Economic Contribution of Arkansas Agriculture: A Comparison of Hypothetical Extraction and Export

Base Methods

Leah English, University of Arkansas, lae001@uark.edu
Jennie Popp, University of Arkansas, jhpopp@uark.edu

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A Comparison of Hypothetical Extraction and Export Base Methods

Leah English, M.S. & Jennie Popp, Ph.D.

DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Center for Agricultural and Rural Sustainability

INTRODUCTION

Economic contribution studies are common practice, but variation in methods have confounded comparability, leading to questions regarding the accuracy and interpretation of results (English, Popp, and Miller, 2016; Watson et al., 2007). Most follow the hypothetical extraction methodology (HEM), with contributions representing the value of final demand for the target industry (direct effect), as well as the indirect and induced contributions generated through economic linkages to other industries. Issues with HEM, including those related to lack of standardization and double-counting, have led researchers to investigate alternative methods to estimate ex-post economic contributions.

One alternative method known as export base contribution analysis involves diagonalization of a region's exogenous final demand vector and multiplying by an (n x n) Leontief inverse matrix of multipliers (Watson, et al., 2015). This approach eliminates the issue of double counting by ensuring that the sum of all contributions equals observed totals of economic activity for a given study area, while also providing additional information for analyzing the role played by an industry in growing the regional economy through the generation of exports.

Here we compare hypothetical extraction and export base approaches using the economic contribution of Arkansas agriculture as an example.

METHODS

The study area was Arkansas. Agriculture defined as all industries involved in its production and processing, including fiber and forestry.

Hypothetical extraction analysis: 2018 Arkansas data and software from IMPLAN were used to perform a multi-industry contribution analysis (IMPLAN, 2020). Results are reported in terms of direct, indirect, and induced economic contributions.

Export base analysis: IMPLAN's SAM and employment data were used in combination with automated social accounting matrix (ASAM) software (Watson, 2010-2011). Results are reported as gross (direct), agricultural export, and export support and local consumption contributions.

The two methods were compared in terms of estimation of direct contributions.

RESULTS

Table 1 presents the total direct contributions of Arkansas Agriculture to the state economy in 2018. There were 145,623 jobs, providing nearly $5B in wages and generating $10.6B in value added. These estimates are expected to match as they represent the actual reported values for the agricultural sector.

In Table 2 we compare the results from the export base contribution to the somewhat analogous results from the HEM method. In this case the export base model showed lower overall contribution values. Contributions were 11% lower for total jobs, 11.9% lower for total wages and 9.4% lower for total value added.

Table 1: Hypothetical Extraction Method vs Export Base Method Direct Contributions Comparisons

	Jobs	Employee Compensation ($1,000)	Value Added ($1,000)
Export Base Gross Contribution	145,622	$4,995,171	$10,646,790
HEM Direct Contribution	145,623	$4,995,171	$10,646,790

Table 2: Hypothetical Extraction Method vs Export Base Method Contributions Comparisons

	Total HEM Contributions	Total Agricultural Export Base Contributions	Difference
Direct Jobs	145,622	91,803	
Indirect Jobs	123,328	147,692	
Total Jobs	**268,950**	**239,495**	**-11.0%**
Direct Compensation	$4,995,171,000	$3,756,970,000	
Indirect Compensation	$5,420,829,000	$5,419,857,000	
Total Wages	**$10,416,000,000**	**$9,176,827,000**	**-11.9%**
Direct Value Added	$10,646,790,000	$8,005,384,000	
Indirect Value Added	$10,290,210,000	$10,954,643,000	
Value Added	**$20,937,000,000**	**$18,960,027,000**	**-9.4%**

DISCUSSION

While each method evaluates the contributions of agriculture across the Arkansas economy, differences in the values may be explained by the fact that the two methods are examining contributions from different perspectives.

With the hypothetical extraction method, we are providing an answer to: *What could potentially happen across the economy if the agriculture sector disappeared*? Here, multipliers are used to estimate the impact of a change in value equal to the total final demand of the agriculture sector across the economy.

For the export base analysis, we are providing an answer to: *What effect do agricultural exports have on the overall Arkansas of the economy*? (i.e. How much new value does agriculture bring into the state as a result of either producing exports, or supporting the production of exports in other sectors?) Here, a comprehensive economic contribution study for all sectors of a region's economy is performed simultaneously by using social accounting data within an economic base framework.

CONCLUSION

Each method offers important insights into economic contributions stemming from agricultural activity occurring within a region. However, the story told by each set of results differs dramatically. Although export base methods may eliminate double counting, the overall question being asked differs from that of an HEM analysis. Taking this into consideration, we do not believe it is appropriate to directly compare the results of the two analyses. Instead, researchers should carefully consider the question being asked and choose their contribution methodology accordingly.

RELEVANT LITERATURE

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