
Empirical Studies of NIPF Management: A Critical Review

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Outline

Research Issues

Literature Review

- approach
- data
- findings

Proposed approach

- data & key variables
- preliminary results

Next Steps

Research Issues

Forest Policy and Management

- assumed behavior - price responsiveness, owner and resource characteristics
- economic projections/simulations

Econometric Models

- test hypotheses regarding behavior
- parameterize behavior
- provide basis for projections

... Research Issues (continued)

Potential problems

- single equation models of forestry decisions (not systems)
- omitted factors and variables
- transferred parameters from other sites and studies

Proposed approach

- update and re-evaluate literature
- overlay regional data (NC)
- estimate joint models of harvesting, management & investment, and habitat
- **Caveat:** public data and proxy measures

Literature Review

- **Publications in last 20 years**
 - Journal articles
 - Working papers
 - Ph. D. and M. S.
- **Data-bases**
- **Journals**
- **References**

Empirical Articles Reviewed

Authors (Year)	Description	Ihs and Method	Price Elasticities
Boyd (1984)	North Carolina; survey of commercial forest landowners	Harvest, TSI Probit	NA
Brooks (1985)	2 southern regions (Southeast and Southcentral); panel	Acres planted OLS (dist. lag on cost-share)	-0.092 to -0.291 (cost)
Cohen (1983)	Southern U.S.; panel	Acres planted OLS	NA
de Steiguer (1984)	10 U.S. southern states.; panel	Tree planting expenditures OLS (geometric lag)	NA
English et al. (1997)	Tennessee, cross-section (survey)	Participate in FSP Logit	NA
Hyberg and Holt hausen (1989)	Georgia; cross-section (survey)	Harvest, Replanting Logit	NA
Kula and McKillop (1988)	Northern Ireland; panel	Soft wood acres afforested OLS with distributed lags	1.8 - 5.8
Lee et al. (1992)	Southern U.S.; panel	Pine plantation acres OLS	
Lee and Murray (1990)	Georgia, FIA, cross-section	Harvest and Planting acres OLS	0.6 – 2.3 -0.5 - 0.5 (cost)

Empirical articles review (continued)

Authors (Year)	Description	Ins and Methods	Price Elasticities
Löyland et al. (1995)	Norway, cross-section	Planting, seeding, thinning, tending OLS	NA
Miranda (1989)	13 states in the Southern U.S. for 1953-85, panel	Acres regenerated OLS	NA
Newman and Wear (1991, 1993)	5 U.S. southeastern states; panel	Profit, Saw timber & Pulpwood, Regeneration, SUR	-0.2 (price_SR) -0.3 (cost_SR) LR and other
Romm et al. (1987)	Northern California; panel	Investment, Timber mgmt plan Logit	NA
Royer (1987)	12 U.S. southern states, cross-section (survey)	Replanting Logit	1.02 (price) -2.74 (costs)
Royer and Moulton (1987)	9 U.S. southern states, cross-section (survey)	Reforestation Logit	NA
Zhang and Flick (2001)	North and South Carolina, cross-section (survey)	Replanting, Planting expenditures 2SLS	NA
Zhang and Pearse (1997)	British Columbia, Canada; panel	Planting, Restocking Logit	NA
Zhang and Pearse (1996)	British Columbia, Canada; panel	Silvicultural expenditure OLS	NA

Theoretical Basis of Empirical Studies

- **Production forestry**
 - Inputs: treatments and regeneration
 - Outputs: harvest
- **Profit and utility maximization (hpf)**
 - Optimal land use
 - Optimal silvicultural treatment
- **Investment & Management types**
 - Extensive margin: forestation
 - Intensive margin: TSI, site preparation

Empirical Approaches in Articles Reviewed

- **Data**
 - Primary survey of landowners
 - Secondary data (FIA)
- **Methods**
 - Reduced form regressions (except Newman & Wear, 1993)
 - Discrete choice (probit / logit): harvest, regeneration
 - OLS: expenditure, acreage
- **Explanatory Factors**
 - *Owner*: income, age, education, nipf
 - *Economic*: prices, costs, interest rates
 - *Policy*: cost-share, tax incentives, assistance, habitat
 - *Plot*: site index, size, slope, elevation

Covariates of Regeneration

Study	Saw prices	Pulp prices	Planting costs	Cost Share	Assist	Interest-SR	Interest-IR	Income	Age	Occup	Plot Size
Alig (1986)	0			+				+			
Brooks (1985)	0		-	+							
Cohen (1983)	+		0	+			-	0			
de Steiguer (1984)	0			0		-		+			
Hyberg and Holt hausen (1989)	+		-	+	0			0			
Kula and McKillop (1988)	+			+							
Lee et al. (1992)	+		-	+		-					
Lee and Murray (1990)	+		0								+
Loyland et al. (1995)				+	+				0		+
Miranda (1989)				+		-	+	0			
Newman and Wear (1993)	+	0	-								
Royer (1987)	0	+	-	+	+			+		0	0
Royer and Moulton (1987)		+	0	+	+			+		0	
Royer and Vasievich (1987)	0	0		+				+		0	
Zhang and Flick (2001)	0		-	+	+	-	0	0	0		0

Covariates of Treatments (TSI)

Study	Saw prices	Cost Share	Assist	Tax Incentive	Income	Age	Educ Training	Owner Type	Location	Plot Size	Site index
Boyd (1984)	+	+	+				+	+		+	
Loyland et al. (1995)		-	+		+	0	+	+		+	+, -
Romm et al. (1987)					+	-	0	0		0	
Zhang and Flick (2001)	0	-	+	+	+	-	+			0	+
Zhang and Pearse (1996)								+	+	0	+

Proposed Approach

- **Test hypothesis and provide parameters**
- **Data sources**
 - FIA plot and multiple resource
 - Census of Population and Housing
 - Timber Mart South
 - Census of Agriculture
 - Federal Reserve
 - Forest landowner survey (Auburn)
- **Empirical models**
 - Initial focus on North Carolina
 - EDA: Probit models of TSI & Regeneration

Measures of Investment & Management

- **TSI**
 - Thinning (selective, commercial)
 - Timber stand improvement (cleaning, release, hardwood control)
- **Regeneration**
 - Site preparation (clearing, prescribed burning, drainage, chopping, disking, etc.)
 - Artificial and natural regeneration

Measures of Explanatory Variables

- **Sawtimber and pulpwood prices**
- **Agricultural land values**
- **Interest rates**
- **Management costs**
- **Tax rates**
- **CRP payments**
- **NIPF & Industry, Income**
- **Site class**
- **Slope & elevation**
- **Endogenous management choices – harvest, treatment, regeneration, habitat**

Preliminary Results

	Treatments	Regeneration	Harvest
<i>Management cost</i>	> 0	> 0	> 0
<i>Treasury Bill 1 Year rate</i>	< 0		> 0
<i>Federal Fund rate</i>		> 0	< 0
<i>Agricultural land value</i>	< 0	< 0	< 0
<i>Timber and pulp price index</i>	> 0	> 0	> 0
<i>NIP (dummy)</i>		> 0	
<i>Industry (dummy)</i>	> 0		> 0
<i>Site Index</i>	> 0		> 0
<i>Elevation</i>	< 0	< 0	
<i>Slope</i>	< 0	< 0	
<i>Mountain eco-region (dummy)</i>	< 0		> 0
<i>Tax rate</i>		< 0	
<i>Median Household Income</i>	< 0		

Next Steps

Estimate

- Evaluate and specify alternatives
- Estimate joint models

Validate

- Internal – using regression diagnostics
- External – SRTS
 - Incorporate parameters
 - Conduct baseline and new parameter runs



Two-step Probit (LIML)

- **Step 1: Specify amenity demand as a function of timber prices and landowner socio-demographics**

$$a = \beta_p P + \beta_d D + \varepsilon_a$$

- **Step 2: Specify timber supply as a function of timber price, site characteristics and amenity demand**

$$\text{Pr ob} (H = 1) = \Phi (\gamma_P P + \gamma_Z Z + \gamma_a \hat{a})$$

Results: Amenity Demand (OLS)

Timber Price Index < 0

NIP owner > 0

Education > 0

Income < 0

1. all significant at conventional levels

Results: Timber Supply (probit)

Predicted Non-timber	< 0
Timber Price	> 0
Timber Inventory	> 0
Operability	> 0
Site Class	> 0
National Forests	< 0

1. all significant at conventional levels

2. standard errors corrected for estimated RHS using Murphy and Topel asymptotic distribution for two-step MLE