

## Lecture 7: Long-run timber supply and demand

---

FOR 4684 Natural Resource  
Economics and Management



School of Forest Resources



## Long-run timber supply

---

- All factors are variable in long-run
- Supply shifting factors can be:
  - Biological
  - Technological
  - Sociological



## Biological supply shifters

---

- Acres of timberland
- Silvicultural advances that lead to improved yields per acre of timberland
- Biotechnology
  - Genetic manipulations
  - Fertilizer site improvements
  - Pesticide/insecticide manipulations
- Damage events
  - Climate, insects and disease, fire
- Time factor
  - 10-15 years to affect positive change in supply
  - Negative supply changes can happen quickly



## Technological supply shifters

---

- Utilization standards
- Pulping processes
- Engineered wood products
- Sawmill efficiency (waste reduction)
- More efficient harvesting technology
- Time factor
  - Can effect change in useable timber supply more quickly (1-5 years) to 10-15 years depending on how rapidly the technology is adopted by the industry.



## Sociological supply shifters

---

- Forest landowner preferences
- Environmental regulations
  - BMPs
  - Silvicultural restrictions
  - T&E species
- Timberland set asides



## Long-run timber demand shifters

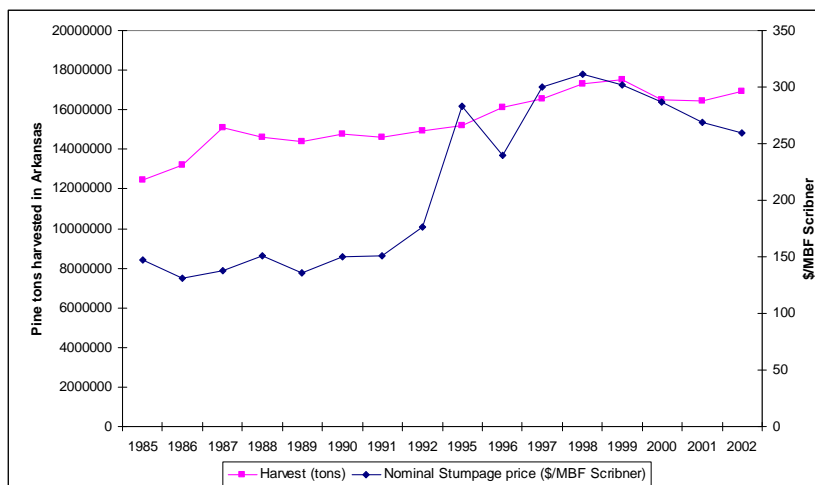
---

- Factors are large sociological.
- Tastes and preferences for consumer goods
  - Homes
  - Furniture
  - Paper products
  - Fuelwood
- Population
- Available income

## Long-run supply and demand interactions – complicating factors

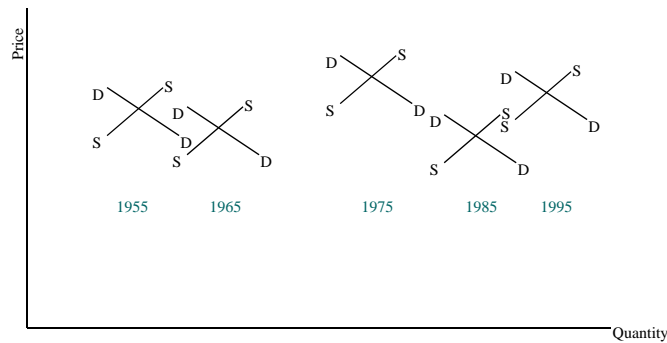
- Due to downward sloping regional demand curves, faster (slower) harvesting today will decrease (increase) stumpage prices.
- The more (less) you harvest today, the less (more) is available tomorrow, and the higher (lower) tomorrow's stumpage prices will be.
- Biological supply shifters take 5-40 years to affect a supply INCREASE
- Land continuously shifts in and out of forest due to changing prices of wood versus competing land uses.
- Natural afforestation will provide timber for the future regardless of afforestation developments.
- Transportation, energy costs, and relative stumpage prices have a great effect on log movements across regions.
- Sociological / political factors can change unpredictably.
- Utilization and technology standards can shift production onto smaller and poorer-quality stems.

## Stumpage prices and harvest volumes in Arkansas, 1985 to 2001



## Identification problem

- When building a long-run supply or demand curve, possible reasons:
  - Demand constant and supply shifting
  - Supply constant and demand shifting
  - Both supply and demand shifting



## Econometric models to predict timber supply and demand

$$V_y^s = c_0 + c_1P + c_2S_{1y}^s + c_3S_{2y}^s + c_4S_{3y}^s + \dots$$

Sawlog stumpage supply

- $y$  – years
- $V$  – volume supplied
- $P$  – stumpage price
- $S$  – supply shifting factors:
  - Acres in forestland
  - Timber inventory
  - Age class, species, and site conditions

$$V_y^d = b_0 + b_1P + b_2S_{1y}^d + b_3S_{2y}^d + b_4S_{3y}^d + \dots$$

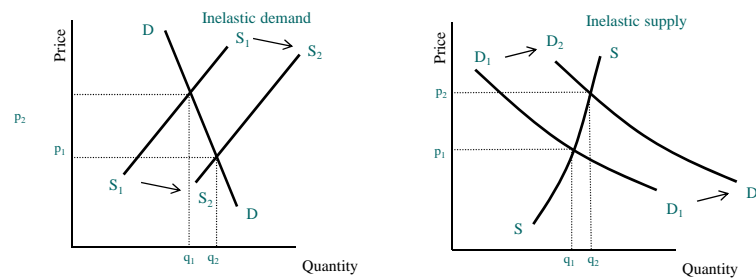
Sawlog stumpage demand

- $y$  – years
- $V$  – volume harvested
- $P$  – stumpage price
- $S$  – demand shifting factors:
  - Housing starts
  - Real per capita income
  - Population
  - Interest rates
  - Wood processing costs
  - Paper recycling rates

## What are econometric models used to do?

- Project price and quantity scenarios
- Estimate short-run elasticities of supply and demand
  - Short-run stumpage elasticities in USA range from 0.06 to 0.99 (inelastic)
  - Short run stumpage demand also inelastic (-0.14 to -0.57)
- Since both supply and demand for stumpage are typically inelastic, quantity changes more slowly than price, price is more volatile than quantity. →

## Inelastic supply and demand interaction effects



Note that price changes are greater than quantity changes...



## Future timber availability

---

- Can the free market provide enough timber?
- In 19<sup>th</sup> Century, reforestation was nearly 100% natural
  - Timber prices were low (huge reserves of old growth)
  - Rates of return on timber investment were too low to stimulate investment
- Stumpage prices in USA rose from 1950 to 1900 and so did private investment in forestry
- Research by Newman and Wear (1993) suggest long-term supply elasticities of 2.5 for sawtimber and 1.8 for pulpwood For a 1% change in anticipated future price, after 1 rotation there will be a:
  - 2.5% change in sawtimber harvest volume
  - 1.8% change in pulpwood harvest volume



## Timber supply projections for the USA

---

- Resource Planning Act (RPA) Timber Assessment
- Completed every 10 years by USDA
- By 2050, US will increase forest product consumption by 40%
- Increased consumption will be met by:
  - 23% increase in timber harvests (non-sawtimber trees)
  - Increase in log, chip, and product imports
  - Recycling increases
- Consumption will shift from lumber and pulp to engineered wood material
- Prices will remain relatively stable
  - Sawtimber prices of ½% per year real price increase
  - Pulpwood prices falling or stable for next 40 years
- Inventories will increase over next 50 years
  - Softwood (53%)
  - Hardwood (27%)
- Timber production mainly in eastern USA (80% now, 82% in 2050)
  - SE USA will maintain leadership in timber production (63% now, 67% in 2050)
- Canada will remain our biggest source of imported wood, but Europe and South America will gain some ground.



Next lecture...

---

Valuation and appraisal