

Motivations and Land-Use Intentions of Nonindustrial Private Forest Landowners: Comparing Inheritors to Noninheritors

Indrajit Majumdar, David Laband, Lawrence Teeter, and Brett Butler

Abstract: The documented importance of intergenerational human capital transfers in agriculture generally gives us reason to suspect that such transfers may be important in a forestry context and that there may be important implied differences between first-generation woodland owners and multigeneration woodland owners with respect to their motivations and future intentions. In turn, knowledge of the motivations and intentions of nonindustrial private landowners may be extremely important because such knowledge may be vital in terms of our ability to predict future timber supply and the availability of nontimber amenities. Also, the effectiveness of public policies targeting nonindustrial private forest landowners may depend critically on their motivations and intentions. In this article, we analyzed 8,373 responses to the National Woodland Owner Survey to compare characteristics, motivations, and intentions of multigeneration forest landowners against those of single-generation forest landowners. In brief, we found there were significant differences in their motivations and management behavior; inheritors are more active forest managers and manage for both timber and nontimber forest products more aggressively than noninheritors who typically value esthetics, privacy, protection of biodiversity, and nonhunting recreation. *FOR. SCI.* 55(5):423–432.

Keywords: inheritance, intentions, nonindustrial private forest owners, National Woodland Owner Survey

“Our forests are a living legacy. We inherit them from our predecessors, tend them while they are under our care, but ultimately they outlive us and the condition of what we leave to our successors speaks loudly as to the type stewards we were, thus becoming our legacy.”

—*Maryland Forests Association, 2006*

FOR MANY YEARS, the paradigm explaining why children followed in their parents' (typically fathers') occupational footsteps was that social rigidity and lack of opportunity essentially blocked new workers from upward mobility, forcing them to work in the same occupations as their parents (e.g., Blau and Duncan 1967). However, in a series of contributions to the economics literature, Laband and Lentz (1983a, 1983b, 1985, 1989, 1990, 1992) and Laband et al. (1984) argued that intergenerational occupational following largely was voluntary on the part of the younger generation. In a number of occupations, children receive specific human and nonhuman capital, the value of which is maximized when they follow in their parents' occupational footsteps. Across a variety of occupations, Laband and Lentz demonstrated that occupational followers typically had higher earnings and greater career success than nonfollowers. However, Laband and Lentz never were able to present evidence comparing motivations and intentions of either the parents or the children who followed into their occupations against those of parents and children where there was no occupational following. The documented importance of intergenerational human capital transfers in agriculture generally (Laband and Lentz 1983a) gives us reason to suspect that such transfers may be

important in a forestry context and that there may be important implied differences between first-generation woodland owners and multigeneration woodland owners with respect to their motivations and future intentions.

In a forestry context narrowly and natural resources context more broadly, knowledge of the motivations and intentions of nonindustrial private landowners may be extremely important for at least two reasons: such knowledge may be vital in terms of our ability to predict future timber supply and the availability of nontimber amenities and the effectiveness of public policies targeting nonindustrial private forest (NIPF) landowners may depend critically on their motivations and intentions; if so, then better information about landowner motivations and intentions is a sine qua non for the design and implementation of more effective public policy. Several typological studies on NIPF behavior in the United States (Kline et al. 2000, Kendra and Hull 2005, Butler et al. 2007, Majumdar et al. 2008) and in Scandinavian countries (Karppinen 1998, Boon et al. 2004, Ingemarson et al. 2006) have emphasized the need to better understand the diversity in landowner motivations and intentions for extending educational/extension efforts and for policy implementation.

In recent years, several empirical analyses of decision-making by NIPF landowners have included a control variable for whether or not the landowner inherited some or all of the property (e.g., Hardie and Parks 1996, Amacher et al. 2002b, Conway et al. 2003, Sullivan et al. 2005, Vokoun et al. 2006). From our review of this literature, inheritance

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Acknowledgments: Funding for this research was provided by the US Forest Service, North Central Research Station through a cooperative agreement (06-JV-11231300-100) with the School of Forestry and Wildlife Sciences, Auburn University. We wish to thank the anonymous reviewers for their valuable comments. All errors are the responsibility of the authors.

status is treated as a landowner characteristic, with no theoretical justification for inclusion of this characteristic in the models. Nonetheless, at least some of this research shows that inheritance status is a statistically significant explanatory variable for certain landowner behaviors. For example, Hardie and Parks (1996) found that demand for acreage to plant after harvest was significantly greater among landowners who inherited their land than among those who did not inherit. Similarly, Vokoun et al. (2006) reported that inheritors are significantly more likely than noninheritors to harvest timber at 100% intensity. In their analysis of NIPF landowners in five central Virginia counties, Conway et al. (2003) reported that those who inherited their land were significantly more likely than noninheritors to be planning a bequest of timber, land, or both to their heirs. They also reported positive but statistically insignificant impacts of inheritance status with respect to timber harvesting activity and the number of nontimber activity days on the property.

In Table 1, we provide an overview of the forestry-related empirical studies in which whether or not the owner inherited some/all of the property was controlled for. With the lone exception of Vokoun et al. (2006), none of these analyses included explanatory variables that controlled for

the owner's education. Further, only Vokoun et al. (2006) controlled for duration of ownership, although it seems likely that this is correlated, at least to some degree, with owner's age, which is included as an explanatory variable in the other analyses. Note, however, that in several cases the authors did control for the owner's stated intention to bequeath the land and/or timber to his or her heirs. This factor is important, as differences between inheritors and first-generation timberland owners with respect to motives may drive subsequently observed differences with respect to land-use decisions. Taken together, these studies provide an empirical basis for suggesting that inheritors are more strongly focused on timber production than are noninheritors, even with controls for demographic characteristics and bequest motives.

However, even this suggestion is of limited value in understanding the behavior of inheritors. It may be, for example, that inheritors are more strongly motivated than noninheritors by a wide spectrum of timber-related amenity values, such as the desire for privacy, hunting, harvesting of nontimber forest products, recreation, and others in addition to timber production. In this case, the observation that inheritors are more focused on timber production than noninheritors is merely a proxy for a much broader conclusion

Table 1. Previous findings on the impact of inheriting woodland

Researchers	Landowner behavior	Sign/significance of inheritor	Other landowner characteristics controlled for
Vokoun et al (2006)	Harvest intensity (100%)	Positive; 0.10 level	Absentee Income Years owned Acreage No. children Employed No. structures College degree Bequest motive
Sullivan et al. (2005)	Forest Bank enrollment	Positive; NS	Income Gender Absentee Bequest motive
Conway et al. (2003)	Harvested in last 5 years	Positive; NS	Age Absentee owner Parcel size Bequest motive
	Bequeath timber to heirs	Positive; 0.10 level	Income Acreage Age Married Employed Absentee
	Non-timber activity days	Positive; NS	Acreage Age Married Lived on property Absentee
Amacher et al. (2002b)	Bequeath timber to heirs	Negative; NS	Gross income Household size Married Age Acreage
Hardie and Parks (1996)	Demand for post-harvest acreage to plant	Positive; 0.01 level	Age Acreage

NS, not significant.

about motives. On the other hand, it may be that inheritors really are focused narrowly on timber production, whereas noninheritors are significantly more interested in nontimber amenity values.

The only study of nontimber amenity values that permits comparison between inheritors and first-generation landowners is the Conway et al. (2003) analysis of days spent on nontimber (hunting plus nonhunting) activities. Using this broad definition of nontimber activities, they found no statistically significant differences between inheritors and noninheritors. But there are, of course, a number of specific nontimber amenity values that landowners may be motivated by, and it may be especially insightful to compare inheritors and first-generation timberland owners with respect to a more detailed suite of nontimber motivations and to control for these other motivations, in addition to the bequest motive, when looking at factors that influence timber-related decisionmaking. It should be noted that the empirical analyses referred to above all relied on highly localized survey data, raising the possibility that the inheritor findings reflect localized conditions rather than being generally representative of NIPF landowners who inherited their land.

Because in this forestry context inheritance status is treated as an exogenous characteristic, we do not really understand why certain types of decisions made by inheritors differ significantly from the decisions made by noninheritors. One possibility is that there are differences between inheritors and noninheritors with respect to age, income, wealth, gender, education, or other attributes that

also have been found to influence landowner decisionmaking (Royer 1987, Romm et al. 1987, Dennis 1989, Kuuluvainen et al. 1996, Conway et al. 2003). That is, both inheritors and noninheritors have similar objectives and motivations, but their constraints, defined in demographic terms, differ.

A second, not mutually exclusive, possibility is that, with demographic characteristics held constant, there are differences between inheritors and noninheritors with respect to motivations, objectives, and management planning, which in turn have been shown to influence landowner decisionmaking (Royer 1987, Dennis 1989). Such differences between inheritors and first-generation woodland owners might exist by virtue of the overlapping generations context in which both investment and consumption decisions are made by inheritors and their parents (Amacher et al. 1999, 2002b). Further, as noted previously, first-generation woodland owners are not privy to the intergenerational transmission of both values and important human capital that normally accompany bequests of physical capital in the form of land with timber stock. Yet a third possibility is that there are other, not well-understood but nonetheless important, differences between inheritors and noninheritors that are unrelated to demographic characteristics or to landowner motivations but that exert significant influence on their respective patterns of decisionmaking.

Yet a better understanding of the importance of inheritance to NIPF decisionmaking surely commands our attention, as 28% of NIPF woodland owners (nationally) report having inherited their land (Table 2). No doubt, a great deal

Table 2. Demographic characteristics of National Woodland Owner Survey respondents

Variable	Complete sample		Inheritors			Noninheritors		
	Mean	SD	Mean	SD	N	Mean	SD	N
Income <\$25,000	0.097	0.295	0.098	0.297	2,908	0.096	0.294	7,552
Income \$25,000–\$49,999	0.237	0.426	0.240	0.427	2,908	0.237	0.425	7,552
Income \$50,000–\$99,999	0.302	0.459	0.310	0.463	2,908	0.299	0.458	7,552
Income \$100,000–\$199,999	0.137	0.344	0.132	0.338	2,908	0.139	0.346	7,552
Income ≥\$200,000*	0.078	0.268	0.065	0.246	2,908	0.083	0.276	7,552
Age <25	0.001	0.031	0.001	0.032	2,908	0.001	0.030	7,552
Age 25–34*	0.012	0.108	0.008	0.090	2,908	0.013	0.114	7,552
Age 35–44*	0.080	0.271	0.050	0.218	2,908	0.091	0.287	7,552
Age 45–54*	0.217	0.412	0.174	0.379	2,908	0.233	0.423	7,552
Age 55–64	0.272	0.445	0.275	0.447	2,908	0.271	0.445	7,552
Age 65–74*	0.226	0.419	0.260	0.439	2,908	0.214	0.410	7,552
Age ≥75*	0.152	0.359	0.186	0.389	2,908	0.138	0.345	7,552
Less than 12th grade*	0.060	0.238	0.039	0.194	2,908	0.068	0.251	7,552
High school graduate/GED*	0.243	0.429	0.210	0.408	2,908	0.256	0.436	7,552
Some college*	0.173	0.378	0.156	0.363	2,908	0.180	0.384	7,552
Associate/technical degree*	0.096	0.294	0.079	0.269	2,908	0.102	0.303	7,552
Bachelor's degree*	0.210	0.408	0.265	0.441	2,908	0.189	0.392	7,552
Graduate degree*	0.175	0.380	0.203	0.402	2,908	0.165	0.371	7,552
Tenure*	25.566	15.112	28.250	16.237	2,908	24.502	14.509	7,552
Forest land	599.101	7,199.900	691.436	2,909.550	2,908	560.650	8291.400	7,552
Mountain	0.018	0.133	0.019	0.135	2,908	0.018	0.132	7,552
North Central*	0.448	0.497	0.308	0.462	2,908	0.502	0.500	7,552
North East*	0.187	0.390	0.154	0.361	2,908	0.199	0.399	7,552
South Central*	0.164	0.370	0.240	0.427	2,908	0.134	0.340	7,552
South East*	0.152	0.359	0.248	0.432	2,908	0.114	0.318	7,552
Gender, male = 1*	0.791	0.406	0.801	0.399	2,586	0.892	0.311	6,970
Inherit	0.278	0.448						

* Denotes statistical significant difference between inheritors and non-inheritors based on a two sample *t* test.

of forestland gets passed from one generation to another, with the younger generation selling off the land for a variety of reasons. So the 28% of inheritors in our sample refers to the ones who inherited and chose not to sell the family lands. This figure is comparable to the 30% rate of occupational inheritance in agriculture (Laband and Lentz 1983b). Differences between inheritors and noninheritors, then, may have widespread and sizable implications with respect to issues of considerable importance within the forestry community, such as the supply of timber and non-timber amenities. For example, Amacher et al. (2002b) suggested that inheritors may be more likely than noninheritors to make bequests in the form of land plus standing timber stock rather than cash. Although they did not find specific evidence in support of this hypothesis in the context of the landowner sample they analyzed, their work serves to illustrate the potential importance of possible behavioral differences between inheritors and first-generation woodland owners.

In this article, we analyzed 8,373 responses to the National Woodland Owner Survey (NWOS) (Butler et al. 2005) to compare characteristics, motivations, and intentions of multigeneration forest landowners against those of single-generation forest landowners. Although we make no pretense of developing a comprehensive theory of the behavior of inheritors, our purpose and unique contribution is twofold. First, we hope to demonstrate that the differences between NIPF inheritors and noninheritors extend considerably beyond harvesting and replanting decisions to encompass motivations for owning their land and future intentions. Second, we seek to provide initial evidence that permits us to better understand whether inheritance has been found to be empirically important merely because it reflects demographic characteristics that were not otherwise controlled for in previous empirical analyses of landowner decisionmaking or whether such a better understanding requires further scientific attention.

Data

Our data come from the NWOS. NWOS is conducted as part of the Forest Inventory and Analysis program of the US Forest Service. As part of the NWOS, a self-administered questionnaire is mailed to private landowners as the primary survey instrument with supplemental telephone interviews conducted on nonrespondents to augment response rates and test for nonresponse bias (Butler et al. 2005). The questionnaire included 30 questions concerning Woodland characteristics, Ownership objectives, Forest use, Forest management, Sources of information, Concerns and issues, and Demographics. For our purposes we used only responses from family forest owners [1].

The questions in the survey were prepared using a comprehensive questionnaire review process that included expert reviews, pretesting of the survey instrument at several woodland owner conferences and professional meetings, input from state forestry agencies, expert opinion and review by the clearance office of the US Forest Service. For a detailed description of the development and implementation of the survey instrument, see Butler et al. (2005).

The response rate (for details on sample design and sample size refer to Butler et al. 2005, p. 11–12) to this mail-based survey was 51.3%. A total of 15,440 family forest owners who responded in the NWOS between 2002 and 2006 were included in our analyses. We ignored the inclusion of forest industry, timber investment management organizations, and real estate investment trusts in our analysis because we were interested in exploring the diverse set of motivations of only the family forest owners. After removing observations with missing responses for the variables used in our analysis we were left with a usable sample of 8,373.

The NWOS offers an unprecedented opportunity to compare inheritors against first-generation timberland owners in a large numbers, national context, with representation from every region of the United States. In this context, observed differences with respect to land-use decisions are unlikely to result from demographic differences between inheritors and first-generation landowners. On average, the survey respondents had owned their land just under 26 years, with an average forestland holding of 599 acres [2]. That is, with two very large groups of landowners, the demographics are unlikely to vary significantly.

Across a number of demographic characteristics, there seemed to be only relatively minor differences between inheritors and first-generation NIPF landowners. However, although differences in the sample means with respect to inheritors and first-generation woodland owners seem to be relatively minor, many of the differences, in fact, are statistically significant, as determined using a two-sample *t*-test. For example, with respect to the fraction of respondents reporting annual family income greater than \$200,000/year, the number identified for inheritors (0.065) seems quite close to that identified for noninheritors (0.083). Likewise, the fraction of inheritors with some college (0.156) appears to be close to the fraction of noninheritors with some college (0.180). However, as indicated by the asterisks in Table 2, the sample means for both of these variables are statistically different. It is not surprising to find significant differences with such large sample sizes. Just because the means are “significantly different” does not mean that the difference is practically important. This fact contributed to our motivation for a more rigorous empirical analysis that follows.

Methods

Information available from the NWOS permits us to identify forest landowners who inherited [3]. In our study we consider as inheritors only those individuals who checked “inherited it” as the response to the direct question “How did you get your woodland”; other individuals may have acquired woodland from family members through a purchase at a below market price. Whether such owners behave as inheritors or first-generation woodland owners remains an open-ended question. Although land inheritance does not per se imply that the second (or *n*th) generation has the same motivation as the parent, it seems possible, if not likely, that multigeneration landowners feel differently

about and behave differently toward the land than single-generation landowners [4]. The NWOS contains a question pertaining to the respondent's motives for owning land and a question regarding his or her future intentions for the property. With respect to the former, respondents were asked to reveal the importance of 12 specific motives plus a catch-all category (other) on a scale that ranged from 1 (very important) to 7 (not important). The specific question on the survey referred to the importance of "the following as reasons for why you own woodland..." Strictly speaking, these reasons may be regarded as objectives as opposed to motives, but from our perspective, this is splitting a pretty fine hair. The relevant point is that however one classifies these reasons, they offer an opportunity to explore possible differences between inheritors and first-generation woodland owners. We merged responses 1 and 2 together and responses 3–7 together to create a binary variable indicating whether (1) or not (0) the respondent regarded each specific motivation as important and used logistic regression to estimate the model,

$$\text{Motivation}_i = \sum \alpha_i + \sum \beta_i X_i + \varepsilon_i, \quad (1)$$

where α_i is the constant term, β_i are parameter estimates of the explanatory variables, X_i , and ε_i is the error term, which is assumed to follow a logistic distribution. Our merging of the response categories is consistent with the analysis of Butler et al. (2007) using the same NWOS data.

The explanatory variables were the respondent's age, entered as categorical variables (<25, 25–34, 35–44, 45–54, 55–64, 65–74, or ≥ 75 [reference category]); education, entered as categorical variables (less than 12th grade, high school graduate or GED, some college, associate or technical degree, bachelor's degree, or graduate degree [reference category]); gender (male = 1); inherit, assigned a value of 1 if respondent i inherited the land and 0 otherwise; tenure (the number of years the respondent had owned land); woodland (the number of acres of woodland owned by the respondent); and dummy variables for region of the country. Because the future intentions and motivations of landowners may be related, we estimated our set of future intentions equations using a two-stage regression process whereby we included the predicted probabilities of the landowners' stated motivations (all 12 motivations estimated) from the first-stage regressions specified in Equation 1 as control variables in our set of second-stage logistic estimations of those same landowners' future intentions, as specified in

$$\text{Future Intention}_i = \sum \alpha_i + \widehat{\text{Motivation}}_{ij} + \sum \beta_i X_i + \varepsilon_i, \quad (2)$$

where for each of the future plans, $\text{Future Intention}_i$ reveals whether (1) or not (0) respondent i indicated that she or he planned to engage in that use in the next 5 years, α_i is the constant term, $\widehat{\text{Motivation}}_{ij}$ are the predicted probabilities of the j th motivation (where $j = 1$ to 12) for respondent i (from results of Equation 1), β_i are parameter estimates of the explanatory variables, X_i , and ε_i is the error term, which is assumed to be distributed logistically. Logistic regression

models are relatively flexible compared with other regression techniques, as there are no potentially limiting assumptions about the distribution of the independent variables. They do not have to be normally distributed, linearly related or of equal variance within each group.

The motivations and intentions are identified in Table 3, which also reports the sample statistics for both the combined sample and for inheritors and first-generation NIPF landowners separately. Because respondents were advised to check all boxes (for intended use of their land) that applied, each response category was treated as a separate variable of interest that respondents either did or did not indicate.

Findings

Motivations for Owning Their Land

Our estimation results for logistic regression estimation of Equation 1 for each of the 12 motivations for owning their woodland presented as possibilities on the NWOS are presented in Table 4 and discussed below. All of these regression models contain the same set of explanatory variables. After missing values for all of the explanatory variables were removed, the total number of observations for each model was 8,373. With respect to the dependent variables, out of 12 motivations only "Farm" and "Home" had additional missing values; we imputed these missing values so as to be able to use all the explanatory values and also maintain consistency in sample size for comparing results across regressions. Given the nature of the "Motivation" question in the NWOS, respondents who did not respond to the Home and Farm questions were considered less likely to be motivated by those reasons for owning woodland and were therefore imputed with a value 0 (not important) for our analysis. Because the coefficient estimates are not directly interpretable as probabilities, we also present, in Table 5, the associated odds ratios, which in our analysis revealed how much more or less likely inheritors are to have certain motivations compared with first-generation woodland owners [5].

To simplify the presentation, we focused on the signs and significance of the Inherit variable. With respect to reasons for owning their woodland, we found that inheritors placed significantly more importance than noninheritors on the following motivations, in order of size of impact (Table 5): to pass land on to their children or other heirs, production of timber, to be part of their farm or ranch, and for cultivation and production of nontimber forest products. Specifically, inheritors are only 57% as likely as noninheritors to indicate that passing on their woodland to their children or other heirs is "not important"; that is, inheritors are much more likely than first-generation woodland owners to be motivated by the opportunity of passing along a legacy of woodland to their children or heirs. This finding is consistent with Conway et al. (2003). Likewise, inheritors are only 58% as likely as noninheritors to indicate that timber production is "not important." Although the phrasing of the NWOS survey questions may seem awkward, the interpretation is clear: among woodland owners, inheritors are much more likely than noninheritors to report passing on the land

Table 3. Sample statistics regarding Motivations and Intentions of National Woodland Owner Survey respondents

	Inheritors			Noninheritors		
	Mean	SD	N	Mean	SD	N
Motivation for owning land (1 = very important to 7 = not important)						
Nontimber forest products	5.189	1.948	2,542	5.306	1.896	6,800
Firewood	4.951	2.033	2,584	4.759	2.077	6,907
Investment	3.158	2.164	2,668	3.275	2.101	7,023
Timber	3.547	2.313	2,674	4.566	2.255	6,980
Recreation	3.701	2.204	2,602	3.302	2.174	6,972
Hunting	3.191	2.220	2,695	3.150	2.314	7,134
Legacy	2.269	1.830	2,750	2.917	2.087	7,127
Privacy	3.052	2.230	2,580	2.374	1.908	6,978
Farm	3.603	2.590	1,768	3.881	2.601	4,743
Home	3.257	2.447	1,820	2.651	2.202	5,112
Biodiversity	2.608	1.749	2,631	2.484	1.725	7,004
Aesthetics	2.250	1.665	2,687	1.947	1.498	7,174
Future intentions (1 = yes, 0 = no)						
Convert to woodland	0.045	0.208	2,840	0.031	0.173	7,410
Deforest/convert to other use	0.032	0.177	2,840	0.035	0.183	7,410
Buy more	0.126	0.332	2,840	0.153	0.360	7,410
Subdivide/sell	0.026	0.159	2,840	0.022	0.146	7,410
Give to children/heirs	0.204	0.403	2,840	0.139	0.346	7,410
Sell	0.087	0.282	2,840	0.076	0.263	7,410
Produce nontimber forest products	0.088	0.283	2,840	0.104	0.305	7,410
Sawlogs	0.357	0.479	2,840	0.229	0.420	7,410
Firewood	0.311	0.463	2,840	0.392	0.488	7,410
Minimal	0.408	0.492	2,840	0.440	0.496	7,410
No activity	0.271	0.444	2,840	0.315	0.464	7,410
Unknown	0.050	0.217	2,840	0.049	0.217	5,395
No plans	0.136	0.343	2,840	0.159	0.366	7,410

to their heirs and production of timber as important. However, noninheritors place significantly more importance than multigeneration woodland owners on the following motivations for owning their woodland (also in order of size of impact): privacy, to be part of their home, esthetics, protection of biodiversity, and for recreation other than hunting or fishing. There is no difference between inheritors and noninheritors with respect to owning land as an investment, for hunting or fishing, and for production of firewood or biofuel. So the suite of valued products and services provided by their respective woodland differs markedly between inheritors and noninheritors.

Future Intentions for Their Land

Because inheritors, by definition, have a family tradition of passing woodland from one generation to the next, our finding that inheritors are more strongly motivated than noninheritors to own their land to, in turn, pass on a legacy to their children or heirs was both expected and believable (Table 6). In addition, owners who inherited are more likely than noninheritors to have an investment time horizon for their woodland that is consistent with long-term management activity, such as timber production (Hultkrantz 1992). In turn, more active management for timber by inheritors further implies a lower likelihood that inheritors will respond that they have no plans for their property or no planned activity.

In Table 6 we report results of logistic regression estimations of the likelihood that respondents identified a specific, listed intention for their woodland *in the next 5 years*.

To economize on the presentation, we report relevant information for the Inherit variable only [6]. We found that inheritors are significantly *more* likely than noninheritors to intend to harvest sawlogs, convert another land use to woodland, and harvest nontimber forest products. Specifically, compared with first-generation woodland owners inheritors were 44% more likely to intend to harvest sawlogs, 37% more likely to intend afforestation, and 24% more likely to intend to harvest nontimber forest products in the future (Table 6). We also found that inheritors are significantly *less* likely than noninheritors to have no plans (82% as likely as noninheritors), to have no planned activity (79% as likely as noninheritors), or to plan to buy more woodland (66% as likely as noninheritors). There were no significant differences between inheritors and noninheritors for the following future intentions: future plans not known, plan minimum activity to maintain woodland, plan to harvest firewood, plan to sell some or all of their woodland, or plan to divide all or part of their woodland and sell the subdivisions.

Conclusions and Discussion

We analyzed more than 8,373 responses to the NWOS to compare motivations and intentions of multigeneration forest landowners against those of single-generation forest landowners. Controlling for demographic characteristics (age, education, income, gender, size, and tenure of land-ownership), we found that inheritors are significantly more active forest managers in the production of both timber and nontimber forest products compared with noninheritors who

Table 4. Logistic regression estimation results of factors that affect motivations for owning woodland

Explanatory variable	Aesthetics	Biodiversity	Timber	Investment	Home	Farm	Privacy	Legacy	Hunting	Recreation	Non-timber Forest Products	Firewood
Intercept	1.0841 (0.18)*	0.0717 (0.17)*	-2.1182 (0.21)*	-0.4319 (0.17)*	-1.0067 (0.19)*	-1.8451 (0.23)*	0.7126 (0.17)*	0.2641 (0.17)	-1.5767 (0.20)*	-0.6007 (0.19)*	-2.5494 (0.28)*	-2.3788 (0.24)*
Age <25	-0.1613 (0.62)	-0.3320 (0.59)	-0.2398 (0.73)	0.1913 (0.58)	0.1069 (0.59)	-0.9954 (0.91)	-0.2046 (0.58)	-0.0771 (0.59)	1.0749 (0.72)	1.4800 (0.70)†	0.0099 (0.92)	0.1421 (0.71)
Age 25-34	0.6518 (0.24)*	0.0876 (0.19)	-0.2097 (0.24)	0.3745 (0.19)†	0.0776 (0.19)	-0.2084 (0.26)	0.4692 (0.21)†	0.2464 (0.19)	0.2338 (0.21)	0.1918 (0.20)	-0.0512 (0.33)	-0.3745 (0.28)
Age 35-44	0.1800 (0.13)	0.2591 (0.12)†	-0.0897 (0.15)	-0.0013 (0.12)	0.0312 (0.12)	0.0386 (0.17)	0.4086 (0.14)†	0.0790 (0.12)	0.2945 (0.14)†	0.1374 (0.14)	0.0348 (0.20)	0.2488 (0.15)‡
Age 45-54	0.2130 (0.12)‡	0.2755 (0.11)*	-0.0274 (0.14)	0.0213 (0.11)	0.0774 (0.11)	0.1841 (0.16)	0.3838 (0.11)†	-0.1562 (0.11)	-0.0421 (0.13)	-0.0232 (0.13)	0.1803 (0.18)	0.1595 (0.14)
Age 55-64	0.0677 (0.12)	0.2118 (0.11)†	0.0575 (0.13)	-0.1468 (0.11)	0.1135 (0.11)	0.3351 (0.16)†	0.1118 (0.11)	-0.1540 (0.11)	-0.2757 (0.13)†	-0.2834 (0.13)†	-0.0034 (0.17)	0.1641 (0.14)
Age 65-74	-0.2775 (0.12)†	-0.0636 (0.11)	0.1724 (0.14)	-0.1096 (0.11)	-0.0931 (0.11)	0.3324 (0.16)†	-0.2943 (0.11)*	0.0106 (0.11)	-0.4857 (0.13)*	-0.6188 (0.13)*	-0.0424 (0.18)	-0.0615 (0.14)
Less than 12th grade	-0.2527 (0.08)*	-0.2080 (0.08)*	-0.0789 (0.09)	0.0522 (0.09)	-0.0849 (0.08)	0.1982 (0.09)†	0.0352 (0.08)	0.1667 (0.08)†	0.3159 (0.08)*	-0.1155 (0.09)	0.5582 (0.11)*	0.4155 (0.10)*
High school graduate/GED	-0.1871 (0.05)*	-0.1280 (0.04)*	0.0718 (0.05)	0.0511 (0.05)	0.0359 (0.05)	0.1386 (0.05)*	0.1137 (0.05)†	0.1413 (0.05)*	0.2380 (0.05)*	0.0358 (0.05)	0.1393 (0.07)†	0.2733 (0.06)*
Some college	0.0633 (0.05)	0.0059 (0.05)	-0.1243 (0.06)†	-0.0214 (0.05)	0.0138 (0.05)	0.0746 (0.05)	0.1609 (0.05)*	0.0521 (0.05)	0.0190 (0.05)	-0.0191 (0.05)	-0.2423 (0.09)*	-0.0747 (0.07)
Associate degree	0.2152 (0.07)*	0.0289 (0.06)	-0.0548 (0.08)	-0.1162 (0.07)‡	0.1179 (0.06)‡	‡	0.1359 (0.07)†	0.0788 (0.06)	0.1239 (0.07)†	0.0522 (0.06)	-0.0802 (0.11)	-0.0237 (0.08)
Bachelor's degree	-0.0451 (0.05)	0.0115 (0.05)	0.2065 (0.05)*	0.0456 (0.05)	-0.0885 (0.05)‡	-0.1067 (0.05)†	-0.2241 (0.05)*	-0.1746 (0.05)*	-0.2617 (0.05)*	0.0079 (0.05)	-0.2090 (0.08)*	-0.1781 (0.07)*
Income <\$25,000	-0.2050 (0.07)*	-0.0538 (0.06)	0.0557 (0.07)	-0.4379 (0.07)*	0.1145 (0.07)‡	0.1517 (0.07)†	0.0202 (0.07)	-0.1020 (0.07)	-0.1454 (0.07)†	-0.2668 (0.07)*	0.1625 (0.10)	0.7096 (0.08)*
Income \$25,000-\$49,999	0.0024 (0.05)	0.0626 (0.04)	0.0913 (0.05)‡	-0.0715 (0.04)	-0.0372 (0.04)	-0.0095 (0.05)	-0.0468 (0.04)	-0.0113 (0.04)	-0.0391 (0.05)	-0.0981 (0.05)†	0.0613 (0.07)	0.3490 (0.06)*
Income \$50,000-\$99,999	0.0012 (0.04)	0.0005 (0.04)	-0.0460 (0.05)	0.0147 (0.04)	-0.0591 (0.04)	-0.0431 (0.04)	0.0415 (0.04)	0.0327 (0.04)	0.0124 (0.04)	0.0208 (0.04)	-0.0638 (0.07)	0.0379 (0.06)
Income \$100,000-\$199,999	-0.0117 (0.06)	-0.0618 (0.05)	0.0836 (0.06)	0.1541 (0.05)*	-0.0847 (0.05)	-0.0880 (0.06)	-0.0229 (0.05)	0.0144 (0.05)	0.0672 (0.05)	0.0642 (0.05)	-0.0587 (0.09)	-0.2604 (0.08)*
Inherited	-0.3648 (0.06)*	-0.1586 (0.05)*	0.5516 (0.06)*	-0.0194 (0.05)	-0.3059 (0.05)*	0.1039 (0.06)‡	-0.4528 (0.05)*	0.5899 (0.05)*	0.0744 (0.05)	-0.1262 (0.05)†	0.1480 (0.08)‡	0.0629 (0.07)
Male	-0.3140 (0.08)*	-0.3848 (0.07)*	0.6389 (0.09)*	-0.0100 (0.07)	0.0427 (0.07)	0.2858 (0.08)*	-0.0640 (0.07)	-0.1009 (0.07)	0.8263 (0.07)*	-0.0100 (0.07)	0.4392 (0.13)*	0.5526 (0.11)*
% Woodland	-4.0E-5 (1.3E-5)*	-2.0E-5 (1.3E-5)	3.7E-4 (3.5E-5)*	2.2E-4 (3.1E-5)*	-8.0E-5 (2.3E-5)*	6.7E-5 (2.9E-5)†	-6.0E-5 (1.7E-5)*	3.3E-5** (1.6E-5)†	2.3E-4 (3.2E-5)*	-3.0E5 (1.5E-5)†	1.8E-4 (6.7E-5)*	2.2E-5 (1.8E-5)
% Woodland2	1.2E-10 (5.8E-11)†	5.7E-11 (5.8E-11)	-2.2E-9 (2.3E-10)*	-1.3E-9 (2.2E-10)*	2.4E-10 (2.0E-10)	-2.0E-9 (8.5E-10)†	2.8E-10 (1.5E-10)†	8.4E-11 (9.0E-11)	-5.5E-9 (9.0E-10)*	1.1E-10 (6.4E-11)‡	-1.1E-8 (6.0E-9)‡	6.0E-11 (7.8E-11)
Mountain	0.2510 (0.22)	-0.0148 (0.21)	-1.4193 (0.32)*	-0.5057 (0.22)†	1.0274 (0.22)*	1.1272 (0.22)*	0.0440 (0.13)	-0.3514 (0.21)‡	0.3602 (0.23)	0.3886 (0.22)‡	-0.3552 (0.36)	0.1836 (0.29)
North Central	0.3325 (0.13)*	0.4874 (0.13)*	-0.2022 (0.15)	-0.0447 (0.13)	0.8832 (0.15)*	0.4148 (0.15)*	-0.0799 (0.13)	-0.1939 (0.13)	1.4567 (0.15)*	0.5675 (0.14)*	-0.0861 (0.20)	0.1712 (0.18)
North East	0.3646 (0.14)*	0.4496 (0.13)*	0.0952 (0.16)	-0.1041 (0.14)	1.0115 (0.15)*	0.2542 (0.16)	0.0408 (0.14)	-0.2883 (0.13)†	0.7897 (0.15)*	0.3485 (0.14)*	-0.3352 (0.22)	0.3972 (0.19)†
South Central	0.0409 (0.14)	-0.2800 (0.13)†	0.6528 (0.15)*	0.5616 (0.14)*	0.7672 (0.15)*	0.5633 (0.16)*	-0.1712 (0.14)	0.2655 (0.14)†	1.0131 (0.15)*	0.0350 (0.14)	0.0444 (0.21)	-0.4931 (0.20)*
South East	0.0557 (0.14)	-0.3495 (0.14)*	0.7342 (0.16)*	0.5628 (0.14)*	0.3098 (0.16)†	0.1170 (0.16)	-0.0466 (0.14)	0.1285 (0.14)	0.8880 (0.15)*	-0.0229 (0.15)	0.1048 (0.22)	-0.4926 (0.20)†
-2 Log likelihood	9,894.54	11,290.70	9,032.40	10,926.49	11,098.48	9,831.21	10,721.24	11,221.57	10,815.37	10,840.58	5,435.18	7,002.75
N	8,373	8,373	8,373	8,373	8,373	8,373	8,373	8,373	8,373	8,373	8,373	8,373

SEs in parentheses.

* Significant at 0.01 level.

† Significant at 0.05 level.

‡ Significant at 0.10 level.

Table 5. Odds ratios comparing inheritors against noninheritors with respect to motivations

	Odds ratio		
	Point estimate*	95% Wald confidence limits	
Aesthetics	1.352†	1.228	1.487
Biodiversity	1.127†	1.028	1.236
Timber	0.579†	0.529	0.634
Investment	1.055	0.963	1.155
Home	1.470†	1.315	1.643
Farm	0.857†	0.765	0.959
Privacy	1.610†	1.466	1.768
Legacy	0.566†	0.515	0.622
Hunt	0.908	0.829	0.995
Recreation	1.127†	1.030	1.233
NTFPs	0.913†	0.832	1.002
Firewood	0.977	0.891	1.070

* The marginal effect is calculated in terms of the respondent's likelihood of indicating that each of the listed motivations for owning woodland was not important. Thus, for example, inheritors are only 58% percent as likely as noninheritors to indicate that timber production is not an important motivation for owning woodland; in contrast, inheritors are 61% percent more likely than noninheritors to indicate that privacy is not an important motivation for owning woodland.

† Significant regression coefficient in estimated model.

Table 6. Logistic regression estimation results of factors that affect woodland owners' future intentions, controlling for motivations

Future intentions	Inheritor coefficient	SE	χ^2	Odds ratio
No plans	-0.2015	0.0964	4.37*	0.817
Plans unknown	-0.1215	0.1917	0.40	0.886
No activity	-0.2354	0.0780	9.11†	0.790
Minimal activity	0.0572	0.0689	0.69	1.059
Harvest fuelwood	0.0810	0.0748	1.17	1.084
Harvest sawlogs	0.3668	0.0824	19.83†	1.443
Nontimber forest products	0.2179	0.1168	3.48‡	1.243
Sell	0.0978	0.1237	0.63	1.103
Buy	-0.4145	0.1044	15.77†	0.661
Transfer to heirs	-0.1242	0.0922	1.82	0.883
Subdivide	0.1999	0.2344	0.73	1.221
Deforest	-0.0518	0.1860	0.08	0.949
Afforest	0.3131	0.1744	3.22‡	1.368

The explanatory variables included in these models included a set of category variables for respondent's education, a set of category variables for respondent's income, size of forest land holding, regional dummies, gender, whether the respondent had a written management plan, whether the respondent had ever harvested trees from the property, and estimated values of the likelihood for each of the 12 motivations identified in Table 4. We did not include the category variables for respondent's age because several of the regression estimations were identified as not statistically viable and were characterized by highly inflated, virtually identical standard errors for the age variables.

* Significant at 0.05 level.

† Significant at 0.01 level.

‡ Significant at 0.10 level.

are mainly motivated by the intangible aesthetic and biological diversity amenity values of the forest. Further, controlling for demographic characteristics and motivations, we still find that inheritors are significantly more likely than noninheritors to be focused on timber production. The national scope of this survey insulates our findings from the criticism that they reflect highly localized conditions.

Our findings are important for several reasons. First, it is evident that the motivations for woodland ownership differ considerably between inheritors and noninheritors. Inheritors place significantly greater emphasis on production of timber and nontimber forest products than noninheritors do, as well as the provision of a legacy for their heirs. In contrast, first-generation woodland owners attach greater importance to nontimber benefits, such as esthetics, privacy, protection of biodiversity, and nonhunting recreation. Note that these differences are not merely an artifact of landowner age (that is, they cannot be attributed to "generational differences"). Even controlling for age, we find the above-mentioned differences in motivations between inheritors and noninheritors.

Second, among the inheritors, there is considerable consistency between their timber production-related motivations for owning their woodland and their planned use of the land within 5 years, as we observed that inheritors are significantly more likely than noninheritors to plan to harvest sawlogs and nontimber forest products and to convert nonforested land to forested land. In addition, inheritors are less likely than first-generation woodland owners to report having no plans for their land or no planned activity. The fact that our empirical findings are based on a large, national sample of NIPF landowners makes us confident that they are not driven by local considerations. One important implication of these findings is that future timber supply in the United States, both nationally and regionally, may be influenced significantly by policies that have an impact on patterns of inheritance. On a national scale, public policies that encourage or, at a minimum, do not discourage intergenerational transfer of woodland will have socially beneficial consequences in the form of a sustainably managed timber and NTFPs supply and reduced parcelization, as well as the ecosystem services and amenity values produced as byproducts. Alternatively, programs that educate first-generation woodland owners with respect to the private and social benefits of using their land to produce timber in addition to the amenity values that currently motivate them might yield the same sorts of benefits.

Third, given the greater emphasis by inheritors on production of timber and the bequest of woodland to their heirs, landowner participation in programs that permanently reduce harvesting opportunities is likely to be lower among inheritors than among first-generation woodland owners. This is quite consistent with the Sullivan et al. (2005) finding, based on a survey of 1,000 landowners in five southwestern Virginia counties owning 10 acres or more, that those who plan to bequeath their land to heirs are less likely to participate in Forest Bank programs.

Fourth, our findings provide considerable empirical reinforcement of the previously cited strand of literature on occupational following. Specifically, our finding that inheritors are significantly more likely than first-generation forest landowners to intend to manage for timber production is consistent with the notion that inheritors receive a legacy of important human capital (in a variety of forms, including land stewardship and forest sustainability values) that first-generation landowners may not have acquired (Laband and Lentz 1983a). Although we do not have direct evidence of

this intergenerational transmission of nonphysical capital, such transmission is implied by the nature of the physical capital (woodland) bequest. The critical question in this regard is “Why would the older generation bequeath land with standing timber to the younger generation, rather than selling the woodland to an unrelated third party that might be willing to pay a nominal price premium for these physical capital assets, then simply bequeath the cash to their children?” The simple answer to this question is that something about the human (or nonphysical) capital transfer is critical in terms of maximizing the present value of the physical capital bequest in the specific form of woodland. That is, because of the intergenerational transmission of nonphysical capital, bequests of woodland from the older generation to the younger generation in fact maximize the value of the inheritance to the latter. Further, transfers of nonphysical capital would plausibly explain at least some of the observed differences between inheritors and noninheritors with respect to motivations.

One specific aspect of our work merits special emphasis as we close: inheritors differ significantly from noninheritors with respect to the several future intentions identified in Table 6, even with controls for demographic characteristics, previous harvesting activity, and a broad spectrum of motivations. This finding implies that additional research is needed to better understand why the land management behaviors of inheritors differ from those of noninheritors. Such research might focus on the extent to which the motivations and intentions of inheritors are influenced by the motivations and intentions of their parents [7]. This would imply intergenerational transfer of important human capital and provide empirical support for an overlapping generations approach to modeling the behavior of inheritors and/or their parents. In addition, researchers might gain valuable empirical insights by using qualitative survey techniques to explore more fully the genesis of the motivations and intentions of both inheritors and noninheritors. As Majumdar et al. (2008) have demonstrated, NIPF land owners do not all think or act alike; there is considerable variability among them with respect to motivations and intentions. This conclusion suggests that although there may be significant differences between NIPF inheritors and noninheritors, there also may be considerable variation across inheritors and across noninheritors. If so, an understanding of this variation may be of considerable importance with respect to forecasting future timber supply and with respect to formation and implementation of natural resources policy.

Endnotes

- [1] Although used often synonymously with NIPF, the definition of family forest owners in this study is “family forests include lands that are at least 1 acre in size, 10% stocked, and owned by individuals, married couples, family estates and trusts, or other groups of individuals who are not incorporated or otherwise associated as a legal entity” (Butler and Leatherberry 2004).
- [2] Tenure was defined as 2006 minus the year the respondent first got woodland. However, we found that the maximum value of tenure in the data was 246 years. Thus, there were errors in responses or errors in processing the responses, or respondents interpreted the word “you” broadly to include previous generations in their families. For our purposes, tenure refers to the period of time the respondent has owned the property not how long the property has been in his or her family.

Thus, although the age categories are imprecise, we discarded responses from individuals who indicated that they had held the land longer than their age (the high end of the age category that they marked).

- [3] In our analysis, inheritors were identified as those individuals who marked “Inherited it” in response to the question, “How did you get your woodland?”
- [4] Multigeneration landowners may feel differently about their land by virtue of the family legacy or by virtue of the fact that management activity on the property has been developed in accordance with a longer-term time horizon than typically would characterize a first-generation landowner. In terms of the family legacy aspect, this probably reflects intergenerational transmission of values and human capital pertinent in certain measure to woodland ownership generally and pertinent in large measure to the family land specifically.
- [5] “Odds ratios” are the exponential logit coefficients estimated in the model. Odds ratio values greater than 1 indicate that an increase in the independent variable translates into a greater probability of that category relative to the base (reference) category, whereas odds ratio values less than 1 indicate a lower probability with an increasing independent variable relative to the base and values at 1 indicate equal probability of the particular category and the base.
- [6] Our complete regression results are available upon request.
- [7] Researchers have constructed theoretical models using overlapping generational models to understand the bequest intentions of forest landowners (Amacher et al. 1999, 2000a, 2000b), which give valuable insights.

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