

January 2003

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Peter Calcagno
College of Charleston

Barry Cuffe
Wingate University

Lisa Schwartz
Wingate University

Jeffrey von Freymann
Wingate University

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Recommended Citation

Calcagno, Peter; Cuffe, Barry; Schwartz, Lisa; and von Freymann, Jeffrey (2003) "Practical Assessment of the Economic Impact of Healthcare Investment: A Case Study Approach," *Southern Business Review*: Vol. 28 : Iss. 2 , Article 5.

Available at: <https://digitalcommons.georgiasouthern.edu/sbr/vol28/iss2/5>

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Practical Assessment of the Economic Impact of Healthcare Investment: A Case Study Approach

Peter Calcagno, Barry Cuffe, Lisa Schwartz, and Jeffrey von Freymann

For years, academics and practitioners have argued the social need and benefits of healthcare spending. Economists and medical researchers question the value of such spending, claiming small marginal benefits to the population's health relative to costs. Previous studies tend to address healthcare costs relative to benefits without considering the overall economic

benefit to the community. While the investment-versus-health-gain debate continues, few articles deal with the actual beneficial short-and long-term impact on the economy of the additional economic activity generated by the healthcare investment itself.

Healthcare investment may be especially critical to small, rural communities. This paper offers a guide to examining the economic impact of healthcare spending by providing a case study on Union Regional Medical Center (URMC) in Union County, North Carolina. It analyzes and reports the effects of healthcare and, specifically, hospital spending. The paper demonstrates how IMPLAN Pro™, a software model developed by the Minnesota IMPLAN Group, utilizes data to perform input/output analysis to evaluate the impact of investment and measure the resulting economic activity generated within the community. Based upon the significant positive contribution of the healthcare industry to the economy of Union County,

North Carolina, this study suggests that practitioners should evaluate the economic impact as a primary consideration, at least for rural healthcare investment.

Literature Review

The existing literature regarding healthcare spending focuses on two main areas: 1) various debates over whether and how public spending on healthcare should occur (Fuchs, 1998; and Arrow, 1963); and, 2) investigations of the economic consequences of healthcare spending (Auster et al., 1969; Emanuel, 1996; Cutler et al., 1998; and Cremieux et al., 1999). Papers in the former group address whether the benefits to society are commensurate with the amount of public spending on health service, or whether there is a significant difference in the population's health depending on the manner in which funds are distributed to various constituents within the healthcare industry. Brief reviews of both areas of the literature are presented, but it is the economic impact of healthcare investment on which this article concentrates.

Peter Calcagno, Ph.D., is assistant professor of economics, Department of Economics and Finance, College of Charleston, Charleston, SC 29424.

Barry Cuffe, Ph.D., is professor of management science, School of Business, Wingate University, Wingate, NC 28174.

Lisa Schwartz, Ph.D., is assistant professor of finance, School of Business, Wingate University, Wingate, NC 28174.

Jeffrey von Freymann, D.B.A., is assistant professor of marketing, School of Business, Wingate University, Wingate, NC 28174.

Spending and Outcomes

Fuchs (1998) discussed the challenges that nations face in the efficient and effective allocation of limited health resources. De Milto (2000) and Kolata (2000) argued that societal benefits of healthcare spending would be greatly enhanced by shifts in focus from technology to service and from care to prevention. Arrow (1963) and Haan et al. (1987) addressed a variety of socio-economic factors that influence the overall effectiveness of healthcare. Conflicting evidence exists as to how healthcare dollars should be spent. Bunker et al. (1994), Blomqvist and Carter (1997), and McClellan and Newhouse (1997) all claim that more needs to be done to investigate the cost-effectiveness and application of preventative versus curative services. Yet, most taxpayers are reluctant to pay higher taxes for a public (curative) healthcare system and are opposed to the practice of rationing services (Price, 1999). While these issues are important and current topics in the healthcare debate, they are outside the purview of this paper.

Economic Impact Studies

Few researchers have examined the economic impact of healthcare spending and/or the spending by specific facilities in a local area. None adopt the premise that promoting healthcare investment is a sound strategy for local economic growth. McDermott and Parson (1994) develop a methodology for researchers to calculate direct, indirect, and induced spending effects for a healthcare

facility in a community or region. The model, formulas, and methodology are valid, but gathering all the necessary data is challenging, which limits its application.

A study by Morton and Bills (1999), applying IMPLAN software, was used to determine the impact of healthcare investments in Western New York State. The results show the importance of the investment and demonstrate the applicability of the software model. Findings show that investment in the healthcare sector is an important source of economic growth to the region, contributing 8,950 jobs and 17% of the region's gross output. The direct effect on employment is greater than any other sector within the region with 3.25 jobs created for every \$100,000 invested.

In an unpublished West Virginia study, researchers report that for every dollar the state invests in a medical school, the school generates \$3.09 in total output and income, as well as \$2.79 of additional personal income, \$.42 in local government revenue, and \$.17 in state income tax (Akkihal & Adkins, 1995). Nelson-Becker (1999) used the Caffrey-Isaacs model to assess the economic impact of the University of Texas Medical Branch (UTMB), showing hundreds of jobs created and millions of dollars in direct and indirect income. All of these studies merely report the economic impact of investing in healthcare in a region. The current paper is unique because it proposes that economic impact is a primary motivation

for investment in rural healthcare.

The IMPLAN Model and Its Application

IMPLAN model software offers data by state, county, or zip code. The IMPLAN data for this study is for Union County, North Carolina. Applying information from national, state, and local sources, the system creates 528 IMPLAN sectors based on groupings of 4-digit Standard Industrial Classifications (SIC) codes. IMPLAN uses structural matrices that involve cause-and-effect relationships. Specifically, IMPLAN is unique because it constructs Social Accounting Matrices (SAM). These matrices capture transfer payments from businesses and individuals to the government and payments from the government to businesses and individuals. Transfer payments such as income, employee, and social security taxes are all incorporated into the model.

The IMPLAN model is based on several standard assumptions from mainstream economic theory: households (individuals) maximize utility, and producers maximize profits. In the model, firms produce goods and services that they sell to firms, consumers, investors, and government institutions inside and outside the region. Firms produce output using labor and capital. The demand for labor and capital associated with each unit of output depends on relative prices. An increase in the price of one input leads to substitution away from that input into relatively less expensive inputs. The labor supply in the model depends on population and

the labor force participation rate. Changes in the adult population size occur through migration. People move into (out of) an area if real after-tax wage rates or the probability of being employed increase (decrease) in that region.

Based on supply and demand for labor, the model assigns local wage rates. These wage rates, along with prices of other inputs and productivity, determine the cost of operating for every industry represented in the model. A change in operating cost leads to a change in either output prices or profits. Market share, in concert with the demand already described, determines the amount of local output.

The IMPLAN model brings together the elements described previously to determine industry values for each of the variables in the model. Three yardsticks for evaluating industries are output, employment, and total value added. *Output* refers to the value of all goods and services produced by firms represented within a given industry. Output is total purchases by all intermediate and final consumers. *Employment* includes all wage, salary, and self-employed jobs in a region. *Total value added* consists of four components: employee compensation, proprietary income, indirect business taxes, and other property type income (interest, rents, royalties, dividends and profits). Total value added measures the total income an industry funnels into the local economy as payments to labor and capital.

The IMPLAN model uses input-output analysis to measure economic activity generated between firms and by individual consumers. IMPLAN calculates multipliers to describe the response of the economy to incremental changes in input variables. Multipliers address economic reactions within three distinct categories. *Direct effects* measure changes within the affected industry. *Indirect effects* capture industry-to-industry interactions in response to the altered demands of the directly affected industry. *Induced effects* reflect changes in household spending as total income and population adjust due to a direct industry impact. The impact analysis is predicted on general equilibrium properties that enable the examination of effects of a change in one or several areas of a regional economy. IMPLAN uses social account matrices (SAM), therefore the multipliers it generates are comprehensive SAM multipliers.¹

Modifications to the IMPLAN Database

IMPLAN data contains information on private and public organizations. URMC is privately managed by Carolina Healthcare System, but the facilities are owned by Union County. The database for Union County, as purchased from IMPLAN, does not include data on URMC under its Hospital designation (IMPLAN sector 492), even though Carolina Healthcare Systems pays the operating expenses for the hospital. To evaluate spending

by Carolina Healthcare Systems, URMC is treated as a private hospital and introduced into the IMPLAN database using information provided by officers of URMC on FTE employees and hospital revenues and expenditures.²

Results

When dealing with healthcare providers, it is important to understand the difference between market value of services and the actual price paid for services. Public and private insurers have contractual arrangements with healthcare providers to pay discounted prices for certain health services. When calculating dollar valued output for URMC, it is based on actual prices paid for services, not market value.³

The data supplied by IMPLAN on Union County provides a baseline value for the County for 1997. The baseline values are the current values of output, employees, and total value added for Union County. These baseline values provide benchmark analysis to evaluate the economic impact of changes in investment and spending. Of the 528 IMPLAN industry sectors, only 198 exist in Union County. The baseline for the hospital output is \$60.8 million, with 835 employees. Total value added by URMC amounts to \$37.9 million. For the composite healthcare industry, output is \$147.3 million, with 2,197 employees, and total value added is \$90.3 million. These values are reported in Table 1.

To demonstrate the contribution of the healthcare industry to Union County, relative comparisons are made against the county's largest industries. Table 2 lists Union County's largest output contributors. The

industries are ranked by output as a percentage of total Union County output. The comparison industries (poultry processing, nonferrous metals processing, and poultry and egg farming) are the county's top three

producers.⁴ Banking is also chosen as a comparison industry because it is a service industry similar in size to healthcare. The composite healthcare industry is ranked 10th, and the hospital alone is ranked 26th.

Table 1
Economic Impact Summary
(Thousands of Dollars)

	Healthcare Industry	Hospital
Output	147,254	60,833
Employment (jobs)	2,197	835
Total Value Added	90,286	37,868

Table 2
Union County's Largest Industries

Industry Output as a Percentage of Total Output		
1	Poultry Processing	6.25
2	Nonferrous Processing	5.87
3	Poultry and Eggs	5.09
4	New Residential	4.70
5	Wholesale Trade	4.54
6	Industrial Construction	3.91
7	Hardware	3.24
8	Owner-Occupied Dwellings	3.20
9	Maintenance/Repair—Other	3.09
10	Healthcare	3.03
11	Miscellaneous Plastics	2.41
12	Banking	2.07
13	New Government Facilities	2.05
14	Transformers	1.96
15	Real Estate	1.91
16	Lubricating Oils and Grease	1.88
17	State and Local Gov't.—Education	1.77
18	Motor Freight Transport	1.74
19	State and Local Gov't—Non Education	1.46
20	Broadwoven Fabric Mills	1.45
21	Pumps and Compressors	1.43
22	Automotive Dealers and Service Stations	1.41
23	Food Stores	1.34
24	Motor Vehicle Parts	1.30
25	Maintenance/Repair—Residential	1.29
26	Hospital	1.25
27	Eating and Drinking	1.22
<i>198 industries in Union County</i> <i>Total Union County Output is \$4,863,954,000 (\$4.86B)</i>		

Industry Summary

Table 3 shows the Industry Summary for three categories of economic contribution for the hospital, composite healthcare, and comparison industries. Industry output is reported in Panel 1 according to the dollar value of output produced and rank relative to all other producers in Union County. Table 3 Panel 2 depicts the number of FTE employees in these industries. The healthcare industry is the sixth largest employer with 2,197 employees, including 835 employed by the hospital.

Table 3 Panel 3 compares the industries using total value added. The table shows that healthcare ranks third overall, the highest of the highlighted industries, with total value added of \$90.3 million. The healthcare industry in Union County ranks in the top 5 percent for each of these economic measures. URM is the dominant factor comprising almost fifty percent of the healthcare industry in Union County.

Industry Multiplier Summary

Table 4 reports the industry multipliers for the hospital, composite healthcare industry, and comparison industries. Given that the hospital is a major component of the healthcare industry, it is not surprising that both have similar multipliers.

Table 4 Panel 1 illustrates industry output multipliers. Output multipliers measure the total dollar amount of output produced in Union County for each additional dollar of output

generated by that particular industry. The healthcare industry output multiplier is 1.427. For each additional \$100,000 of output generated by the healthcare industry, other industries in Union County will produce an extra \$42,700's worth of output, for a total of \$142,700 in output.⁵

Table 4 Panel 2 presents industry employment multipliers. The healthcare industry employment multiplier is 1.419, which means for approximately every ten jobs created in healthcare, there are four additional jobs created elsewhere in Union County.

Table 4 Panel 3 exhibits industry total value added multipliers. The healthcare industry total value added multiplier is 1.435. For each additional \$100,000 of income generated by the healthcare industry, other industries in Union County will produce an extra \$43,500 worth of income, for a total of \$143,500 in income.

Total Economic Impact

Details of the total impact of URM and the healthcare industry on Union County can be found in Table 5. These figures demonstrate the consequences to Union County if URM and the composite healthcare industry were to completely shutdown. Impacts are measured in terms of output, employment, and total value added; however, these measures are further broken down into direct, indirect and induced effects. Direct impacts show the change for output, employment, and total value added to a particular industry

initiating a change. Indirect effects then capture the changes in the final demand for business-to-business transactions. Induced impact represents changes in final demand of all goods and services based on changes in household spending.

Panel 1 of Table 5 shows if Union County were to experience a shutdown of the composite healthcare industry, the direct effects would be a reduction in output of \$147.3 million, 2,197 lost jobs, and \$90.3 million decline in total value added. Other industries represented in Union County would lose \$877,744, 13 jobs, and \$538,173 in output, employment, and total value added, respectively, if the healthcare industry shutdown. The induced effects from changes in household spending are even greater. Output would decline by \$5.3 million, 80 jobs would be lost, and regional income (total value added) would drop by \$3.3 million. Total losses to Union County, if the healthcare industry were to leave, would be \$153.5 million in total output, 2,289 employees, and \$94.1 million in income added by this industry.

Panel 2 of Table 5 indicates consequences of losing URM. Union County would have direct losses of \$60.8 million dollars in total output, 835 employees, and \$37.9 million in total value added. There would be a decline of \$7,288 in output and \$4,537 in income added from businesses that transact directly with the hospital. These induced effects result in output, employment, and total value added decreasing by \$952,235, 13 jobs, and \$582,756, respectively. Overall,

Table 3
Industry Summary

	Panel 1: Industry Output (Thousands of Dollars)		Panel 2: Employment		Panel 3: Total Value Added (Thousands of Dollars)	
	Rank*		Rank*		Rank*	
Hospital	60.833	(26)	835	(17)	37.868	(19)
Total Healthcare Industry	147.254	(10)	2,197	(6)	90.286	(3)
Poultry Processing	304.138	(1)	2,465	(3)	69.288	(9)
Poultry and Eggs	247.489	(3)	824	(18)	47.894	(16)
Nonferrous Processing	285.316	(2)	904	(15)	64.257	(12)
Banking	100.850	(12)	721	(24)	73.946	(7)

*Rank out of 198 industries

Table 4
Multiplier Summary

	Panel 1: Output Multipliers		Panel 2: Employment Multipliers		Panel 3: Total Value Added Multipliers	
	Mean = 1.360 Median = 1.356		Mean = 1.488 Median = 1.450		Mean = 1.534 Median = 1.491	
	Rank*		Rank*		Rank*	
Hospital	1.423	(42)	1.448	(102)	1.420	(127)
Total Healthcare Industry	1.427	(39)	1.419	(111)	1.435	(119)
Poultry Processing	2.004	(1)	1.821	(25)	2.346	(4)
Poultry and Eggs	1.188	(192)	1.723	(30)	1.543	(79)
Nonferrous Processing	1.347	(107)	2.343	(5)	1.957	(18)
Banking	1.218	(189)	1.449	(101)	1.190	(189)

*Rank out of 198 industries

Table 5
Detailed Economic Impact (Thousands of Dollars)*

	Panel 1: Impact of Healthcare Industry Leaving Union County				Panel 2: Impact of Closing Union Regional Medical Center (Thousands of Dollars)*			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Output*	\$147,254	\$877	\$5,334	\$153,466	\$60,833	\$7	\$952	\$61,792
Employment*	2,197	13	80	2,290	835	0	13	848
Total Value Added*	\$90,286	\$538	\$3,270	\$94,094	\$37,867	\$4	\$582	\$38,465

if URM Closes, Union County would have total reduction in output, employment, and value added of \$61.8 million, 848 jobs, and \$38.5 million, respectively.

Conclusions and Implications for Practitioners

This case study provides an understanding of the economic contribution of the composite healthcare industry and Union Regional Medical Center on the Union County economy. This study emphasizes the importance of economic impact studies for practitioners and healthcare professionals. The results show that URM C and the healthcare industry provide substantial output and income in Union County. The healthcare industry directly employs over 2,100 people, which is 4% of the total employment in Union County. In addition, healthcare produces 3% of all output and 4% of income in the county.

Continued investment in the healthcare industry will result in positive economic benefits to the county. Rural healthcare

systems, in particular, should consider this positive economic impact when analyzing medical spending issues. In attracting and allocating private funds, economic impact analysis should be a major consideration. As demonstrated here, all parties contemplating healthcare investment should focus on generating economic impact studies to gauge the extent to which it can stimulate the local economy.

The results of the hospital and healthcare investment in Union County generated from the IMPLAN model have several implications. Economic evaluations of this type further explain and provide evidence that healthcare spending is an economic force for the region. This conclusion is especially true in rural areas where healthcare is a large employer. Healthcare services are intangible and it is difficult to identify the direct impact in the community. Local officials may believe the healthcare industry is a drain on the economy, but contrary to this view, healthcare investment is an economic stimulus in job creation. Finally, consideration should be given to the fact that the

existence of healthcare services is a priority for many in determining quality of life, which means healthcare spending provides a positive induced effect on a region.

Endnotes

1. This means that an induced change in household consumption that results from a direct change in the affected industry is based on disposable income because SAM accounts for tax payments and other transfers.
2. While the principal focus of this study was to assess the economic activity that the entire healthcare industry generates in Union County, the authors also deemed it equally important to assess URM C's influence as a major part of the healthcare industry in this county. In order to make such a comparison, the database had to be modified again. The healthcare industry was incorporated into the model by aggregating four distant IMPLAN sectors (490 — Doctors and Dentists; 491 — Nursing and Protective Care; 492 — Hospitals; and 493 — Other Medical and Health Services).

The output, employment, and Total Value Added represent simple sums over the four sectors, but all associated multipliers for the healthcare industry constitute weighted averages.

3. This model and analysis use the latest available data (1997) in the calculations, and all numbers are in 1997 real values. Union Regional Medical Center is referred to as the hospital in the text and tables in this paper.

4. Union County's largest industry, poultry processing, accounts for only 6.25 percent of the total output in the county.

5. The mean output multiplier for Union County is 1.360. The top ranking industry is poultry processing, which has a multiplier of 2.004, the only industry with an output multiplier greater than 2.

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