

Measuring the Outdoor Recreation Economy at the Sub-State Level

Daniel Centuriao* Caroline Welter[†] Heather M. Stephens[‡]
Matthew Fredriksson[§]

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Abstract

Official outdoor recreation accounts are rarely available at the local scale, although land, infrastructure, and development decisions are often local. We develop a portable accounting method that recovers local outdoor recreation GDP, employment, and labor income from standard regional production accounts plus an explicit activity classification. Relative to full satellite-account construction, the method requires fewer data inputs and fewer unobserved allocation assumptions. Applied to West Virginia, the estimates are of the same order as the official state benchmark and reveal large county differences. The same accounting structure can be transferred to other countries or regions with sufficiently disaggregated regional accounts.

Keywords: Outdoor Recreation, Satellite Accounts, Regional Measurement, Local GDP.

JEL Classification: E01, C67, R11

I. Introduction

Official statistics on the outdoor recreation economy are too geographically coarse for many of the decisions they are intended to inform. In the United States, the Bureau of Economic Analysis (BEA) Outdoor Recreation Satellite Account (ORSA) measures outdoor recreation at the national and state levels, but not for counties or other sub-state areas (Highfill and Franks, 2019; Bureau of Economic Analysis, 2024). This matters because the relevant economic margins are local: communities decide where to invest in access, trails, tourism infrastructure, workforce capacity, and complementary services, and the importance of outdoor recreation can differ sharply across otherwise similar places.

The obstacle is measurement. Outdoor recreation is not an industry. It is a collection of goods and services produced across recreation, manufacturing, retail, transportation,

*Pennsylvania State University and Regional Research Institute (RRI), West Virginia University. Email: dfc5823@psu.edu.

[†]Assistant Professor, Skidmore College.

[‡]Regional Research Institute, West Virginia University.

[§]Department of Economics, West Virginia University.

accommodation, and other sectors. A full satellite account resolves this problem with detailed product-level information and a sequence of allocation decisions. Those data and allocations are difficult to reproduce at fine geographic scales. We propose a simpler alternative. The method requires a regional industry transactions table, standard value-added and final-demand components, margins, and an explicit classification of activities associated with outdoor recreation. The accounting structure is fixed; only the local classification and the regional data change. This substantially lowers the data burden, makes the assumptions observable, and allows the same procedure to be adapted to other regions, countries or industries with sufficiently disaggregated regional accounts.

We apply the method to West Virginia and its 55 counties using 2023 regional accounts. The baseline estimate assigns 3.12 percent of state GDP to outdoor recreation, while a participation-weighted specification yields 2.40 percent, compared with 2.0 percent in BEA-ORSA. More importantly, county estimates reveal a distinction that a state account cannot: large counties may generate the greatest dollar value of outdoor activity, while smaller counties may be substantially more specialized in it. The paper focuses on the measurement framework. Results are used primarily to show how the method behaves in practice.

II. Data and Industry Classification

The empirical application uses 2023 regional production accounts for West Virginia and each of its 55 counties. The accounts are provided by IMPLAN at a 528-industry level and contain the objects required by the method: industry-to-industry transactions, gross output, value-added components, final demand, taxes on production and imports, and trade, transportation, and service margins. The method itself is not tied to IMPLAN. Any national or regional accounting system that provides comparable industry transactions and income-side components can be used. The geographic resolution of the estimates is therefore determined by the geographic resolution of the underlying accounts.

The central empirical choice is the definition of the outdoor recreation production complex. Unlike a conventional industry, outdoor recreation cuts across standard classifications. The same industry can produce goods used for outdoor recreation and goods with no meaningful connection to it. This classification problem cannot be eliminated by a more detailed accounting identity; it must be made explicit.

For the West Virginia application, specialists from the Brad & Alys Smith Outdoor Economic Development Collaborative reviewed an item-to-industry list constructed from the IMPLAN classification and information on commodities used in the BEA outdoor recreation framework. The review covered 19,586 item descriptions across the 528 industries. Each item was classified according to whether it could reasonably be associated with outdoor recreation. We then computed, for each selected industry, the share of its reviewed items classified as outdoor related. Thirty industries had at least one outdoor-related item and form the candidate production complex shown in Table 1.

The participation share performs two roles. First, it provides a transparent rule for separating industries that are primarily part of the outdoor economy from industries that support or transform outdoor-related production. Industries with participation shares of at least 50 percent are designated *core* outdoor industries and enter the direct-production aggregate. Industries below 50 percent are designated *transformation* industries and enter the

supporting-production aggregate. Second, the shares are used in a conservative robustness specification that scales mixed industries before the accounting procedure is applied. The 50 percent cutoff is a modeling choice rather than a structural parameter. A different application can change the cutoff, the underlying item classification, or both without changing the accounting equations below.

This modularity is important. The method does not require a universal list of outdoor industries. It requires a defensible local definition. The same accounting structure can therefore be used for a mountain tourism region, a coastal economy, or a national application in another country even when the relevant mix of recreation activities differs. The cost of that flexibility is that the classification must be documented and subjected to sensitivity analysis rather than treated as known.

Table 1: Industry Classification and Outdoor Recreation Participation Shares

IMPLAN	NAICS	Industry	Outdoor items	Total items	Outdoor share (%)
247	332992	Small arms ammunition manufacturing	19	19	100.00
345	336991	Motorcycle, bicycle, and parts manufacturing	7	7	100.00
483	712110	Museums, historical sites, zoos, and parks	64	64	100.00
365	339920	Sporting and athletic goods manufacturing	55	56	98.21
432	532111	Automotive equipment rental and leasing	35	37	94.59
329	336214	Travel trailer and camper manufacturing	12	13	92.31
347	336999	All other transportation equipment manufacturing	10	11	90.91
344	336612	Boat building	17	19	89.47
385	441110	Retail – motor vehicle and parts dealers	48	54	88.89
324	336110	Automobile and light duty motor vehicle manufacturing	16	19	84.21
486	713920	Other amusement and recreation industries	110	134	82.09
435	532411	Commercial and industrial machinery and equipment rental and leasing	61	76	80.26
490	721191	Other accommodations	33	44	75.00
122	316210	Footwear manufacturing	62	89	69.66
402	487110	Scenic and sightseeing transportation and support activities for transportation	93	137	67.88
379	423210	Wholesale – other durable goods merchant wholesalers	336	496	67.74
18	114210	Commercial hunting and trapping	4	6	66.67
484	713110	Amusement parks and arcades	10	15	66.67
433	532210	General and consumer goods rental except video tapes and discs	46	78	58.97
226	332216	Handtool manufacturing	60	111	54.05
117	315120	Apparel knitting mills	55	103	53.40
375	423110	Wholesale – motor vehicle and motor vehicle parts and supplies	45	85	52.94
236	332439	Metal barrels, drums and pails manufacturing	11	24	45.83
114	314910	Textile bag and canvas mills	9	20	45.00
326	336211	Motor vehicle body manufacturing	13	29	44.83
237	332510	Hardware manufacturing	10	23	43.48
249	332994	Small arms, ordnance, and accessories manufacturing	23	56	41.07
360	339113	Surgical appliances and supplies manufacturing	26	84	30.95
116	314999	Other textile product mills	5	59	8.47
105	313110	Fiber, yarn, and thread mills	3	62	4.84

Notes: The participation share is the number of item descriptions classified as outdoor recreation related divided by the total number of reviewed items associated with the industry. The horizontal rule separates core industries (share ≥ 50 percent) from transformation industries (share < 50 percent). The classification is specific to the West Virginia application and is not imposed on other regions.

III. Measurement

The measurement problem is to recover the value added associated with a production complex that spans multiple industries without counting the same production more than once. We adapt the economic-complex accounting approach of Furtuoso and Guilhoto (2003), which in turn uses the interindustry accounting structure formalized by Leontief (1936). The procedure is an accounting decomposition, not a multiplier exercise: it measures observed production associated with the defined complex and does not estimate a counterfactual impact of additional recreation spending.

Let $Z = (z_{ij})$ denote the transactions matrix, where z_{ij} is the value of input from industry i used by industry j . Let X_i denote gross output and VA_i value added at basic prices. Let K be the set of core outdoor industries and Q the set of transformation industries. Market-price value added is

$$VA_i^{mp} = VA_i + T_i - S_i, \quad (1)$$

where T_i is indirect taxes and S_i subsidies. In the IMPLAN implementation, taxes on production and imports are reported net of subsidies. The value-added coefficient is

$$VAC_i = VA_i^{mp} X_i^{-1}. \quad (2)$$

The coefficient converts a dollar of industry output into the value added generated by that production.

We divide the outdoor recreation economy into four mutually adjusted components. *Aggregate I* measures value added generated by industries supplying intermediate inputs to core outdoor production. Summing across all core industries,

$$A_I = \sum_{k \in K} \sum_{i=1}^n z_{ik} VAC_i. \quad (3)$$

This construction values the supplier output used by the outdoor complex at the supplier's own value-added rate rather than treating the gross transaction as GDP.

Aggregate II measures value added generated directly by core outdoor industries. Because part of their production is already represented in Aggregate I through intermediate transactions, the corresponding supplier value added is removed:

$$A_{II} = \sum_{k \in K} VA_k^{mp} - A_I. \quad (4)$$

The subtraction is the first explicit double-counting correction in the framework. Without it, the same production relationship would enter once through the supplier side and again through the value added of the core activity.

Aggregate III measures the value added of transformation industries linked to outdoor recreation. These industries produce goods or services that are related to the outdoor complex but are not classified as primarily outdoor under the threshold in Table 1. Their contribution is

$$A_{III} = \sum_{q \in Q} VA_q^{mp} - \sum_{q \in Q} \sum_{k \in K} z_{qk} VAC_q. \quad (5)$$

The second term removes the value added associated with transformation-industry output already used as an intermediate input by the core outdoor industries. Equations (3)–(5) therefore partition supplier, core, and transformation activity while preserving value-added accounting.

Aggregate IV incorporates the trade, transportation, and service margins required to move outdoor-related goods and services to final users. Let domestic final demand be

$$F^d = F - T^F - M^F, \quad (6)$$

where F is total final demand, T^F is indirect taxes net of subsidies on final demand, and M^F is imported production embodied in final demand. Let total gross margins be

$$\Psi = \psi_{Transport}^{mp} + \psi_{Trade}^{mp} + \psi_{Services}^{mp}. \quad (7)$$

The outdoor share of these margins is allocated using the share of domestic final demand associated with core and transformation industries:

$$A_{IV} = \Psi \left(\frac{f_K + \sum_{q \in Q} f_q}{F^d} \right), \quad (8)$$

where f_K is final demand for core outdoor industries and f_q is final demand for transformation industry q . For the county application, detailed margin schedules are not separately observed for every county, so we use the common West Virginia margin structure. This is an explicit data-saving assumption and is examined as a limitation below.

Outdoor recreation GDP is the sum of the four components:

$$GDP^{OR} = A_I + A_{II} + A_{III} + A_{IV}. \quad (9)$$

The corresponding share is $100 \times GDP^{OR}/GDP$, where regional GDP is the sum of market-price value added across all industries. The same equations are applied directly to each county's production accounts. We do not allocate the state estimate to counties. Consequently, county estimates reflect county-specific production structures rather than a mechanical population, employment, or GDP share. Because small-area accounts need not aggregate exactly to the state accounts, the sum of county estimates is expected to be close to, but not identical to, the independently estimated state total.

The same production structure can be translated into employment and labor income without changing the classification or the double-counting adjustments. Let E_i be industry employment. Define the employment coefficient

$$EC_i = E_i X_i^{-1}. \quad (10)$$

Replacing VAC_i with EC_i in the production components converts associated output into jobs. For example, employment generated by the intermediate inputs in Aggregate I is

$$E_I = \sum_{k \in K} \sum_{i=1}^n z_{ik} EC_i. \quad (11)$$

For margins, the industry-specific margin values are first converted into employment and then allocated by the same final-demand ratio:

$$E_{IV} = \left(\sum_i \psi_i EC_i \right) \left(\frac{f_K + \sum_{q \in Q} f_q}{F^d} \right). \quad (12)$$

The employment analogues of Aggregates II and III follow Equations (4) and (5), replacing market-price value added with employment and VAC_i with EC_i . Total outdoor employment is $E_I + E_{II} + E_{III} + E_{IV}$.

For labor income, let LI_i denote employee compensation plus proprietor income and define

$$LIC_i = LI_i X_i^{-1}. \quad (13)$$

Replacing VAC_i or EC_i with LIC_i yields the four labor-income aggregates. This extension preserves the same production assignment across GDP, employment, and labor income, so differences across the three outcomes reflect industry-specific value added, labor intensity, and earnings rather than different definitions of the outdoor complex.

The baseline specification treats every selected industry according to the core/transformation classification in Table 1. This is intentionally transparent but can overstate activity in mixed industries. *Robustness I* therefore scales the selected industries by their participation share r_i before the aggregation is performed. Value added, final demand, gross output, taxes, margins, employment, and labor income are scaled by r_i ; both the relevant row and column of Z are scaled so that the reduction propagates through purchases and sales. The denominator for each reported percentage remains the full regional economy. This specification asks how the estimated outdoor complex changes when only the identified outdoor fraction of mixed industries is retained.

A second robustness method follows the commodity-share logic more closely associated with satellite-account construction. It estimates an outdoor share of each industry's production from commodity coefficients and applies that share to GDP, employment, and labor income. Because this procedure requires an additional commodity-by-industry allocation, it is more data intensive than the proposed baseline method. We use it as an external sensitivity check rather than as the primary estimator. Its equations and implementation are reported in Supplemental Appendix A.

IV. West Virginia Estimates

Table 2 reports the state estimates. The baseline assigns approximately \$3.30 billion in GDP to the outdoor recreation complex, or 3.12 percent of West Virginia GDP. Scaling selected industries by their observed participation shares lowers the estimate to approximately \$2.54 billion, or 2.40 percent. BEA-ORSA reports \$2.07 billion, or 2.0 percent, for 2023. The participation-weighted result is therefore closer to the official state benchmark, but the comparison should not be interpreted as a test in which the BEA estimate is error free. The two approaches use different activity definitions and different allocation procedures. The relevant result is that a method constructed from substantially fewer data inputs produces a state estimate of the same economic order while remaining directly extensible to counties.

The employment results reinforce this interpretation but are not directly comparable

Table 2: State-Level Outdoor Recreation Estimates, West Virginia, 2023

	Main	Robustness I	BEA-ORSA
GDP (\$ millions)	3,301.21	2,541.58	2,074.25
GDP share (%)	3.12	2.40	2.00
Employment (jobs)	27,234	20,947	20,326
Employment share (%)	3.00	2.31	2.80
Labor income/compensation (\$ millions)	1,708.94	1,293.85	863.97
Labor income/compensation share (%)	3.04	2.30	1.80

Notes: Main is the full-industry implementation of the proposed method. Robustness I scales selected industries by the item-based participation shares in Table 1. GDP values are in 2023 dollars. IMPLAN employment includes proprietor employment, and IMPLAN labor income includes employee compensation and proprietor income. BEA-ORSA employment and compensation exclude the self-employed. GDP is therefore the most directly comparable benchmark across the two systems. Source for BEA-ORSA: Bureau of Economic Analysis (2024).

in percentage terms. The baseline produces 27,234 outdoor-related jobs and Robustness I 20,947. BEA-ORSA reports 20,326 jobs. The levels under the conservative specification are close, but IMPLAN includes proprietor employment while ORSA excludes the self-employed. The same definitional issue is larger for income: IMPLAN labor income includes proprietor income, whereas BEA reports compensation. We therefore use the BEA comparisons as an external scale check rather than forcing conceptually different measures into an exact validation exercise.

The main empirical gain appears below the state level. Figure 1 reports outdoor recreation GDP as a share of county GDP under the baseline specification. The variation is large. Mercer County has the highest estimated share at about 5.9 percent, followed by Cabell at 5.7 percent and Braxton at 5.4 percent. Several counties are below 1 percent. A single state share therefore conceals economically meaningful differences in local dependence on the outdoor complex.

Nominal activity and specialization need not coincide. Kanawha County generates the largest estimated outdoor recreation GDP, approximately \$517.7 million, but that activity represents about 3.3 percent of its substantially larger county economy. Braxton generates only about \$28.9 million, yet outdoor recreation represents about 5.4 percent of county GDP. Cabell combines both dimensions, with roughly \$374.5 million in outdoor recreation GDP and a share near 5.7 percent. These contrasts are the principal reason to construct local accounts rather than infer local importance from a statewide total.

The participation-weighted specification lowers estimated shares across counties but leaves the broad geography recognizable. Supplemental Appendix Figures B1–B4 report the state and county comparisons for GDP, employment, and labor income. The alternative commodity-share method in Supplemental Appendix A provides a second sensitivity check. Its largest departures from the baseline occur in a subset of small counties, where industry composition and individual coefficients can have disproportionate effects. This is precisely where reporting the assumptions and alternative specifications is most important.

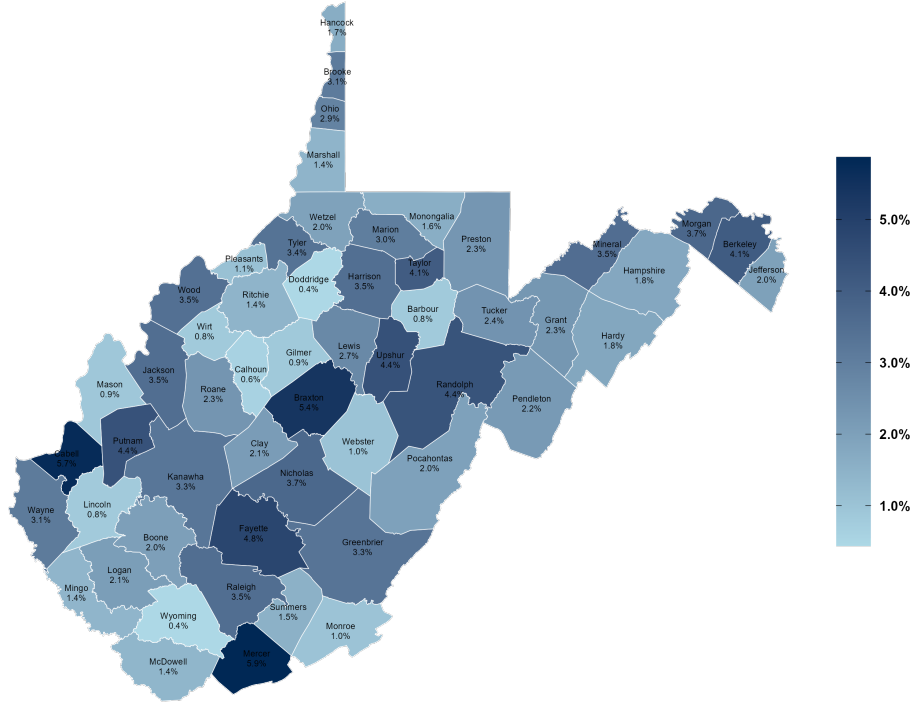


Figure 1: Outdoor Recreation GDP as a Share of County GDP

Notes: Baseline estimates for 2023. Each county is estimated directly from county production accounts using the classification and accounting equations in Sections I and II; the state total is not allocated to counties.

V. Discussion

The contribution of the method is a change in the cost and transparency of local measurement. A full satellite account is data intensive because it must identify products associated with the target activity and then allocate those products across producing industries, uses, and geographies. At local scales, many of those detailed data are unavailable or confidential. Our baseline requires fewer objects: a regional transactions table, value-added and final-demand components, margins, and an explicit classification of the relevant production complex. It therefore replaces a large set of difficult-to-observe product allocations with one visible modeling object: the industry classification and, when available, its participation shares.

That trade-off is economically useful. It makes the method portable without pretending that outdoor recreation has the same industrial composition everywhere. The accounting equations do not change across regions. What changes is the local definition of the production complex. A country or region with different recreation assets can substitute its own industry classification, threshold, and participation shares while retaining the same treatment of supplier value added, direct production, transformation activity, margins, employment, and labor income. The framework can also be applied retrospectively whenever comparable regional accounts are available, rather than only for years covered by a dedicated satellite account.

The method has three principal limitations. First, the classification is consequential. Local expertise improves relevance but does not eliminate judgment; Robustness I is intended to make that sensitivity explicit. Second, the West Virginia application uses a common state margin structure at the county level because county-specific margin schedules are not observed. Third, small regional accounts can exhibit aggregation and measurement noise, so county estimates should be interpreted as local economic accounts rather than exact administrative totals. These limitations are observable and can be relaxed when better data become available.

Finally, the estimates are descriptive, not causal. They measure the value added, employment, and labor income associated with a defined outdoor recreation production complex. They do not estimate the economic effect of creating a trail, attracting an additional visitor, or removing outdoor recreation from the economy. That distinction is important for policy interpretation. The method is designed to answer a measurement question that precedes such causal or counterfactual analyses: how large is the locally embedded outdoor recreation economy, and where is it most economically important?

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Appendix

VI. A. Alternative Commodity-Share Estimator

The main paper uses the production-complex accounting method because it requires relatively few data inputs and makes the classification assumptions explicit. As a second robustness exercise, we implement a commodity-share estimator that is closer in spirit to a product-based satellite account. This approach requires an additional commodity-by-industry production allocation and is therefore more data intensive.

Let C^{OR} denote the set of commodities identified as outdoor recreation related. For industry i , let θ_{ic} denote the share of industry output associated with commodity c . Define the industry-specific outdoor attribution factor as

$$s_i = \sum_{c \in C^{OR}} \theta_{ic}, \quad 0 \leq s_i \leq 1. \quad (\text{A.14})$$

The coefficient permits industries outside the initial representative list to contribute when they produce an outdoor-related commodity. Outdoor value added is

$$VA_i^{OR} = s_i VA_i^{mp}, \quad (\text{A.15})$$

and total outdoor GDP is

$$GDP_{M2}^{OR} = \sum_i VA_i^{OR}. \quad (\text{A.16})$$

The employment and labor-income analogues use the same attribution factor:

$$E_i^{OR} = s_i E_i, \quad (\text{A.17})$$

$$LI_i^{OR} = s_i LI_i. \quad (\text{A.18})$$

The method is applied independently to the state and each county. Because s_i is industry specific, the approach is particularly sensitive to the composition of small county economies. We therefore treat it as a robustness exercise rather than the preferred local estimator.

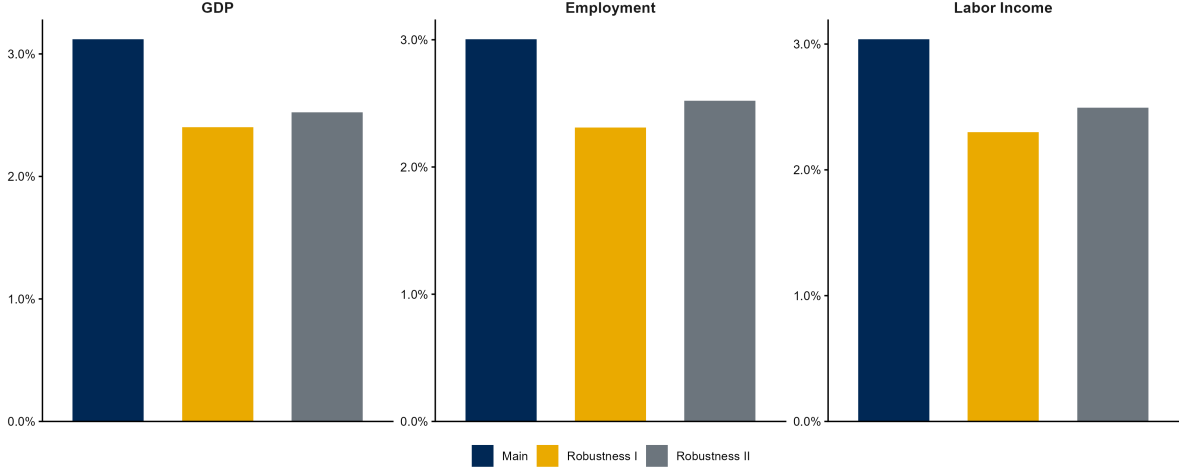


Figure A.1: Statewide Estimates across Main, Robustness I, and Robustness II
Notes: Main is the baseline production-complex estimator; Robustness I scales selected industries by their participation shares; Robustness II is the commodity-share estimator described in this appendix.

VII. B. Participation-Weighted Robustness

Robustness I addresses the fact that the industries in the candidate complex are not exclusively outdoor related. Let r_i be the item-based participation share reported in Table 1 of the main paper. For each selected industry, value added, final demand, output, taxes, employment, labor income, and the industry-specific margin base are multiplied by r_i . For the transactions matrix, both the selected row and selected column are scaled. The full regional GDP, employment, and labor-income totals remain the denominators when percentage contributions are reported. This preserves the interpretation of the robustness exercise as a change in the outdoor numerator rather than a change in the size of the regional economy.

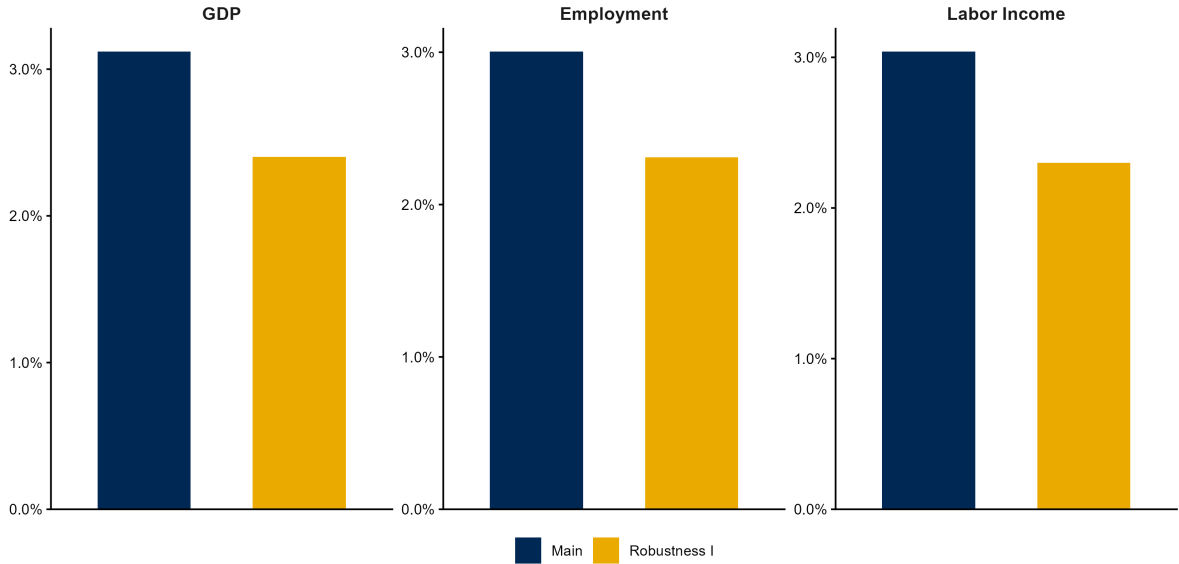


Figure A.2: West Virginia Outdoor Recreation Economy: Main and Robustness I

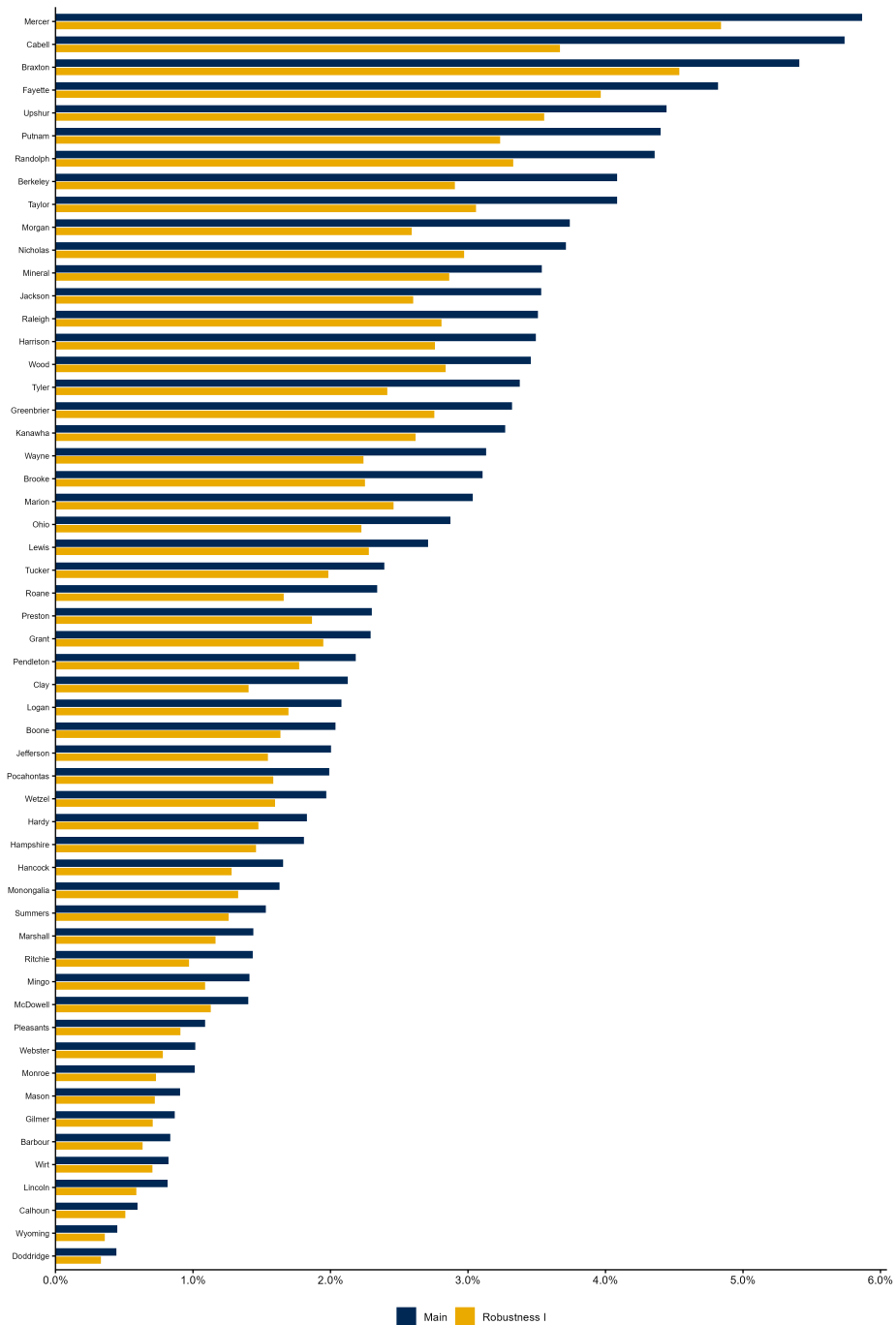


Figure A.3: Outdoor Recreation GDP Share by County: Main and Robustness I

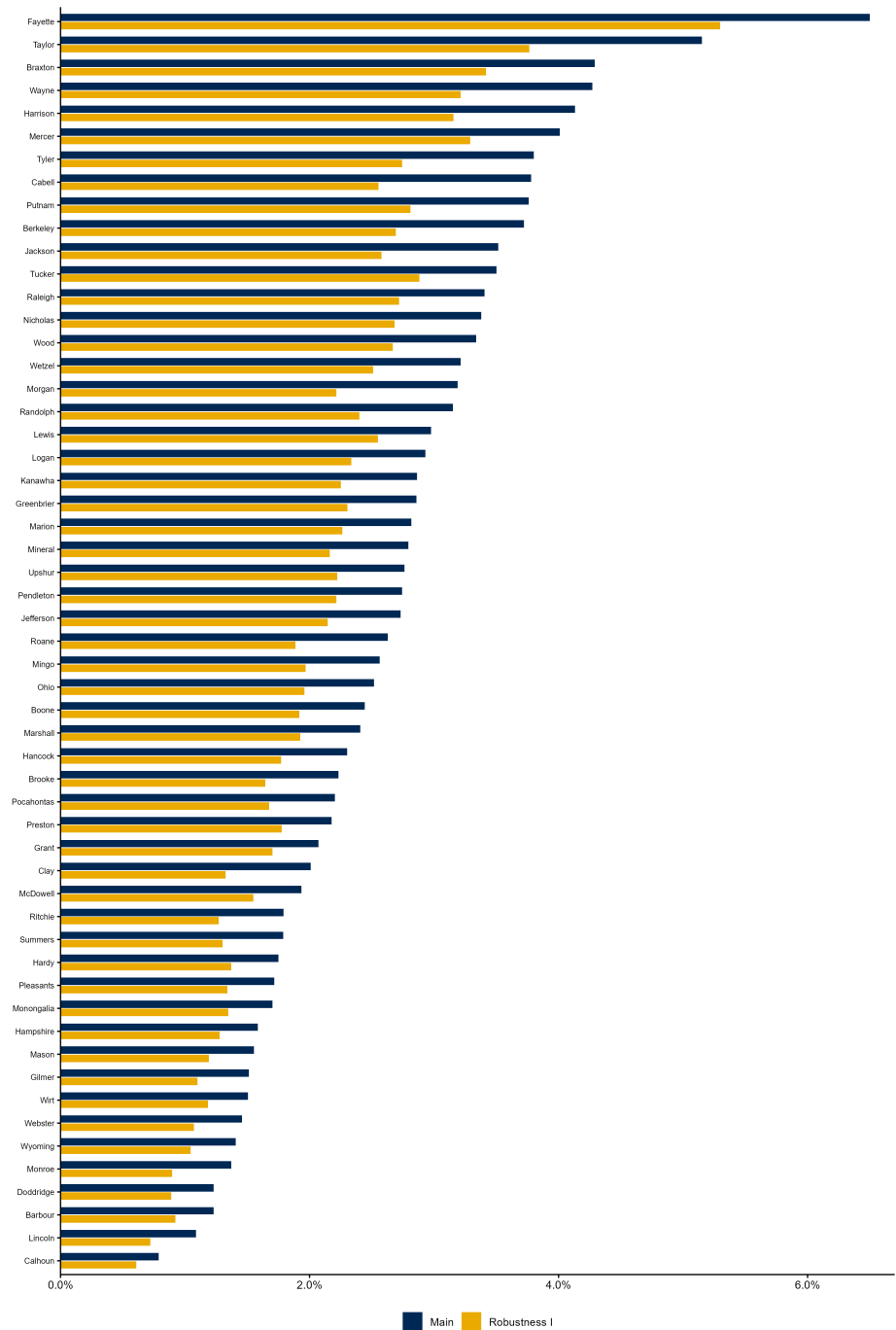


Figure A.4: Outdoor Recreation Employment Share by County: Main and Robustness I

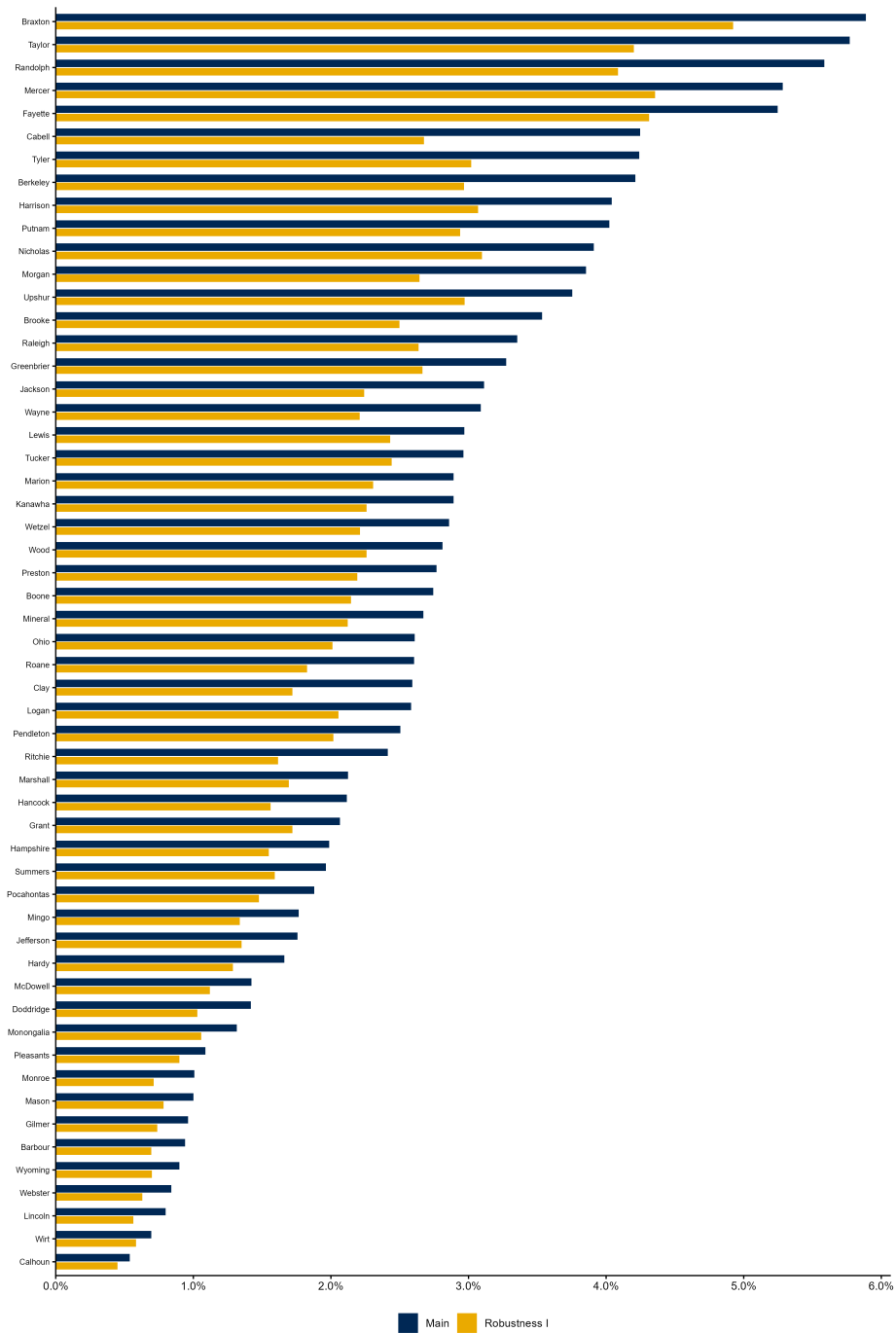


Figure A.5: Outdoor Recreation Labor Income Share by County: Main and Robustness I

VIII. C. Additional County Results

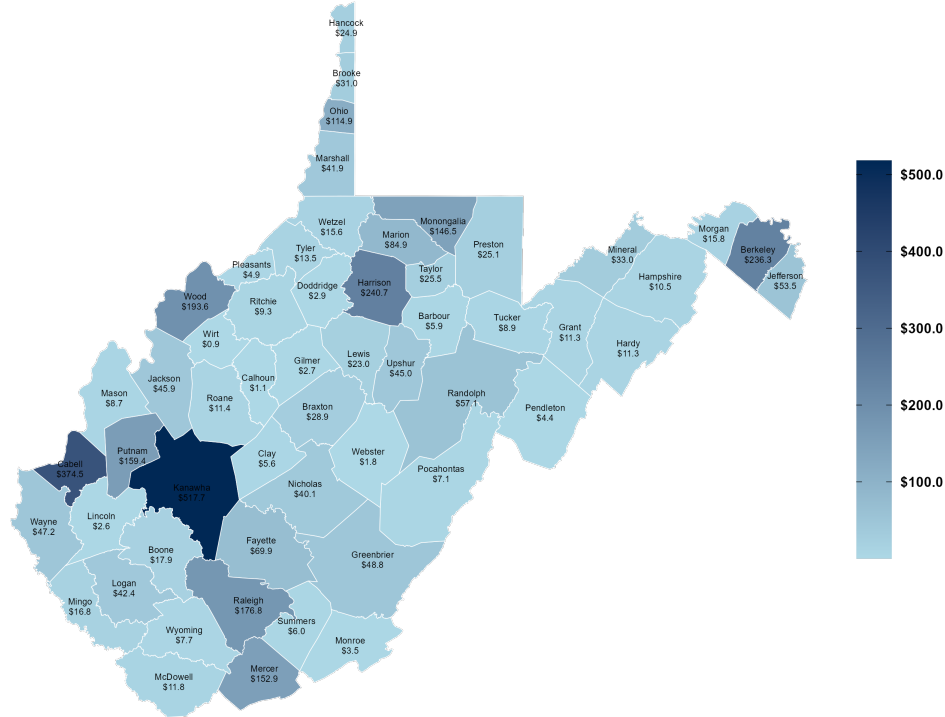


Figure A.6: Outdoor Recreation GDP by County, Baseline Specification
Notes: Dollar values are in millions of 2023 dollars. This figure complements the share map in the main paper by showing the scale rather than specialization of outdoor recreation production.

gross output. Second, the accounts must include value-added and final-demand components sufficient to construct regional GDP and domestic final demand. Third, the researcher needs an explicit rule for identifying the industries or activities associated with the target economic complex. Local expert classification, administrative product lists, survey evidence, or another transparent rule can supply this third input.

The West Virginia classification should not be transplanted mechanically. Regions differ in industrial structure, recreation assets, and the goods and services through which outdoor activity enters production. The portability of the method lies in the invariance of the accounting equations, not in a claim that the same industry list is appropriate everywhere. In practice, an application should report the classification, participation shares, and at least one sensitivity analysis so that users can distinguish accounting results from assumptions about the boundary of the target activity.