1961–1966 and compared the result with employment shares obtained by the location quotient technique. The authors conclude that the results from the regression analysis provided better estimates of the local economic activity and a more accurate estimate of the local employment multiplier than the ones obtained by using location quotients. There have been many more attempts, beside Mathur and Rosen (1974), to refine and develop existing methods as well as create more elaborate methods to distinguish between basic and non-basic economic activity and to obtain more accurate estimates of the local base multipliers over the years.[8] A recent contribution is Mulligan (2008), who develops a new regression-based shortcut method that explicitly takes a location's industrial specialization and time into account when distinguishing between basic and non-basic employment in smaller regions. The method is subsequently tested on data from the Arizona Community Data Set and the result compared to the estimates from the other

[8] See Isserman (1980) for a survey and critique of several of these methods.

three shortcuts methods. A general conclusion from the analysis is that the new method seems to provide smaller and more precise local employment multipliers as compared to the other methods.

Most of the methods described here have been used extensively in the economic base literature, but the by far most implemented technique is the location quotients and the minimum requirements. As a general rule, though, it is probably best to use multiple methods as a robustness test to see how the estimated magnitudes of basic and non-basic activity and the ensuing local base multiplier vary with different methods.

5. Critique and extensions of the economic base model

The economic base model and the local base multiplier have been around for a long time and have received a fair amount of critique over the years. This section highlights some of the most common criticism, controversies and extensions of the simple economic base model.

5.1 A too narrow focus on export activities

The strong focus on export activities for explaining fluctuations and growth of the local economy shadows the fact that there are many other types of autonomous shocks that may have multiplier effects on the local economy (Hildebrand and Mace, 1950; Lane, 1966; Sirkin, 1959). In fact, any type of autonomous income flowing into the region will affect the local economy through repeated rounds of spending. This can be illustrated by a simple Keynesian model adapted to the local economy, where aggregate regional demand AD is determined by local consumption C, local investments I, demand from the local public sector G, local exports X and by local imports M,

$$AD = C + \bar{I} + \bar{G} + \bar{X} - M \tag{13}$$

where a bar over a variable indicates that it is autonomous. While local investments, local government spending and exports are considered autonomous in this simple model, consumption as well as imports are determined within the model and depend on the level of disposable income (*YD*),

$$C = \bar{C} + cYD \tag{14}$$

$$M = \bar{M} + mYD \tag{15}$$

where *c* and *m* denote marginal propensity to consume and import out of disposable income, respectively. Finally, disposable income is determined as total income less tax payments, which we assume are proportional to income,

$$T = tY \tag{16}$$

where *t* denotes the average tax rate. Imposing equilibrium conditions in the goods market and solving for local income yields,

$$Y = \frac{\bar{A}}{1-(c-m)(1-t)}, \quad \bar{A} = \bar{C} + \bar{I} + \bar{G} + \bar{X} - \bar{M} \tag{17}$$

From equation (17) it is obvious that changes in any one of the autonomous components included in $\bar{A}$ will have a multiplier effect on local income causing the

final change in income to be greater than the initial change in autonomous spending. Moreover, the income multiplier increases with the marginal propensity to consume and decreases with the marginal propensity to import and with the tax rate. We can in effect view spending on import, savings and taxes as leakages from the circular flow of local income – i.e. the higher the tax rate or the marginal propensity to import, the less income remains for the next round of local spending. Also, higher savings, i.e. a smaller marginal propensity to consume, will reduce the amount of spending and thereby also the multiplier.

The example clearly illustrates that regional income growth depends on more factors than income accruing from export activities. The economic base theory, however, seldom mention anything about the other channels through which a local economy might grow. As emphasized by Blumenfeld (1955), this may cause politicians to put too strong emphasis on measures to enhance the local export sector instead of implementing a more nuanced policy mix. It might also lead to inaccurate forecasts of local economic development, which again may trigger politicians to implement inadequate policy measures.

5.2 Limited attention to the supply side of the economy

Another drawback of the economic base model is the strong focus on demand without much consideration of the supply side of the local economy. The simple economic base theory assumes that there exist unlimited slack resources in the economy that immediately, and perfectly elastically, are ready to be engaged in response to increased local demand. Without this assumption, an increase in export demand would lead to higher wages in the local basic sector possibly followed by intra-regional labor

mobility from the non-basic to the basic sector as workers try to take advantage of the higher wage level in that sector (Polzin, 1977).

Two studies that explicitly included labor market consideration into the economic base analysis were Ledent (1978) and Plaut (1982). The former study regarded households not only as consumers of goods and services, but also as suppliers of labor and extended the theoretical framework to include demographic factors. The model was subsequently fitted to data for the metropolitan area of Tucson, Arizona, USA. The latter study developed a simultaneous-equation model of regional employment and wages to allow the economic base to depend on elasticities of labor demand and supply as well as on population growth. Plaut's (1982) results indicate that multipliers based on this method were much larger than those previously estimated for states in the US.

Finally it needs to be stressed that as we shift focus from short run fluctuations in economic activity to long-run economic development, we are in fact also shifting focus from fluctuations in aggregate demand to changes in the supply of production factors such as physical capital, human capital and technological innovations. Hence, when we look at the local base multiplier as a tool to forecast economic development over extended periods of time, it becomes imperative to also include the supply side of the economy into the analysis (Lane, 1966).[9]

5.3 Regression analysis and local multipliers

There are several ways to get an estimate of the local multiplier once we have decided how to distinguish between basic and non-basic employment. The simplest way

[9] See also the vivid discussion between North (1955, 1956) and Tiebout (1956a, 1956b, 1956c) on whether the economic base model should be seen as a tool to assess short term economic fluctuation or as a means to predict long-run regional growth.

is to calculate the ratio between overall local employment and employment in the basic sector for a single year (Weiss and Gooding, 1968),

$$M = \frac{T}{B} \tag{18}$$

The homogeneous linear multiplier (M) requires very strong assumptions when used for forecasting purposes since the relation between total employment (T) and employment in the basic sector (B) must remain constant over time. This simple multiplier can be improved upon if we have has access to regional employment data for two years. Then it is possible to relate total employment changes in the region to changes in basic employment between the two years to obtain a nonhomogeneous linear multiplier,

$$M' = \frac{\Delta T}{\Delta B}. \tag{19}$$

This estimator can be further improved if we have access to more than two years of regional employment data. Then it is possible to estimate the multiplier by regressing total local employment on employment in the basic sector,

$$T_t = \alpha + \widehat{M} B_t + \varepsilon_t \tag{20}$$

where α denote the intercept and ε the error term. The multiplier is given by the slope coefficient $\widehat{M}$, which represents the average change in total local employment for

a unit change in basic employment. One study employing the simple OLS-regression technique is Davidson and Schaffer (1973), who use annual employment data for Atlanta between 1961 and 1970 to obtain the following regression equation,

$$T = 16.9 + 3.3B \tag{21}$$

implying that one additional worker in Atlanta's basic sector on average generates 2.3 additional workers in the region.

The regression technique also enables us to estimate different multipliers for different types of basic employment (so called differential multipliers) by adding more explanatory variables to the regression equation (see e.g. Weiss and Gooding, 1968). Regression techniques also make it possible to distinguish between the immediate impact on total employment and effects that takes longer time to manifest themselves. One way of doing this is to use employment changes over different time spans in the regression (see e.g. McNulty, 1977), another is to include a set of lagged variables as in the VAR analysis implemented by Lesage and Reed (1989) and Roy et al. (2009).

A general problem in many studies using regression techniques to estimate the local multiplier is the failure to isolate truly exogenous variation in basic employment. Unobserved shocks to the local labor market that affect both basic and non-basic employment implies that the result from the analysis will be biased if we simply regresses total employment on basic employment. Moretti and Thulin (2013) use a shift-share instrumental variable to address the endogeneity problem and to isolate exogenous

variation in basic employment when estimating local multipliers for Sweden.[10] The main regression specification in Moretti and Thulin (2013) is given by,

$$E_{r,t}^{NB} - E_{r,t-s}^{NB} = \beta_0 + \beta_1 \left(E_{r,t}^{B} - E_{r,t-s}^{B} \right) + \beta_2 TDUM + \varepsilon_{r,t} \tag{22}$$

where subscript *r* and *t* denote region and year, respectively. Superscript *B* and *NB* stand for basic and non-basic employment and *TDUM* is a time dummy included in the regression to control for unobserved shocks to non-basic regional employment. The local employment multiplier is given by $1+\beta_1$. In their most elaborate version of the model, they use 74 basic industries (*i*) to calculate the instrument for basic employment growth in region *r* at time *t* as,

$$\sum_i E_{r,i,t-s}^{B} \left(\ln\left(E_{i,t}^{B} - E_{r,i,t}^{B} \right) - \ln\left(E_{i,t-s}^{B} - E_{r,i,t-s}^{B} \right) \right). \tag{23}$$

Hence, the instrument isolates the variation in local employment that follows from nationwide employment changes in industry *i*.[11] The instrument identifies exogenous changes in local basic employment because nationwide changes are not likely to be affected by local economic conditions. The multipliers were generally somewhat larger in size and more precisely estimated as compared to the multipliers obtained without using the instrument.

[10] See also Moretti (2010).

[11] Note that nationwide changes are computed excluding region *r*.

6. Some concluding words

The economic base model and the local multiplier have been around for a long time and are still used today.[12] The model is founded on the notion of a duality in regional economic activity. Some firms are dependent on the local market for their existence while other firms compete on the national or global market. It is the latter type of firms – belonging to the basic sector – that draw new money and purchasing power into the region and thereby raising demand for services and products produced by the former type of firms – belonging to the non-basic sector. Means of strengthening and growing the local economy is therefore to develop and enhance its basic sector. The local multiplier is a measure of the strength of the local economy's dependence on its basic sector – it tells us how much overall regional economic activity is affected by a unit change in its basic sector activity.

The economic base model has been the object of a fair amount of critique since it was first developed at the beginning of the twentieth century, but it has also continually evolved in response to the critique. On a theoretical ground, the model has for example been criticized for not recognizing other sources of autonomous shocks to the local economy than export and for having too strong focus on the demand side of the economy. Attempts have been made to expand the simple economic base model to also allow for these types of effects. One longstanding empirical problem has been to classify economic activity into basic and non-basic sectors. Several shortcut methods have been developed such as location quotients and the minimum requirement methods,

[12] See e.g. Robertson's (2003) extensive study of small forest communities in Alaska; Magnan and Seidl (2004) and Watson and Seidl (2004) for base studies of Colorado counties; Roy et al. (2009) for an economic base study of Newfoundland's fishing industry and Windsor (2005) for an analysis of the Windsor and Essex County region.

but the result has many times been shown to deviate substantially from the true distribution. However, economic base studies are likely to continue to progress as access to more detailed data becomes available and more elaborate econometric tools are being developed.

Some future challenges for the theory probably include a better understanding of the spatial distribution of local multipliers, e.g. to what extent multipliers are clustered in space and how regional spillover effects affect the magnitude of multipliers (see e.g. Olfert and Stabler, 1999; Biles, 2003; Çubukçu, 2011). Another valuable line of inquiry is to further disentangle the role non-basic activity, as compared to basic economic activity, has for a region's growth (Rutland and O'Hagan, 2007).

References

Alexander, J.W. (1954), 'The Basic-Nonbasic Concept of Urban Economic Functions', *Economic Geography*, **30**(3), 246–261.

Andrews, R.B. (1953a), 'Mechanics of the Urban Economic Base: Historical Development of the Base Concept', *Land Economics*, **29**(2), 161–167.

Andrews, R.B. (1953b), 'Mechanics of the Urban Economic Base: The Problem of Terminology', *Land Economics*, **29**(3), 263–268.

Andrews, R.B. (1953c), 'Mechanics of the Urban Economic Base: A Classification of Base Types', *Land Economics*, **29**(4), 343–350.

Andrews, R.B. (1954a), 'Mechanics of the Urban Economic Base: The Problem of Base Measurement', *Land Economics*, **30**(1), 52–60.

Andrews, R.B. (1954b), 'Mechanics of the Urban Economic Base: General Problems of Base Identification', *Land Economics*, **30**(2), 164–172.

Andrews, R.B. (1954c), 'Mechanics of the Urban Economic Base: Special Problems of Base Identification', *Land Economics*, **30**(3), 260–269.

Andrews, R.B. (1954d), 'Mechanics of the Urban Economic Base: The Problem of Base Area Delimitation', *Land Economics*, **30**(4), 309–319.

Andrews, R.B. (1955), 'Mechanics of the Urban Economic Base: The Concept of Base Ratios', *Land Economics*, **31**(1), 47–53.

Andrews, R.B. (1956), 'Mechanics of the Urban Economic Base: The Base Concept and the Planning Process', *Land Economics*, **32**(1), 69–84.

Aurousseau, M. (1921), 'The Distribution of Population: A Constructive Problem', *Geographical Review*, **11**(4), 563–592.

Biles, J.J. (2003), 'Using Spatial Econometric Techniques to Estimate Spatial Multipliers: An Assessment of Regional Economic Policy in Yucatán, Mexico', *The Review of Regional Studies*, **33**(2), 121–141.

Blumenfeld, H. (1955), 'The Economic Base of Metropolis: Critical Remarks on the "Basic-Non-basic" Concept', *Journal of the American Institute of Planners*, **21**(4), 114–132.

Çubukçu, K.M. (2011), 'The Spatial Distribution of Economic Base Multipliers: A GIS and Spatial Statistics-based Cluster Analysis, *A|Z ITU Journal of the Faculty of Architecture*, 8(2), 49–62.

Davidson, L.S. and W.A. Schaffer (1973), 'An Economic-Base Multiplier for Atlanta, 1961-1970', *Atlanta Economic Review*, **23**(4), 52–54.

Davis, H.C. (1975), 'Economic Base and Input-Output Multipliers – A Comparison for Vancouver, B.C.', *The Annals of Regional Science*, **9**(3), 1–8.

Florence, P.S. (1929), *The Statistical Method in Economics and Political Science*. Harcourt Brace and Company: New York.

Florence, P.S. (1937), 'Economic Research and Industrial Policy', *The Economic Journal*, **47**(188), 621–641.

Fortune (1938), 'Oskaloosa vs. the United States', April, 55–62.

Gibson, L.J and M.A. Worden (1981), 'Estimating the Economic Base Multiplier: A Test of Alternative Procedures', *Economic Geography*, **57**(2), 146–159.

Greytak, D. (1969), 'A Statistical Analysis of Regional Export Estimating Techniques', *Journal of Regional Science*, **9**(3), 387–395.

Hartshorne, R. (1936), 'A New Map of the Manufacturing Belt of North America', *Economic Geography*, **12**(1), 45–53.

Hildebrand, G.H. and A. Mace Jr. (1950), 'The Employment Multiplier in an Expanding Industrial Market: Los Angeles County, 1940–47', *Review of Economics and Statistics*, **32**(3), 241–249.

Hoyt, H. (1941), 'Economic background of Cities', *The Journal of Land & Public Utility Economics*, **17**(2), 188–195.

Isserman, A.M. (1977), 'The Location Quotient Approach to Estimating Regional Economic Impacts', *Journal of the American Institute of Planners*, **43**(1), 33–41.

Isserman, A.M. (1980), 'Estimating Export Activity in a Regional Economy: A Theoretical and Empirical Analysis of Alternative Methods', *International Regional Science Review*, **5**(2), 155–184.

Kahn, R.F. (1931), 'The Relation of Home Investment to Unemployment', *Economic Journal*, **41**(162), 173–198.

Krikelas, A.C. (1992), 'Why Regions Grow: A Review of Research On the Economic Base Model', *Economic Review*, Federal Reserve Bank of Atlanta, 16–29.

Krumme, G. (1968), 'Werner Sombart and the Economic Base Concept', *Land Economics*, **44**(1), 112–116.

Lane, T. (1966), 'The Urban Base Multiplier: An Evaluation of the State of the Art', *Land Economics*, **42**(3), 339–347.

Ledent, J. (1978), 'Regional Multiplier Analysis: A Demometric Approach', *Environment and Planning A*, **10**(5), 537–560.

Lesage, J.P. (1990), 'Forecasting Metropolitan Employment Using an Export-Base Error Correction Model', *Journal of Regional Science*, **30**(3), 307–323.

Lesage, J.P. and J.D. Reed (1989), 'The Dynamic Relationship Between Export, Local, and Total Area Employment', *Regional Science and Urban Economics*, **19**(4), 615–636.

Leven, C.L. (1956), 'Measuring the Economic Base', *Papers in Regional Science*, **2**(1), 250–258.

Magnan, N. and A. Seidl (2004), 'The Economic Base of Montezuma County, Colorado', *Economic Development Report 04–02*, Colorado State University.

Mathur, V.K. and H.S. Rosen (1974), 'Regional Employment Multiplier: A New Approach', *Land Economics*, **50**(1), 93–96.

McCann, P. (2001), *Urban and Regional Economics*. Oxford University Press: Oxford.

McNulty, J.E. (1977), 'A Test of the Time Dimension in Economic Base Analysis', *Land Economics*, **53**(3), 359–368.

Moore, C.L. (1975), 'A New Look at the Minimum Requirements Approach to Regional Economic Analysis', *Economic Geography*, **51**(4), 350–356.

Moore, C.L. and M. Jacobsen (1984), 'Minimum Requirements and Regional Economics, 1980', *Economic Geography*, **60**(3), 217–224.

Moretti, E. (2010), 'Local Multipliers', *American Economic Review*, **100**(3), 1–7.

Moretti, E. and P. Thulin (2013), 'Local Multipliers and Human Capital in the United States and Sweden', *Industrial and Corporate Change*, **22**(1), 339–362.

Mulligan, G. (1987), 'Employment Multipliers and Functional Types of Communities: Effects of Public Transfer Payments', *Growth and Change*, **18**(3), 1–11.

Mulligan, G. (2008), 'A New Shortcut Method for Estimating Economic Base Multipliers', *Regional Science Policy & Practice*, **1**(1), 67–84.

Mulligan, G. (2010), 'Regional Analysis', pp. 335–353 in B. Gomez and J.P. Jones III (eds.) *Research Methods in Geography*. Wiley-Blackwell: Oxford.

Neff, P. (1949), 'Interregional Cyclical Differentials: Causes, Measurement, and Significance', *American Economic Review*, **39**(3), 105–119.

Nijkamp, P., Rietveld, P. and F. Snickars (1986), 'Regional and Multiregional Economic Models: A Survey', pp. 257–294 in P. Nijkamp (ed.) *Handbook in Regional and Urban Economics, vol.1*. North Holland: Amsterdam.

Nishiyama, Y. (1997), 'Exports' Contribution to Economic Growth: Empirical Evidence for California, Massachusetts, and Texas, Using Employment Data', *Journal of Regional Science*, **37**(1), 99–125.

North, D.C. (1955), 'Location Theory and Regional Economic Growth', *Journal of Political Economy*, **63**(3), 243–258.

North, D.C. (1956), 'Exports and Regional Economic Growth: A Reply', *Journal of Political Economy*, **64**(2), 165–168.

Olfert, M.R. and J.C. Stabler (1999), 'Multipliers in a Central Place Hierarchy', *Growth and Change*, **30**(2), 288–302.

Pfister, R.J. (1980), 'The Minimum Requirements Technique of Estimating Exports: A Further Evaluation', pp. 54–67 in S. Pleeter (ed.), *Economic Impact Analysis: Methodology and Applications*. Martinus Nijhoff: Amsterdam.

Plaut, T.R. (1982), 'Economic Base, Labor Force Migration and Regional Employment Growth in the United States', *Papers in Regional Science*, **50**(1), 75–94.

Polzin, P.E. (1977), 'A Two-Sector Approach', *Growth and Change*, **8**(1), 11–15.

Pratt, R.T. (1968), 'An Appraisal of the Minimum-Requirements Technique', *Economic Geography*, **44**(2), 117–124.

Richardson, H.W. (1985), 'Input-Output and Economic Base Multipliers: Looking Backward and Forward', *Journal of Regional Science*, **25**(4), 607–661.

Robertson, G.C. (2003), 'A Test of the Economic Base Hypothesis in the Small Forest Communities of Southeast Alaska', *General Technical Report PNW-GTR-592*, United States Department of Agricultural.

Romesburg, H.C. (2004), *Cluster Analysis for Researchers*. North Carolina, USA: Lulu.com.

Roy, N., Arnason, R. and W.E. Schrank (2009), 'The Identification of Economic Base Industries, with an Application to the Newfoundland Fishing Industry', *Land Economics*, **85**(4), 675–691.

Rutland, T. and S. O'Hagan (2007), 'The Growing Localness of the Canadian City, or, On the Continued (Ir)relevance of Economic Base Theory', *Local Economy*, **22**(2), 163–185.

Sirkin, G. (1959), 'The Theory of the Regional Economic Base', *Review of Economics and Statistics*, **41**(4), 426–429.

Sombart, W. (1916), *Der Moderne Kapitalismus, Erster Band: Die Vorkapitalistische Wirtschaft* (2d. rev. ed.). Munich, Germany: Duncker & C. Humblot.

Sombart, W. (1927), *Der Moderne Kapitalismus, Dritter Band: Das Wirtschaftsleben in Zeitalter des Hochkapitalismus* (2d. rev. ed.). Berlin, Germany: Duncker & C. Humblot.

Tiebout, C.M. (1956a), 'Exports and Regional Economic Growth', *Journal of Political Economy*, **64**(2), 160–164.

Tiebout, C.M. (1956b), 'Exports and Regional Economic Growth: Rejoinder', *Journal of Political Economy*, **64**(2), 169.

Tiebout, C.M. (1956c), 'The Urban Economic Base Reconsidered', *Land Economics*, **32**(1), 95–99.

Ullman, E.L. and M.F. Dacey (1960), 'The Minimum Requirements Approach to the Urban Economic Base', *Papers in Regional Science*, **6**, 175–194.

Vining, R. (1949), 'The Region as an Economic Entity and Certain Variations to Be Observed in the Study of Systems of Regions', *American Economic Review*, **39**(3), 89–104.

Watson, P. and A. Seidl (2004), 'The Economic Base of Moffat County, Colorado', *Economic Development Report 04–09*, Department of Agricultural and Resource Economics, Colorado State University.

Weimer, A.M. and H. Hoyt (1939), *Principles of Urban Real Estate*. New York, USA: The Ronald Press Company.

Weiss, S.J. and E.C. Gooding (1968), 'Estimation of Differential Employment Multipliers in a Small Regional Economy', *Land Economics*, **44**(2), 235–244.

Windsor (2005), 'Windsor Essex County: Economic Base Analysis 2000–2004', Matthew Fischer & Associates Inc., Economic Development Solutions.

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