FOREST INVESTMENT AND MANAGEMENT:
A Research Update

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OUTLINE

Research issues

Literature Review
- conceptual approach
- data used
- empirical approach
- key findings

Proposed Approach
- data sources
- measures of key variables

Next Steps

RESEARCH ISSUES

Forest Policy and Management

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

Econometric Models

- test hypotheses regarding behavior
- provide behavioral parameters for projections

Potential problems

- individual econometric 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, landuse, and habitat

LITERATURE REVIEW

Publications in the last 20 years

Data-bases

- Agricola
- Biological abstracts
- Scientific Citation (Web of Science)

Journals

- American Journal of Agricultural Economics
- Forest Ecology and Management
- Forest Policy and Economics:
- Forest Science
- Journal of Environmental Economics and Management
- Journal of Forest Economics
- Journal of Forestry
- Land Economics
- Northern Journal of Applied Forestry
- Southern Journal of Applied Forestry

EMPIRICAL ARTICLES REVIEWED

Authors (Year)	Description	Lhs 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 Holthausen (1989)	Georgia; cross-section (survey)	Harvest, Replanting Logit	NA
Kula and McKillop (1988)	Northern Ireland; panel	Softwood 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 REVIEWED (CONTINUED)

Authors (Year)	Description	Lhs 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, Sawtimber & 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 and outputs
- regeneration and silvicultural treatment inputs

Profit or Utility maximization (household production framework)
- optimal land use
  - forestry as the highest use activity
- optimal treatment
  - marginal net benefits equal zero

Types of Investments
- extensive margin: forestation
- intensive margin: TSI, site preparation, regeneration

EMPIRICAL APPROACHES IN ARTICLES REVIEWED

Data

- primary survey of landowners
- secondary data
  - resource characteristics (FIA, Ministry of Forestry)
  - financial and economic statistics

Methods

- reduced form regressions (except Newman and Wear, 1993)
- binary choice – probit / logit – investment, management
- ols – expenditures

Explanatory Factors

- owner characteristics: income, age, nipf
- economic drivers: price, costs, interest rates
- policy variables: cost-share, tax incentives, technical assistance, habitat
- plot characteristics: size, site index

SUMMARY OF EXPLANATORY VARIABLES: REPLANTING

Study	Saw prices	Pulp prices	Planting costs	Cost Share	Assist	Interest-SR	Interest-LR	Income	Age	Occup	Plot Size
Alig (1986)	0			+				+			
Brooks (1985)	0		-	+							
Cohen (1983)	+		0	+			-	0			
de Steiguer (1984)	0			0		-		+			
Hyberg and Holthausen (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

SUMMARY OF EXPLANATORY VARIABLES: SILVICULTURAL TREATMENTS

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

Conceptual

- utility maximizing landowners
- discrete choices w.r.t regeneration and silvicultural treatment (& harvest and habitat)
- systems of regression equations - harvest, regeneration, treatment, and habitat

Data sources

- FIA plot and multiple resource
- Census of Population & Housing
- Timber Mart South
- Census of Agriculture
- Federal Reserve
- Auburn forestry costs

Empirical Models

- initial focus on North Carolina
- cross-sectional and time series variation
- exploratory data analysis: probit/logit models of regeneration and treatment

MEASURES OF INVESTMENT AND MANAGEMENT

Regeneration (FIA plot surveys)
- Binary data

Silvicultural Treatment (FIA multiple resource surveys)
- Binary data
  - timber stand improvement
  - site preparation
  - artificial and natural regeneration

MEASURES OF EXPLANATORY FACTORS

Prices (subject to matching year of activity)
- sawtimber and pulpwood
- agricultural land
- interest rates
- reforestation and treatment costs

Policy
- expenditures on extension, assistance, and incentives

Owner / Manager
- type
- income
- education

Plot
- site quality
- development pressures

Endogenous management choices - harvest, habitat, regeneration, and treatment

NEXT STEPS

Data

- determine year of regeneration and treatment
- merge data sets

Literature

- review plot level afforestation
  - evaluate CRP and or NRI plot

Empirics

- evaluate and specify alternatives
- estimate joint models

SRTS

- incorporate parameters
- conduct baseline and new parameter runs