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Alternative tourism–timber dependencies and the development of forested rural regions

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Abstract

Tourism and wood processing (timber) present two primary business activities in rural forested regions and the manner in which they are combined, in part, determines the economic and socio-demographic vibrancy of the local community. In this paper, we focus attention on unique regional economic characteristics of a subset of rural counties in the northeastern United States that are both forested and variously dependent on wood products and tourism. Results suggest that dependence on joint forest resource outputs is clearly associated with unique attributes of regional socioeconomic structure.

Keywords: Resource dependence; Rural development; Forest; Tourism; Economic diversity; Wood products; Location quotient; Shannon–Wiener

1. Introduction

Regional science has long been concerned about issues of regional resource endowments, primary industry location, resource dependency, and export base attributes of regions. The early work of North (1955), Perloff et al. (1961) and Richardson (1969,1985) identified the importance of raw material endowments and their processing as principle explanatory factors involved in an export-based concept of regional growth. Porter's work in regional competitive advantage (Porter, 1990,1996) clearly identified factor resource conditions as critical in location decisions of the firm.

Forest resources have provided location-specific advantages for many regions at various stages in their economic development. In early stages of development, timber production and wood processing industries created plentiful and relatively high-paying job opportunities. The wood products sector continues to

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be a strong economic presence throughout rural forested regions of North America (Webster and Chappelle, 1989; Bowe et al., 2004).

Since the 1960s, several forces have come together to fundamentally alter the manner in which forest resources act as engines of rural economic vibrancy. International competition has led wood products industries of the U.S. to lose their price competitiveness in world commodity markets (Freudenburg, 1992; Weber, 1995; Pulver, 1995; Galston and Baehler, 1995). Also, the economic restructuring of the American economy toward a service base has significantly tempered the importance of raw material commodity production as inputs for regional economic production (Bluestone and Harrison, 1982; Chevan and Stokes, 2000). Finally, environmental and political activism of urban audiences has provided strong criticism of extractive productive practices by suggesting adverse environmental impacts, threats to biodiversity and sustainability, and global environmental change (Castle, 1993; Buttel, 1995).

These regional resource development issues have forced a reexamination of the uses and management of forest resources, particularly publicly owned land-based resources such as forests and water resources across Canada and throughout the American West, the Great Lakes Basin, New England, and across the southern United States. Since the late 1960s, forest management has broadened its focus to incorporate non-extractive environmentally sensitive land management practices that reflect broader non-market values (Power, 1996; Hays, 1998). Natural amenity-rich communities have become aware that forest resources provide not only a source of physical raw material commodities but can also serve as a source of recreational amenity that provides a backdrop for tourism development (Galston and Baehler, 1995; Isserman, 2000; Green, 2001; Kim et al., 2005). The joint production of natural resources as both commodities and amenities are increasingly seen as an asset upon which to base economic growth and change (Green et al., 2005).

The amenity component of forest resources is clearly thought to provide an integral foundational basis of recreation, tourism, and retirement development (Fredrick, 1993; Keith and Fawson, 1995; Jakus et al., 1995; Keith et al., 1996; Marcouiller, 1997; McDonough et al., 1999). Lakes, forests, and wildlife as natural amenities provide the substantive but latent primary factor input into tourism industry output (Marcouiller, 1998). As a quality-of-life factor, forests also are believed to play a critical role in human migration and firm location decisions (Graves, 1979, 1980, 1983; Gottlieb, 1994).

While extraction and processing of natural resources have the potential to provide a regional comparative advantage relative to other economic sectors by virtue of their ability to generate surplus resource rents above normal returns to other factors of production, large-scale dependency on resource extraction also can contribute to regional instability over time (Gunton, 2003).[2] In practice, it is generally accepted that diverse economic structures provide significant benefits to economic stability and long-term growth. This said, the diversity literature also identifies a rather interesting and dichotomous applied policy dilemma. Whereas diversity is often viewed as beneficial from a stability perspective, it runs somewhat counter to the notion of comparative advantage (Wagner and Deller, 1998; Siegel et al., 1995; Wagner, 2000). Regardless, the location of resource endowments and related firm activity represents an increasingly important component associated with the new economic geography (Fujita et al., 1999; Audretsch, 2003) and in the analysis of spatial economic issues (Anselin, 2003; Fingleton, 2003).

In related work, regional location models that investigate the wood products and tourism sectors have been constructed and analyzed. For example, Bowe et al. (2004) looked at firm location for three wood products sub-sectors in the northeastern United States. Although lacking specific firm-level profit components, these empirical models contained sig-

[2] Regional economic investigations of the wood products sector are limited. Important work has been done on the impact of timber production and the wood products sector on local economies; however, literature dealing with the regional economic effects associated with timber production and wood products sector activity either does not address or gloss over important issues of firm location (Cox and Munn, 2001; Aruna et al., 1997) and interaction with tourism. Others have examined the environmental impacts of timber production and the wood products industry through regional comparisons without mention of firm location (McNulty et al., 2000; Lewis et al., 1996). Lohmander (1994) addresses cost minimization and firm location in the forest products industry from a transportation cost perspective; however, transportation is only one of many factors in the firm location decision process.

nificant explanatory variables that served as gross proxies to the generic location decision framework. Results suggested that the location of two of the three wood-products sub-sectors was significantly related to timber removals with intra-sector location important as both intermediate demand and input suppliers.

The role of recreation sites and tourism on remote rural economic change was examined in recent work by Dissart (2003a) for remote rural U.S. counties. In this work, explanatory models of regional economic change focused on growth and distribution but firm location and interaction with other primary economic sectors was not addressed. Marcouiller et al. (2004a) and Kim et al. (2005) developed explanatory models that linked natural amenities (including forests) and tourism in the Lake States with a specific interest in how income is generated and distributed among households. Results suggest important natural amenity–tourism relationships.

Our problem set focuses on resource dependency and issues of rural development, namely economic and demographic characteristic differences including population, income levels, employment, poverty, and economic diversity. Building on early work of Webster and Chappelle (1989) that argues for policies that foster a combination of forest products and tourism activity, the following questions become apparent. First, what spatial patterns exist in the location of both wood products and tourism firms in rural forested regions? How can we logically characterize these regions into homogeneous groupings that allow issues of resource use and relative dependency to be distinguished? Once distinguished, how do economic characteristics such as diversity, income source, poverty, and unemployment differ among groupings? These are the descriptive and exploratory questions addressed in this manuscript. While we develop a conceptual approach for characterizing issues associated with tourism–timber tradeoffs, our work suggests needed extensions to develop causal explanatory models of rural resource dependency and economic change.

This paper is organized into four subsequent sections. First, we outline methods used to distinguish

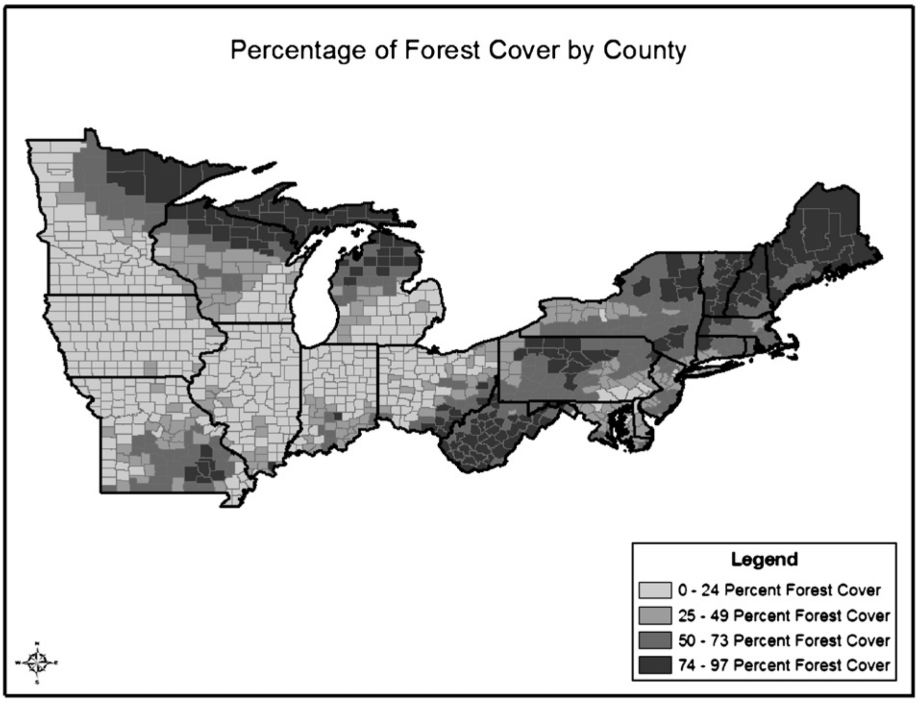

Fig. 1. Percent forest cover by county for the 20 northeastern United States.

regional dependencies by sector and analyze differences in economic characteristic. Next we provide descriptive results of the analysis that differentiates regional uniqueness. This is followed by a discussion section. We conclude with a section that describes policy implications and further research needs.

2. Material studied, area descriptions, methods, and techniques

Our empirical approach in this applied research focused on rural counties in the 20 northeastern United States as defined by presence of forest cover in non-metropolitan areas. We defined forested counties as having 50% or greater forestland cover (non-forested counties have less than 50% forestland cover). Forest cover data were interactively accessed using the USDA Forest Service Forest Inventory and Analysis database (USDA Forest Service, 2004a). County-level categories for this analysis are identified in Fig. 1. Focusing on both forested and non-metropolitan counties allowed us to address distinct types of rural resource dependency and provided a subcategorization with unique and statistically significant different social and economic characteristics.

To address alternative types and relative levels of resource dependency, the first empirical issue that needed to be addressed dealt with developing a logical approach to disaggregating the forested region based upon variation in relative dependency given three types of wood products processing sub-sectors that were combined to represent *timber* and five types of retail and service sub-sectors that were combined to represent *tourism*[3]. This disaggregation into distinct sub-regions was based on sectoral dependence accomplished using location quotients for timber and tourism sectors.

An export-based approach to assessing the supply side elements of wood products processing is relatively straightforward using the assumption that all outputs of wood products firms are exported from the individual county. The tourism sector, however, presents an export-based and supply-side challenge as the retail and service firm grouping that comprises tourism is ill-defined and typically mixes demand (receipts) resulting from both in-region (non-tourists) residents and out-of-region travelers (often characterized as “tourists”). This is a common empirical dilemma that has been addressed in previous research (Smith, 1987, 1988, 1998; Leatherman and Marcouiller, 1996). In estimating the overall extent of tourism using an out-of-region traveler definition, we will apply a minimum requirements approach similar to that used by Leatherman and Marcouiller (1996). This will be further elaborated below. However, given the generally accepted notion that firms rarely operationally distinguish between in-region and out-of-region demand source, we rely on the standardized location quotient as a technique for assessment of relative economic dependency of export-based oriented sectors. This is consistent with the literature on export-based theory (cf. Richardson, 1985; Shaffer et al., 2004).

Location quotients represent the level of sectoral dominance in regional economies and are sensitive to issues of economic diversity, size, and economic scale. Location quotients are used as a proxy for spatial, or locational, dependency of a given economic sector. The location quotient represents an index that places the percent of local output in a given sector as a ratio to the percent of national output in same sector. Specifically, the location quotient is calculated as shown in Eq. (1).

$$\mathrm{LQ}_s^i = \left(\frac{o_s^i}{o_s^t}\right) \Big/ \left(\frac{o_n^i}{o_n^t}\right) \qquad (1)$$

where LQ_s^i is the location quotient for industry i in place s, o_s^i is output in industry i in place s, o_s^t is total output in place s, o_n^i is a national reference for output in industry i while o_n^t is total national output.

Location quotients are well suited to the development questions raised here. They are limited, however, in measurements requiring an absolute incidence of sectoral activity. For instance, regions with large diverse economies may have a significant absolute level of activity in the industry under question. But, given the large extent of “other” sectors present in the economy may not show large location quotients because the relative importance of the sector is

[3] The timber aggregate included the primary, secondary, and reconstituted forest products sub-sectors, while the tourism aggregate included the travel, retail, dining, hotel, and service tourism sub-sectors.

muted with respect to overall economic activity. Thus, our use of the location quotient captures the relative importance of firm location particularly evident in smaller rural economies. Also, it represents a useful proxy for identifying the extent to which export-based activity exists within these regions.

Data on sectoral characteristics for calculating location quotients were generated using IMPLAN[4] developed by the Minnesota IMPLAN Group (MIG, 2001). Specifically, we used IMPLAN data to construct county-level estimates of sector output (in dollars) and other components of value added such as employee compensation, other property type income, proprietor's income, and indirect business taxes. As mentioned earlier, the *timber* aggregate included the primary, secondary, and reconstituted forest products sub-sectors. In addition to forest sector data, IMPLAN also provided data for the *tourism* aggregate. This aggregate consisted of the travel, retail, dining, hotel, and service tourism sub-sectors.

As alluded to earlier, the tourism sector presents an empirical problem due to its endemic mixture of in-region and out-of-region demand, operationally viewed by the firm as an aggregate receipt base. In an effort to distinguish between tourism receipts (out-of-region traveler demands) and residentiary spending (in-region demands), we apply a minimum requirements approach following a procedure developed specifically for tourism by Leatherman and Marcouiller (1996). This supply-side approach is a variant of the location quotient and relies on the identification of regional peer groupings and bases an export portion on that which exceeds the minimum proportion within each peer group.[5]

For our purposes, this peer group selection was accomplished using a procedure developed and standardized by Calvin Beale of the USDA Economic Research Service known as the "Urban-Rural Continuum Code" commonly referred to as Beale Codes, counties are categories by how they fall along the rural to urban continuum using key spatially defined demographic elements, such as population and adjacency to metropolitan area (USDA Ecomonic Research Service, 2004). The 2003 Beale Codes form a classification scheme that distinguishes metropolitan counties by size and non-metropolitan counties by degree of urbanization and proximity to metropolitan areas. The standard Office of Management and Budget (OMB) metropolitan and non-metropolitan categories have been subdivided into three metropolitan and six non-metropolitan categories, resulting in a 9-part county codification. Given our focus on rural development, we have omitted the metropolitan counties and focused solely on the six categories of non-metropolitan counties. The specific elements that define the respective Beale Codes are shown in Table 1.

An important conceptual contribution of our work involves the methodological presentation and application of a dependency matrix, which allowed us to

Table 1
Beale Code classification and numbering scheme

Beale Code number	Code classification
Metropolitan counties	
1	Counties in metro areas of 1 million population or more
2	Counties in metro areas of 250,000 to 1 million population
3	Counties in metro areas of fewer than 250,000 population
Non-metropolitan counties	
4	Urban population of 20,000 or more, adjacent to a metro area
5	Urban population of 20,000 or more, not adjacent to a metro area
6	Urban population of 2500 to 19,999, adjacent to a metro area
7	Urban population of 2500 to 19,999, not adjacent to a metro area
8	Completely rural or less than 2500 urban population, adjacent to a metro area
9	Completely rural or less than 2500 urban population, not adjacent to a metro area

[4] MicroIMPLAN is an input/output software package that relies on a county-level database of economic characteristics compiled using a variety of secondary datasets that allow impact assessment at a very fine level of industrial disaggregation (528 sectors). It is generally accepted as a reliable dataset and modeling structure in both holistic and partitive accuracy contexts.

[5] This technique is a straightforward adaptation of the location quotient using a reference of the minimum peer regional unit instead of a national reference and netting out the extent of activity in the minimum peer. Full elaboration is beyond the scope of this manuscript. The interested reader is referred to its full theoretical and empirical discussion found in Leatherman and Marcouiller (1996).

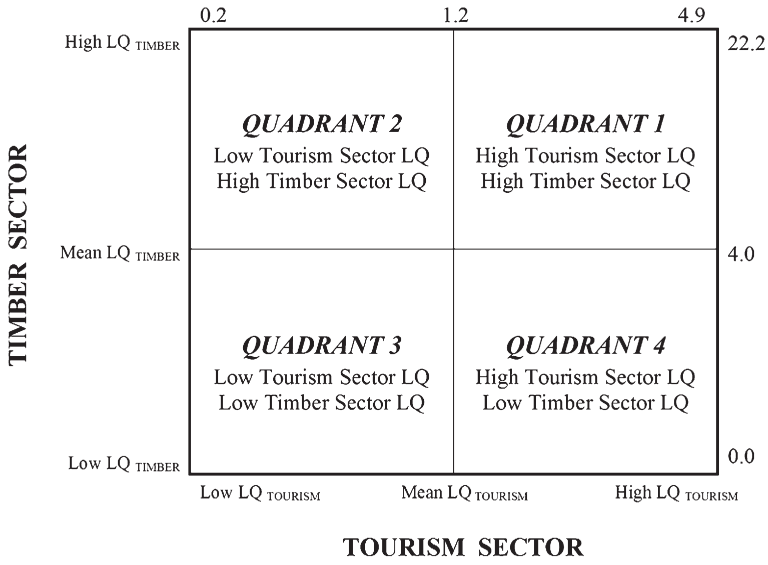

Fig. 2. The Tourism–Timber Diversity Model distinguishes regional homogeneity based on relative location quotients (as defined in Eq. (1)) for the tourism and timber sectors (location quotient values listed on the top and right are specific to the forested region of the northeastern United States).

distinguish alternative levels and types of tourism–timber interaction with a specific interest in relative dependencies.[6] With reference to Fig. 2, consider a two-dimensional representation that arrays the level of sectoral dependency of each industry along the x and y axes as measured using location quotients. Grand means for each sector provided the mid-points. Theoretically, this provided a mechanism to separate and group like regions with respect to relative tourism and timber dependencies.

Empirically, this allowed us to split individual non-metropolitan forested regions into four quadrants that represent each individual area (county) into its respective dependency group. Specifically, these four groups included counties with (1) high tourism–high timber, (2) low tourism–high timber, (3) low tourism–low timber, and (4) high tourism–low timber. We then are interested in testing for distinct characteristic differences in economic performance as a result of a county's placement along this two-dimensional spectrum of resource dependency.

The next empirical issue addressed the comparison of quadrant sub-regions based on economic and demographic characteristics. Our intent was to develop a sufficient list of variables that would allow us to draw conclusions about the relationship between the tourism and timber aggregates. For this work we chose several metrics that allowed interpretation of economic effects related to resource dependency. Namely, we chose to focus on poverty incidence, unemployment, and population as standardized socioeconomic indicators. These data were developed from available Regional Economic Information System (REIS) datasets (USDC, 2004). Economic characteristics focused on proprietor's income, sectoral earnings, and per capita income levels. Again, these data were obtained from REIS. Due to an interest in capturing a broader definition of tourism, we chose to look at recreational housing (seasonal and occasional use residential units) using data obtained from the US Census (USDC, 2002).

Finally, we had distinct interest in comparing levels of economic diversity among the four quadrant sub-regions to answer the specific question of what explains low diversity among alternative resource

[6] This is a rather straightforward extension of similar methods employed in the industrial organization and marketing fields that allow simultaneous presentation of alternative characteristics. One good example is importance performance analysis (IPA) used by marketing research which simultaneously evaluates the importance of a good or service with its relative performance.

dependency types. For this work, we chose a specific log share entropy measure known as the Shannon–Wiener Index. The Shannon–Wiener Index has been used extensively in both ecological and economic settings (Magurran, 1988; Wagner, 2000). In an economic context, equal levels of economic activity in all industry sectors represent perfect diversity. A region heavily weighted to a specific industry would represent a specialized and less economically diverse region. Specifically, the Shannon–Wiener Index is calculated as shown in Eq. (2).

$$W_i = -\sum_{s=1}^{S_i}\left(\frac{o_{si}}{o_i}\right)\ln\left(\frac{o_{si}}{o_i}\right) \tag{2}$$

where S_i is the total number of industries in the ith region, o_{si} is the output of industry s in the ith region, and o_i is the total output in the ith region. The Shannon–Wiener Index captures diversity by displaying larger values for regions with a greater level of diversity. For this work, the Shannon–Wiener Index was derived at the 4 digit SIC level and obtained from the USDA Forest Service (2004b).

3. Empirical results

The non-metropolitan (henceforth termed "rural") northeastern United States contains a broad mixture of agricultural and forested landscapes as suggested by the data presented in Table 2. While timber output was identified as aggregate output by individual sector aggregate, tourism specific output (out-of-region demand) was distinguished using minimum peers groups based on counties classified by rural Beale Code as summarized in Table 3. Of the 687 counties classified as rural, 256 have at least 50% forest cover. Descriptive analysis of the data suggests that rural forested counties of the Northeast have distinct differences when compared to non-forested rural counties. With particular reference to the timber and tourism sectors, rural forested counties have higher

Table 2
Descriptive statistics that distinguish forested from non-forested non-metropolitan counties by quadrant in the 20 northeastern United States [a]

	Range [b]	Mean [b]	Metric [b]				Total [b]
			Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4	
Forested (>50% forest cover)							
# Counties	na	na	37	59	94	66	256
Population density 1990	2.6–209.1	48.8	23.2	28.5	61.6	63.2	na
Output timber	\$1–\$674	\$85	\$4655	\$10,299	\$4256	\$2500	\$21,710
Output tourism [c]	\$3–\$634	\$91	\$3185	\$2701	\$6983	\$10,474	\$23,343
LQ timber	0.0–22.2	4.0*	7.4**	9.1**	1.4**	1.4**	na
LQ tourism	0.2–4.9	1.2*	1.7	0.8	0.8	1.9	na
Non-forested (<50% forest cover)							
# Counties	na	na	3	36	353	39	431
Population density 1990	5.2–663.3	52.8	50.9	60.8	49.8	72.9	na
Output timber	\$0–\$1,541	\$44	\$484	\$9374	\$8306	\$750	\$18,914
Output tourism [c]	\$2–\$516	\$58	\$391	\$2267	\$17,341	\$4901	\$24,900
LQ timber	0.0–17.5	1.3	5.9	7.4**	0.7	0.6**	na
LQ tourism	0.2–3.4	0.8	1.4	0.8	0.7	1.6	na

* Indicates significant difference (between forested and non-forested) at the $p<0.05$ level based on the independent-samples t test.
** Indicates significant difference (between tourism and timber) at the $p<0.05$ level based on the paired-samples t test.
[a] Total of 1037 counties in the 20 northeastern States, 687 of which represent non-metropolitan areas.
[b] Monetary values are in millions of 1997 US dollars; monetary values under the four quadrant headings represent the output sum for each quadrant. Location quotients (LQ) are based on output as a ratio of ratios following Eq. (1) and are reported as means under the four quadrant headings.
[c] Calculated using a minimum requirements approach as defined in Leatherman and Marcouiller (1996). Individual code peer minimums are fully identified in Table 2.

Table 3
Output for the tourism aggregate based on minimum peer calculations by Beale Code classification for non-metropolitan counties in the 20 northeastern United States[a]

	Minimum peer[b]	Mean peer	Total output
Forested (> 50% forest cover)			
Beale 4	\$45.5	\$223.9	\$3806
Beale 5	\$60.8	\$160.9	\$1609
Beale 6	\$7.9	\$119.2	\$7985
Beale 7	\$9.7	\$97.9	\$7149
Beale 8	\$3.0	\$40.7	\$1059
Beale 9	\$4.4	\$27.6	\$1736
Non-forested (< 50% forest cover)			
Beale 4	\$11.7	\$126.6	\$5189
Beale 5	\$18.6	\$98.6	\$1972
Beale 6	\$11.1	\$64.7	\$10,092
Beale 7	\$1.7	\$45.8	\$5820
Beale 8	\$3.7	\$24.1	\$866
Beale 9	\$2.1	\$18.8	\$960

[a] Total of 1037 counties in the 20 northeastern States, 687 of which represent non-metropolitan areas.
[b] Monetary values are in millions of 1997 US dollars.

overall concentrations of these components in their economic structure. Since our focus remains embedded within the interaction between the tourism and timber industries in forested regions, we are primarily interested in those differences reflected by the timber sector dependencies, which in all instances are significantly higher.

Our research problem focused on a specific type of heterogeneity in rural forested economic structure, namely the interplay between tourism and timber. For the 256 rural forested counties, means were calculated for the tourism and timber sector location quotients. These location quotient means were 1.2 and 4.0 respectively. Although roughly similar in terms of output, tourism presents a broader set of retail and service firms that are not as concentrated in rural forested regions as compared to timber producing and wood processing firms. In other words, there is not as much spatial distinction with tourism as these types of firms are also quite prevalent in non-forested counties.

Subsequently, mean location quotients were used to define distinct subcategories within the rural forested region classification. Based upon the relative dependence of a county's economy on tourism and timber, the 256 counties were categorized into one of four quadrants as outlined in Fig. 2. Gross descriptive statistics of each of these four quadrants are summarized in Table 2.

Spatially, the forested counties of the 20 northeastern States are shown as shaded in Fig. 3. Furthermore, the spatial distribution of each resource dependency type is also shown, which highlights the location of regional dependency and relative interaction of the tourism and timber sectors. Counties that contained less than 50% forest cover were left unshaded. Forested counties classified as metropolitan (non-rural) are shown in stippled pattern. Counties representative of Quadrant 1, high tourism–high timber, are shown in light gray. Counties representative of Quadrant 2, low tourism–high timber, are shown in medium gray. Counties representative of Quadrant 3, low tourism–low timber, are shown in dark gray, and counties representative of Quadrant 4, high tourism–low timber, are shown in black.

States such as West Virginia, Pennsylvania, New York, and Missouri have a high occurrence of counties in Quadrant 3, low tourism–low timber. Quadrant 3 counties comprise the largest percentage representing 37% of the rural forested counties. Quadrant 2 and Quadrant 4 are weighed more heavily toward the timber sector and the tourism sectors respectively, with Quadrant 4 being comprised of 66 counties (26%), the second largest quadrant in number. Quadrant 1 represents relative economic concentration and dependency of the tourism and timber sectors and comprises only 15% of the forested counties. States with a high occurrence of Quadrant 1 counties include Minnesota, Wisconsin, and Michigan.

Statistical comparisons focusing on the interplay between tourism and timber sectors provided a host of interesting differences that allowed us to initiate a set of relevant policy implications. It is important to note that our analysis of economic characteristics focused only on rural forested counties (neither non-forested nor metropolitan counties were included). Comparisons were based upon regional socio-demographic and housing attributes, regional economic structures, and regional social–demographic and economic change characteristics and are summarized in Tables 4, 5, and 6 respectively.

Significant differences by quadrant were found for each of the regional socio-demographic and housing attributes tested including poverty rate, unemployment

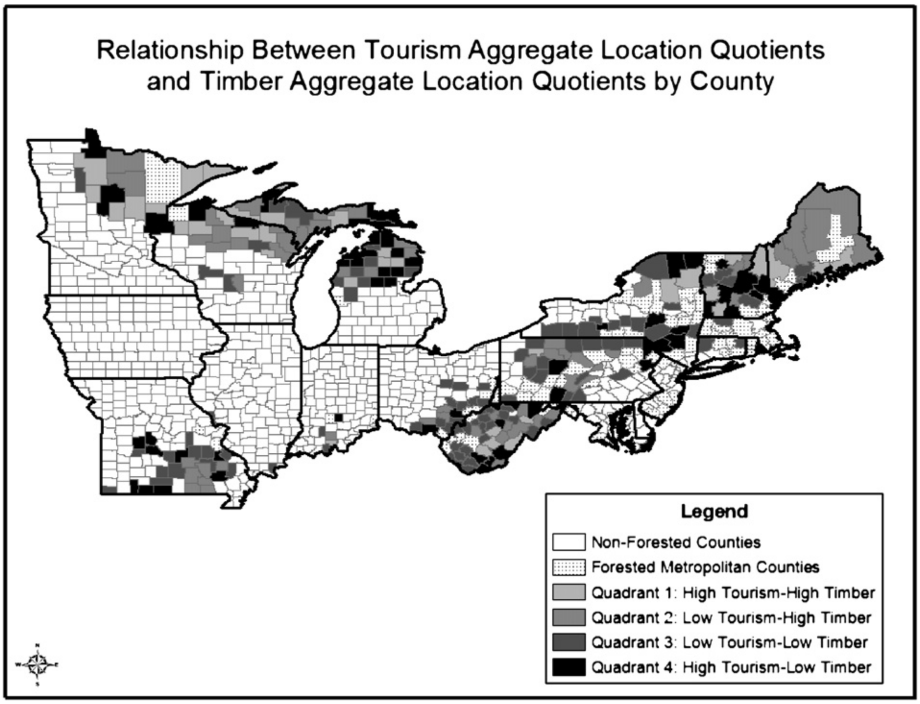

Fig. 3. Placement of forested counties by relative position along the dual tourism–timber continuum; forested metropolitan counties shown in a stippled pattern.

rate, and per capita income as shown in Table 4. Our data suggested that Quadrant 1 counties (high tourism–high timber) were not significantly different in terms of rates of poverty when compared to counties in the other quadrants. Counties classified in Quadrants 2 and 3 (representing the low tourism half of the Tourism–timber Diversity Model) had significantly higher poverty rates when compared to counties in Quadrant 4. Interestingly, counties classified in Quadrant 3 (low tourism–low timber) experienced generally higher rates of poverty when compared to other counties. In essence, counties with relatively lower dependency on tourism had generally higher rates of poverty incidence.

In general, there was little significant difference among quadrants when comparing unemployment rates. The exception was a significantly higher unemployment rate in Quadrant 1 (high tourism–high timber) with Quadrant 4 (high tourism, low timber). This result suggests that within the forested rural region of the northeastern United States, counties with relatively higher dependency on tourism in the absence of high timber sector activity had lower unemployment rates.

Interesting differences exist in base per capita income within the forested rural northeast. Note that per capita income was highest in counties classified within Quadrant 4 (high tourism–low timber) when compared to all three of the other quadrants. No significant differences in county base per capita income were found among the other three quadrants. Again, counties with high tourism dependence in the absence of high timber dependence had higher base per capita income levels.

Economic structure represents a set of characteristics that speak to the extent, diversity, and makeup of regional business activity. For purposes of this work, we focus on three specific elements that bring forward key explanatory elements associated with economic structure. First, population provides a primary attribute of structure due to the over-riding influence of agglomeration economies driven by demographic mass. Next, the breadth of economic activity is captured in a specific log entropy metric of diversity

Table 4
Regional socio-demographic and housing attributes in forested non-metropolitan counties by model quadrants for the aggregate tourism and timber sectors [a]

Socio-demographic and housing characteristic	Quadrant [b] (A)	Base value	Compare quadrant (B)	Mean difference (A–B)	Comparative significance [c]
Poverty rate — in percent, 1989	1	16.3	2	−0.2180	0.875
			3	−0.8459	0.509
			4	1.8849	0.165
	2	16.5	1	0.2180	0.875
			3	−0.6278	0.566
			4	2.1030*	0.076
	3	17.2	2	0.6278	0.566
			1	0.8459	0.509
			4	2.7308***	0.010
	4	14.4	2	−2.1030*	0.076
			1	−1.8849	0.165
			3	−2.7308***	0.010
Unemployment rate — in percent, 1990	1	8.6	2	0.4998	0.434
			3	0.6208	0.294
			4	1.1585*	0.065
	2	8.1	1	−0.4998	0.434
			3	0.1210	0.811
			4	0.6587	0.228
	3	7.9	2	−0.1210	0.811
			1	−0.6208	0.294
			4	0.5377	0.272
	4	7.4	2	−0.6587	0.228
			1	−1.1585*	0.065
			3	−0.5377	0.272
Per capita income — in US dollars, 1990	1	13,930	2	472.6450	0.404
			3	30.2936	0.954
			4	−1450.9218***	0.009
	2	13,457	1	−472.6450	0.404
			3	−442.3514	0.324
			4	−1923.5668***	0.000
	3	13,899	2	442.3514	0.324
			1	−30.2936	0.954
			4	−1481.2153***	0.001
	4	15,381	2	1923.5668***	0.000
			1	1450.9218***	0.009
			3	1481.2153***	0.001

[a] Calculations based on 256 forested non-metropolitan Counties in the 20 northeastern States with quadrant differences significant as shown in the last column.
[b] Model quadrant definitions as listed in Fig. 2; namely: Quadrant 1 = high tourism–high timber; Quadrant 2 = low tourism–high timber; Quadrant 3 = low tourism–low timber; Quadrant 4 = high tourism–low timber.
[c] Statistical tests based on a one-way ANOVA and the LSD post hoc test. For ease of interpretation, significant differences are noted as "*" for $p<0.10$, "**" for $p<0.05$, and "***" for $p<0.01$ level or better.

as measured by the Shannon–Wiener index. Finally, a proxy for specific sectoral profitability is captured in proprietor income (sometimes also termed "proprietary" income), or the income that accrues to business owners as a result of their entrepreneurial activities. These county-level structural characteristics for the rural forested region of the 20 northeastern states are summarized in Table 5.

Clearly, there is a strong tendency for those counties with high timber dependency to be characterized by lower populations. Counties in both Quadrants 1 and 2 (where timber dependency was high) had average base

Table 5
Regional economic structure and relative differences by quadrant in forested non-metropolitan counties for the aggregate tourism and timber sectors[a]

	Quadrant[b] (A)	Base value	Compare quadrant (B)	Mean difference (A–B)	Comparison significance[c]
Population — number of inhabitants, 1990	1	20,930	2	−1530.1874	0.795
			3	−17540.9744***	0.001
			4	−17244.5025***	0.003
	2	22,460	1	1530.1874	0.795
			3	−16010.7871***	0.001
			4	−15714.3151***	0.002
	3	38,471	2	16010.7871***	0.001
			1	17540.9744***	0.001
			4	296.4720	0.948
	4	38,175	2	15714.3151***	0.002
			1	17244.5025***	0.003
			3	−296.4720	0.948
Shannon–Wiener index[d] — as per Eq. (1), 1993	1	0.585	2	−0.01289	0.173
			3	−0.00984	0.261
			4	−0.01840**	0.048
	2	0.598	1	0.01289	0.173
			3	0.00305	0.684
			4	−0.00551	0.495
	3	0.595	2	−0.00305	0.684
			1	0.00984	0.261
			4	−0.00856	0.237
	4	0.604	2	0.00551	0.495
			1	0.01840**	0.048
			3	0.00856	0.237
Proprietor income — in US dollars, 1990	1	28,362	2	−182.6610	0.984
			3	−18700.7447**	0.023
			4	−23508.1212***	0.007
	2	28,545	1	182.6610	0.984
			3	−18518.0837***	0.009
			4	−23325.4602***	0.002
	3	47,063	2	18518.0837***	0.009
			1	18700.7447**	0.023
			4	−4807.3765	0.479
	4	51,870	2	23325.4602***	0.002
			1	23508.1212***	0.007
			3	4807.3765	0.479

[a] Calculations based on 256 forested non-metropolitan counties in the 20 northeastern states with quadrant differences significant as shown in the last column.
[b] Model quadrant definitions as listed in Fig. 2; namely: Quadrant 1 = high tourism–high timber; Quadrant 2 = low tourism–high timber; Quadrant 3 = low tourism–low timber; Quadrant 4 = high tourism–low timber.
[c] Statistical tests based on a one-way ANOVA and the LSD post hoc test. For ease of interpretation, significant differences are noted as "*" for $p<0.10$, "**" for $p<0.05$, and "***" for $p<0.01$ level or better.
[d] Shannon–Wiener diversity index is calculated using Eq. (2) and represents a log-based entropy measure of diversity.

populations that were roughly 60% of the base populations found in counties with relatively higher tourism dependencies. These differences were clear for the timber characteristic only; data did not suggest significant base population differences based on tourism dependency (significant differences in base populations were not evident between the two high timber quadrants or the two low timber quadrants).

Proprietor income consists of payments received for self-employed individuals as income. This includes income received by entrepreneurs who own and operate private businesses. A review of Table 5 shows that the base proprietor income was the greatest in counties categorized in Quadrant 4, namely those which exhibit relatively higher tourism dependency and lower timber dependency. Counties in this quadrant had significantly higher base proprietor incomes when compared to counties in high-timber quadrants (1 and 2). Counties falling in Quadrant 3 followed with the second highest base proprietor income, which were also significantly higher than Quadrant 1 or 2. For this metric, higher proprietor income was evident in counties with relatively lower timber dependency.

Economic diversity reflects the "breadth" of economic activity as measured by activity across economic sectors. Our specific metric of diversity, the Shannon–Wiener Index, showed the highest diversity in counties classified in Quadrant 4 (high tourism–low timber). Surprisingly, the only significant difference among county Shannon–Wiener indices was between counties falling in Quadrants 1 and 4, with Quadrant 1 (high tourism–high timber) showing the lowest diversity measure. This would appear to be a clear contradiction of the Webster/Chappelle hypothesis suggested earlier that counties with both high tourism and high timber dependency would be those with relatively higher economic diversity. Our data suggest that economic diversity was highest in those counties with relatively high tourism but low timber dependency. On the contrary, one might more realistically posit that diversity is better thought of as a function of other structural attributes such as population density, agglomeration, and regional competitive advantage.

Change over time in regional socio-demographic and economic attributes suggests interesting relationships that lead to both policy implications and the need for further research. These metrics are summarized in Table 6 for various time frames. The characteristics which were particularly insightful to the problem set addressed in this manuscript included population change, poverty rate change, unemployment rate change, and per capita income rate change. Significant differences in these characteristics among counties were found in all but unemployment rate change.

Population change was measured between 1990 and 1998; across the board, there was general population increase in these counties. In the forested rural northeast, counties classified in Quadrant 4 (high tourism–low timber) experienced the highest rate of change gaining over 10% of their base population. The other quadrant representing counties with high tourism dependency (Quadrant 1) had the second highest rate of growth at just over 7%. Both of these quadrants had significantly higher rate change than counties falling in Quadrants 2 and 3 (both with low tourism dependency). The data suggest that counties with high tourism (Quadrants 1 and 4) grew faster in base population than counties with low tourism irrespective of timber.

Poverty rate change was measured between 1989 and 1993. In all four quadrants, the rate of poverty incidence increased during this period. Counties falling in Quadrant 4 (high tourism–low timber) had the highest poverty rate increase at just over 9%, and it was significantly higher than all other quadrants. Among the other three quadrants, there was no statistically significant difference with rates ranging from 2 to 4%. Interestingly, counties with relatively lower timber dependency experienced the highest increase in poverty rates.

Unemployment rate change was measured between 1990 and 1996. Across all four quadrants, unemployment rates fell during this period without significant difference. The range of unemployment rate change averaged between 1 and 8% in quadrant averages.

Per capita income change was measured between 1990 and 1998, the same period as our time frame for base population change. In all quadrants, per capita income grew on average between 37 and 41% reflecting the strong economic growth of the 1990s. Counties falling in Quadrant 1 (high tourism–high timber) had the highest positive per capita income change. This growth was significantly higher than in the low tourism counties, Quadrants 2 and 3. No significant differences were found among the remaining three quadrants.

4. Discussion

This work builds on earlier research that presumed qualitative rural economic benefits to dependency on a combination of tourism and timber sector activity. The key presumption involved the notion that counties exhibiting high tourism sector dependency in combination

Table 6
Regional socio-demographic and economic change characteristics[a]

	Quadrant[b] (A)	Base value	Compare quadrant (B)	Mean difference (A–B)	Comparison significance[c]
Population change 1990–1998	1	0.0773	2	0.0343**	0.036
			3	0.0415***	0.006
			4	−0.0249	0.119
	2	0.0430	1	−0.0343**	0.036
			3	0.0072	0.576
			4	−0.0592***	0.000
	3	0.0358	2	−0.0072	0.576
			1	−0.0415***	0.006
			4	−0.0665***	0.000
	4	0.1022	2	0.0592***	0.000
			1	0.0249	0.119
			3	0.0665***	0.000
Poverty rate change 1989–1993	1	0.0306	2	0.0078	0.805
			3	−0.0127	0.666
			4	−0.0594*	0.057
	2	0.0228	1	−0.0078	0.805
			3	−0.0205	0.415
			4	−0.0672**	0.014
	3	0.0433	2	0.0205	0.415
			1	0.0127	0.666
			4	−0.0467*	0.055
	4	0.0900	2	0.0672**	0.014
			1	0.0594*	0.057
			3	0.0467*	0.055
Unemployment rate change 1990–1996	1	−0.0334	2	−0.0092	0.875
			3	−0.0221	0.682
			4	0.0513	0.369
	2	−0.0242	1	0.0092	0.875
			3	−0.0130	0.779
			4	0.0605	0.225
	3	−0.0112	2	0.0130	0.779
			1	0.0221	0.682
			4	0.0734	0.101
	4	−0.0847	2	−0.0605	0.225
			1	−0.0513	0.369
			3	−0.0734	0.101
Per capita income change 1990–1998	1	0.4068	2	0.0315**	0.049
			3	0.0294**	0.047
			4	0.0216	0.168
	2	0.3753	1	−0.0315**	0.049
			3	−0.0021	0.867
			4	−0.0099	0.467
	3	0.3774	2	0.0021	0.867
			1	−0.0294**	0.047
			4	−0.0078	0.523
	4	0.3852	2	0.0099	0.467
			1	−0.0216	0.168
			3	0.0078	0.523

[a] Calculations based on 256 forested non-metropolitan Counties in the 20 northeastern states with quadrant differences significant as shown in the last column.

[b] Model quadrant definitions as listed in Fig. 2; namely: Quadrant 1 = high tourism–high timber; Quadrant 2 = low tourism–high timber; Quadrant 3 = low tourism–low timber; Quadrant 4 = high tourism–low timber.

[c] Statistical tests based on a one-way ANOVA and the LSD post hoc test. For ease of interpretation, significant differences are noted as "*" for $p<0.10$, "**" for $p<0.05$, and "***" for $p<0.01$ level or better.

with high timber sector dependency would represent greater diversity in economic structure at the county level. To validate this presumption, we measured dependency using location quotients, as defined in Eq. (1), as a proxy to describe the impact of the tourism and timber sectors on a given region's economy. Our specified Tourism–Timber Diversity Model, shown in Fig. 2, took an initial step at quantifying and explaining economic characteristics based on relative resource dependencies.

There are several interesting distinctions that require discussion. Even after separating non-metropolitan from metropolitan counties, there is still a distinct difference among quadrants with respect to level of rural-ness as measured by population density. For the forested rural counties of the northeastern United States, the data clearly suggest that higher levels of timber sector activity are associated with counties having lower base populations and population densities; namely, these tend to be more rural and more remote counties. This is not the case with respect to tourism sector activity, which suggests county-level population densities two to three times higher. Population densities were more heterogeneous within the non-forested counties representing a wider range of socio-demographic characteristics.

Several trends were identified in our empirical work, which help define the relationships within the Tourism–Timber Diversity Model as applied to the forested rural Northeast. We had specific interest in that component of rural forested regions experiencing relatively higher dependency on tourism and timber sector activity (Quadrant 1). Initially, it was presumed that the combination of higher tourism and timber sector dependency would provide the greatest economic diversity with commensurate economic benefits as measured by socio-demographic and regional economic attributes (Webster and Chappelle, 1989).

Our data, for several variables, suggest otherwise. Desirable socio-demographic attributes such as lower unemployment rates and higher per capita income were more evident in counties with high tourism dependency than high timber dependency. Indeed, the presumption of greater diversity in tourism–timber dependent counties, as measured by the log entropy based Shannon–Wiener Index, was not supported by the data; that distinction was most pronounced in counties with relatively high tourism and low timber sector dependency.

Although more work is required to fully explain this phenomenon, our analysis points to several empirical realities that can inform our understanding of rural forested regional economies. Definitional and analytical semantics are important when we operationalize metrics that address economic diversity (Wagner, 2000; Dissart, 2003b). It is important to point out that when we distinguish a defensible definition of relative dependency (such as with the location quotient), the result represents only a slice of diversity in terms of economic structure. It represents relatively higher activity in the tourism and timber sectors without consideration of activity in other economic sectors. The Tourism–Timber Diversity Model provides a picture of only a portion of those regional economies, but it does offer some interesting comparisons between the tourism and timber sector interrelationship.

An interesting component mentioned earlier is related to the extent of urbanization. For the rural forested counties of the northeastern United States, the data clearly suggest that higher levels of timber sector activity are associated with counties exhibiting lower population densities. Higher levels of diversity, as measured by the Shannon–Wiener Index, were positively correlated with higher population. Other measures such as proprietor income also tracked population. In contrast, higher levels of timber sector activity were negatively correlated with higher population. In many cases, tourism sector activity or lack of activity appeared to be the primary influence upon the various regional socio-demographic and economic attributes tested. A closer examination of the role of agglomeration and market mass is warranted.

Another obvious issue that requires discussion addresses the uniqueness of how each sector grouping contributes to economic change. While tourism businesses do indeed provide a powerful job generation impact, the quality of these jobs is often a more relevant development question (Rothman, 1998; Lee and Kang, 1998; Kim et al., 2005). Tourism businesses employ large numbers of workers but characteristics of these jobs tend to be skewed toward low wage, seasonal, and part-time opportunities that often lack significant benefit packages (Fernández-Morales, 2003; Bernhardt et al., 2003; Marcouiller, et al., 2004b). This is contrasted with jobs in the forest products sector which tend to have relatively higher wage structures, are more often full-time/year-round positions, and come with a more complete set of fringe benefits (Weber, 1995; Leatherman and Marcouiller, 1999). These sectoral employment characteristics are reflected within the results for each quadrant. While low unemployment and high aggregate income metrics tended to be associated with counties having higher tourism dependency, so too was poverty incidence. To be sure, quick and easy conclusions with regard to sectoral comparisons remain preliminary and elusive. Further research to more clearly specify the distributional nature of change is required.

5. Conclusions, policy implications, and further research needs

This paper focused on forest resource dependency and issues of rural economic development by distinguishing rural forested counties in the northeastern United States based upon their relative dependencies on tourism and timber sector activity. Economic and socio-demographic characteristics of interest included population, income, unemployment, poverty incidence and structural economic diversity. We found that spatial patterns existed in the relative location and extent of both wood products and tourism firms in the northeastern United States and we were able to characterize these regions into homogeneous groupings through the use of our Tourism–Timber Diversity Model. In many cases, tourism sector activity or lack of activity appeared to be the primary influence upon the various regional socio-demographic and economic attributes tested.

The results of our model and its descriptive analysis provide a first exploratory step toward better understanding the role of tourism and timber sectors in rural forested regional economic change. Certainly, further research is warranted to more clearly associate and explain causal elements associated with the role natural resource endowments play in creating rural economic change. This is particularly true as we transition to post-industrial economic stages of rural development, often characterized by an increased reliance on the amenity base (Green et al., 2005). Several specific elements of further research should include a closer examination of agglomeration (population mass) and comparative advantage as key drivers of rural change. We look forward to the further refinement of this model and its application to resource dependent communities as logical next steps in developing the appropriate conceptual basis to address key issues of 21st century rural economic development.

While challenging, the empirical difficulties in developing both deductive and inductive models of rural economic development are developing a broader literature base. Across rural North America, natural resource endowments, extractive sector dependence, and amenity-based development are not random occurrences but tend to be clustered into what, for lack of a better term, exist as bio-regions. Forest presence is a good example of this bio-regional clustering. Empirically, this poses a particularly troublesome analytical issue of spatially auto-correlated error structures. In essence, place in space matters; refined econometric analysis that is unbiased and efficient needs to account for this regional (or spatial) clustering. Future policy analysis work needs to attend to these, and other, important empirical details.

In addition to satisfying theoretical curiosities, research addressing the impact of tourism and timber on regional diversity has several practical applications. A basic understanding of dynamic elements associated with rural economies is of interest to rural economic development specialists, planners, natural resource managers, and public policymakers. Regions with significant forest resources have a unique comparative advantage in attracting and retaining entrepreneurial business owners within both tourism retail/service sectors, forest products firms, and other business opportunities that take advantage of their unique endowments.

This manufacturing and tourism base can serve as an economic foundation for many rural communities. In recent years, economic pressures and public perceptions have brought change upon both tourism and the forest products industry. Competition from foreign manufacturers has impacted many firms. Differing values on the use of our forest resources has caused disputes between various interest groups. A clear understanding of economic factors can help address the array of issues facing rural forested regions, their communities, and residents as we move into and through the 21st century.

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