Economic Contribution of Arkansas Agriculture

As Explained Using Both Hypothetical Extraction and Export Base Methods

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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.

In recent years, an alternative approach based on an export base theory has gained attention. This ***Export Base Methodology*** (**EBM**) 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.

A previous study compared the use of HEM and EBM approaches in evaluating the economic contributions of agriculture in Arkansas for 2018 (English & Popp, 2021), finding some differences in contributions between methods. Here, we replicate that comparison using data for 2019 with the goal of investigating whether differences are consistent over time.

METHODS

Analyses were conducted using 2019 economic data for Arkansas obtained from IMPLAN, LLC.

IMPLAN software was used to perform a HEM analysis following IMPLAN's standard multi-industry contribution protocol (IMPLAN, 2020). Results are reported in terms of direct, indirect, and induced economic contributions.

Automated social accounting matrix (ASAM) software (Watson, 2010-2011) was used to perform an EBM analysis following protocols informed by Watson, et al., 2015. Results are reported as gross (direct), agricultural export, and export support and local consumption contributions.

RESULTS

Table 1 presents the economic values serving as the baseline for each analysis. For HEM, these are labeled "direct" contributions. With EBM, these are labeled as "gross" contributions. These estimates are expected to match as they represent the actual reported values for the agricultural sector in 2019.

Table 1: Jobs, Wages, and VA in Arkansas Agriculture Sector, 2019

	Jobs	Wages ($1,000)	Value Added ($1,000)
HEM (Direct Contributions)	144,928	$5,100,628	$9,747,820
EBM (Gross Contributions)	144,928	$5,100,628	$9,747,820

In Table 2 we compare the results from the export base contribution to the somewhat analogous results from the HEM method. In 2019, EBM contributions were 9.5% lower for total jobs, 9.7% lower for total wages and 8.1% lower for total value added.

Table 2: HEM vs. EBM Arkansas Ag Contributions, 2019

	HEM	EBM	Difference
Direct Jobs	144,928	90,550	
Indirect Jobs	109,548	138,843	
Total Jobs	**254,476**	**230,393**	**-9.5%**
Direct Comp.	$5,101M	$3,843M	
Indirect Comp.	$4,997M	$5,274M	
Total Wages	**$10,098M**	**$9,118M**	**-9.7%**
Direct VA	$9,748M	$7,592M	
Indirect VA	$9,634M	$10,222M	
Value Added	**$19,381M**	**$17,814M**	**-8.1%**

These results are comparable to those seen in 2018 where EBM contributions were 11.0% lower for jobs, 11.9% lower for wages, and 9.4% lower for total value added (Table 3).

Table 3: Difference in EBM results in relation to HEM

	2018	2019
Total Jobs	**-11.0%**	**-9.5%**
Total Wages	**-11.9%**	**-9.7%**
Value Added	**-9.4%**	**-8.1%**

DISCUSSION

As was seen for 2018, results for 2019 continue to indicate that the use of HEM and EBM methods for evaluating economic contributions of agriculture can bring variable results. These differences may again be explained by variation in how economic values are tracked and analyzed within each model. From this, we obtain results pertaining to different economic perspectives.

HEM stems from the perspective of: *If the agriculture sector disappeared from Arkansas, what would be the economic impact across other sectors in the economy?*

With EBM, we are answering: *How much value is brought into the state as a result of either producing exports, or supporting the production of exports across other industries?*

Comparing 2018 to 2019 results, we see a consistent pattern with the use of EBM bringing lower overall contribution values. As larger values are often preferred by those utilizing economic contribution methods to evaluate industries, the smaller values obtained through the use of EBM may dissuade some from utilizing this approach, even in cases where EBM may be a more appropriate analysis technique.

CONCLUSION

HEM and EBM may each offer important insights for evaluating the economic contributions of Arkansas agriculture. However, results obtained, and the story told by each set of results, can differ dramatically. With that being said, 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.

LITERATURE CITED

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