Future Pine Timber Supply, Demand, and Pricing Trends: What is Required for Stumpage Prices to Increase?

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NC State University

Presented at the 2018 Forest Landowners Association Meeting
Lake Oconee, Georgia
27 June 2018; V15
Introduction

- The key question driving more forest investment:
  - Future Pine Timber Supply, Demand, and Pricing Trends: Predicted Trends and What would have to Happen for Stumpage Prices to Increase to Pre-Recession Levels in the Next Five Years?
  - Greater Demand; Less Supply; Better Markets
NON SEQUITUR

OH, MAN...
IT'S EVEN WORSE THAN I THOUGHT

THE ETERNAL ECONOMICS SEMINAR
Outline

- Supply, Demand, Price, and Markets
  - Timber Mart / Forest2Market
  - Regional Market Trends
- Demand shifts
  - Housing, new technology, Cross Laminated Tmbr
- Pine Timber Markets Projections
  - Subregional Timber Supply (SRTS) model
- Supply shifts
  - Technology, investment, global competition
  - Canadian and western challenges
  - Double – Triple National Forest harvest levels
Econ 101: $P_e$ where $S = D$
Goal: Increase $P_e \rightarrow$ More D or Less S
Forisk Research Quarterly Q3 2016 U.S. Lumber Production and Consumption Forecast

What Supply / Demand Shift is Needed?

- Economic Model: Increase Price 10%
- Price Elasticity of Demand or Supply = 0.4%
- About 17 billion Bd Ft production in South, 2015
- Might think we need 1.7 billion board feet more per year
- But inelastic supply and demand
- So smaller quantity change generates larger price change
- Good news if demand increases, bad news if supply increases
What Supply / Demand Shift is Needed?

- The math:
  
  \[ E_p = \frac{\% \text{ Change } Q}{\% \text{ Change } P} = \frac{(Q_2 - Q_1)/Q_1}{(P_2 - P_1)/P_1} = \frac{(X - 17)/17}{($27.5 - $25)/$25} = 0.68 \text{ Billion Bd Ft S or D Change} \]
  
  needed for 10% price change (per yr)
  
  assuming perfect competition

- Good news: lots less needed than 1.7 billion bd ft

- Bad news: still a large amount of S/D change
Supply, Demand, Price, and Markets

- Timber Mart / Forest2Market
- Regional Market Trends
- Timber Products Output
- Better Competition
TIMBER PRICES
Recession Recovery Prices

*Timber-mart South*

PST Stumpage Prices Have Not Recovered
Forest2Market

- Bimonthly data
- Pine
  - Sawtimber
  - Chip n Saw
  - Pulpwood
- Hardwood
  - Sawtimber
  - Pulpwood
- 2005 to 2015
Markets Have Changed

SE GA Pine Stumpage Prices

- Pine Sawtimber
- Pine ChipNSaw

PSE GA Pine Sawtimber (PST)/Pine Pulpwood (PPW) Price Ratio

PST Prices Only 50% Higher than PPW

Source: Forest2Market
Subregional Timber Supply (SRTS) Predicted Shifts

SRTS Supply Demand

- Demand 1
- Demand 2
- Supply 1
- Supply 2

Before Recession

Price = 100

Harvest = 100

MS, AL, GA, FL, NC
SRTS 2008 Recession Impacts

SRTS Supply Demand

- Demand1
- Demand2
- Supply 1
- Supply 2

Recession
Demand shifts back 30%
Price = 65
Harvest = 84
SRTS Post 2008 Recession Recovery Shifts

SRTS Supply Demand

- Demand 1
- Demand 2
- Supply 1
- Supply 2

Recession
Demand Recovers to 10% Below Peak

Price = 88

Harvest = 94
But, SRTS/FIA Increased Sawtimber Impacts

Recession
Demand Recovers to 10% Below Peak
But PST Supply has increased 25%
Price = 67
Harvest = 105
SRTS Required Demand Shift to = 2008 Price

Recession Demand and shifts 25% relative to pre-recession

Price = 100

Harvest = 125
Increases in historical PST inventory from 2010 to 2015 and for several of the big states (AL, FL, GA, MS, NC) it has been between 25 and 30% (amazing, but consistent with SRTS runs). I've also found the excel sheet that draws SRTS supply and demand with different shifts.

Figure 1 shows an equilibrium starting point before recession. Price=100 Harvest=100.

Figure 2. shows a 30% decrease in demand, prices drop 35 percent harvest drops 15%

Figure 3. shows demand increases back to 10% lower than peak level - Prices 88 harvest 94

Figure 4. Using the fact that PST demand went up 25% from 2010 to 2015, I shifted the supply curve up 25%, Prices 67, Harvest 105.

Figure 5. So what would it take to have the same prices with a 25% supply increase, well the new obvious answer is 25% above the pre-recession level, which was pretty much an all time high.

Worse, SRTS runs show about another decade of PST inventory increase even with robust demand recovery.
Volume Needed per 10% Price Change

- 17 billion board feet of lumber total in South
- S and D Price elasticity (Pe) = \(~0.4\)
- 0.68 billion board feet needed for 10% change

- Say we have a big 100 – 150 million bd ft / yr sawmill
- Then need 5 to 7 new sawmills per year in South
- Or similar added capacity / more shifts
- Or closure of 5 – 7 big sawmills elsewhere

- Plus sawmills getting more efficient; need less wood
Decreased Supply Prospects

- Western Fires, Insects, Diseases (F.I.D.)
  - 14 billion board feet / yr feet base in West
  - Usually more productive lands, less F.I.D. risk
  - Might lose a 1-2 billion bd ft / from base

- Could F.I.D. issues spread to South?
  - 2016 Chimney Tops fire in Tennessee/Gatlinburg
  - Pine beetles heading out from NFS?

- Also, NFS mortality now exceeds growth
- More regulations – extremely unlikely
- Canadian Lumber Countervailing Duties at ~21%
ENGOs oppose Salvage

Natural regen above;
Salvage & plant at right

https://www.oregonwild.org/
Experts agree that "salvage" logging is a tax on ecological recovery after a fire. Logging removes valuable structure, kills young seedlings and sprouts just as they are emerging, and replanting displaces diverse native vegetation with conifer monocultures. "Salvage" logging can also require damaging roads to remove logs, which threaten soil and water quality. The best thing to do after fire is to rehabilitate the damage caused by firefighting, reduce imminent hazards along major roads, and let nature heal itself as it has done after fires throughout history.

Oregon Wild: https://www.oregonwild.org/
Quota Could Result in an Undersupplied US Market

Canadian Share of the US Market and Volume Supplied (BBF) on Right Hand Scale

Final Tariff: ~21% Import CVD
Firms can justify less on case by case basis; very hard to do
Econometric Estimates of Countervailing Duties
Parajuli, Abt (NCSU), Johnston (UWI), 2017/2018

- ~20.83% average Countervailing Duty (CVD) on Canadian exports
- Reduces Canada market share in USA by ~5%
- Leads to ~1 billion bd ft more production in USA
- With ~860 million bd ft additional Southern lumber
- About a 7.3% increase in timber prices over 5 years
- And a 2% increase in lumber prices
- Increase annual sawtimber removals by 3.2%
Canada Retaliates Against U.S. Tariffs with a 10% Tariff on U.S. Forest Products

<table>
<thead>
<tr>
<th>HS Code</th>
<th>Product Description</th>
<th>2016</th>
<th>2017</th>
<th>%chg</th>
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<tr>
<td>4412.39</td>
<td>Plywood, consisting solely of sheets of wood (other than bambo)</td>
<td>68,944,205</td>
<td>87,962,580</td>
<td>+28%</td>
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<td>4412.99.90</td>
<td>Other plywood, veneered panels and similar laminated wood</td>
<td>32,488,679</td>
<td>64,424,058</td>
<td>+98%</td>
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<td>4802.56</td>
<td>Other paper and paperboard</td>
<td>131,743,564</td>
<td>128,291,150</td>
<td>-3%</td>
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<td>4811.59</td>
<td>Other paper and paperboard coated, impregnated or covered</td>
<td>145,335,312</td>
<td>157,426,584</td>
<td>+8%</td>
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<td>4818.10</td>
<td>Toilet Paper</td>
<td>234,112,695</td>
<td>213,774,009</td>
<td>-9%</td>
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<td>4818.20</td>
<td>Handkerchiefs, cleansing or facial tissues and towels</td>
<td>449,923,878</td>
<td>456,175,260</td>
<td>+1%</td>
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<tr>
<td>4818.30</td>
<td>Tablecloths and serviettes</td>
<td>80,365,529</td>
<td>75,663,374</td>
<td>-6%</td>
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<tr>
<td>4822.10</td>
<td>Bobbins, spools caps and similar supports of a kind used for winding</td>
<td>743,177</td>
<td>480,291</td>
<td>-35%</td>
</tr>
<tr>
<td>4822.90</td>
<td>Other bobbins, spools caps and similar supports of paper pulp</td>
<td>7,812,065</td>
<td>8,278,433</td>
<td>+6%</td>
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<tr>
<td>4909.00</td>
<td>Printed or illustrated postcards</td>
<td>68,069,816</td>
<td>67,757,129</td>
<td>-0%</td>
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<tr>
<td>9401.61</td>
<td>Other seats, with wooden frames: Upholstered</td>
<td>343,662,195</td>
<td>327,135,280</td>
<td>-5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>1,563,201,115</td>
<td>1,587,368,148</td>
<td>+2%</td>
</tr>
</tbody>
</table>

Data Source: World Trade Atlas via FPinnovations

F2M Newsletter / Blog 14 June 2018; Will mean less demand for our timber
Demand Shifts

- Housing starts – single and multifamily
  - Fluctuate; cap likely at 1.2-1.4 million
  - Decreased sales year on year – 5 months

- New technology / policy
  - Cross Laminated Timber (CLT)
  - Nanoparticles
  - Steel tariffs increase wood demand

- Green investing and management
  - More green investments like TIMOs
  - Certified wood and forest products
U.S. Housing Activity and Forecast:
Demand Stable/Slight Increase: ~1.3 million cap

New Technology: Cross Laminted Timber

CLT Parking in Springfield!
From the outside, it looks similar to the thousands of other hotels built across the country in 2015. But when you learn that this project was completed 37 percent faster and the structure built with 44 percent fewer person hours than similar hotels, it warrants a closer look.
8 Story CLT Design for Portland
A cross-laminated timber (CLT) panel being used in the construction of a subfloor for the new $79.5 million College of Forestry building at Oregon State University (OSU) failed and collapsed earlier this month, according to the Corvallis Gazette-Times.

The 4- by 20-foot panel was manufactured using five layers of 2- by 6-foot boards glued together at right angles and fell after becoming delaminated at one end. No one was injured, the panel has been replaced, and OSU officials, who have hired an engineer to determine the cause of the failure, said they have no plans to change construction materials.

Crews have shored up already-installed CLT panels, and installation of additional members has been suspended pending the results of the investigation. The budget for the three-story, 80,000-square-foot Peavy Hall project, which is expected also to be used to promote the Oregon timber industry...

Supply Shifts

- Technology – High yield forestry & seedlings

- Investment
  - Planted Forests
  - TIMOs, REITs, Institutional, Family Forests

- Global competition

- Forest fires
- Canadian / Western U.S. insect and disease
- Canadian lumber tariffs
Build-up of Sawtimber Keeps PST Prices Down:

- Delays and lowers probability of replanting
- Less acres in younger age classes
- Less deployment of new technology / genetics
- Reduces long run supply

South Pine Sawtimber (PST)
Forest2Market 2015 Prices
RED = Below Average
Green = Above Average
Yellow = Average

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Southern Plantations
24% of timberland
45% of removals
64% of pine removals
Plantation Acres (45 million) Declining Slightly

States with Increasing Acres (000)  States with Decreasing Acres (000)

Age Class Distribution will drive product supply for the next 30 years

Most area and volume in 15 to 30 year age class now: ~24 million acres

Maybe ~19 million in 0-15 age class
Southwide 31a Pine Sawtimber

SRTS SOFTWOOD SAWTIMBER PROJECTIONS
Other Increased Supply Prospects

- Less regulations
  - WOTUS will be less restrictive
  - Fewer areas called federal wetlands
  - Slightly less Clean Water mandates, but BMPs will continue as now
  - And ESA strictures/aquatics significant, but stable
  - Might add 0.5 billion bd ft to supply

- Increased federal timber harvests
  - Might go from 2 billion bd ft / yr to 4 billion
  - Most in the West, but compete with Southern pine
Plantsation Returns in the Americas: Lots of Wood with Good Returns

- USA
- Key Southern Cone+ Countries
- Trends, 2005-2017
- Without and With Land Prices
USA Planted Pine Growth Rates: South-wide Average

Average Growth (cubic feet/acre/year)

Corporate: 83
Non-Corporate: 81
USA Average Planted Pine Growth Rates by State: Corporate

State/Region

- KY: [2]
- OK: [39]
- FL: [60]
- VA: [72]
- LA: [73]
- TN: [83]
- AR: [94]
- GA: [98]
- TX: [113]
- NC: [115]
- AL: [116]
- MS: [121]
- SC: [138]
- Southwide: [83]

85 cu ft/ac = 6.0 m3/ha (average case); 139 cu ft/ac = 9.8 m3/ha (good case)
USA Average Planted Pine Growth Rates by State: Non-Corporate

85 cu ft/ac = 6.0 m3/ha (average case); 139 cu ft/ac = 9.8 m3/ha (good case)
### Plantation Returns, United States, 2017

- **P. taeda avg** = 7 m³/ha/yr
- **P. taeda good** = 10 m³/ha/yr
- **P. taeda high** = 13 m³/ha/yr
- **Douglas fir hi** = 17 m³/ha/yr

#### LEV / VAN
- P. taeda avg = -0.3
- P. taeda good = -0.6
- P. taeda high = -0.1
- Douglas fir hi = -0.1

#### IRR / TIR
- P. taeda avg = 0
- P. taeda good = 5.9
- P. taeda high = 7.6
- Douglas fir hi = 7.9

8% discount rate; no land cost
## Plantation Returns, Brasil, 2017

<table>
<thead>
<tr>
<th></th>
<th>LEV ($000/ha) / IRR (%)</th>
<th>LEV / VAN</th>
<th>IRR / TIR</th>
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<tbody>
<tr>
<td>Eucalyptus Pulp</td>
<td>8.1</td>
<td>0.1</td>
<td>0.8</td>
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<tr>
<td>Sao Paulo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eucalyptus</td>
<td>10.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sawtimber S.P.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pinus - Santa</td>
<td>3.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catarina</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

8% discount rate; no land cost

| Pinus - Santa Catarina | 14.3 |
### Plantation Returns, Chile, 2017

<table>
<thead>
<tr>
<th>Type</th>
<th>LEV / VAN</th>
<th>IRR / TIR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinus radiata Good</td>
<td>1.9</td>
<td>13</td>
</tr>
<tr>
<td>Pinus radiata Average</td>
<td>0.8</td>
<td>11.1</td>
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<tr>
<td>Eucalyptus globulus Pulp</td>
<td>2.2</td>
<td>14.3</td>
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<tr>
<td>Eucalyptus nitens Pulp</td>
<td>1.1</td>
<td>12.1</td>
</tr>
</tbody>
</table>

8% discount rate; no land cost
Plantation Investment Trends USA: IRR, 2005 - 2017

No land costs

Southern Pine
- 2005: 9.5%
- 2008: 8.5%
- 2011: 5.4%
- 2014: 5.9%
- 2017: 7.9%

Douglas Fir
- 2005: 8%
- 2008: 7.7%
- 2011: 7.4%
- 2014: 7.9%

No land costs
Plantation Returns, USA, 2017
Without and With Land Purchase

<table>
<thead>
<tr>
<th></th>
<th>P taeda good</th>
<th>P taeda high</th>
<th>Doug fir high</th>
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</thead>
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<tr>
<td>Without Land Cost</td>
<td>5.9</td>
<td>7.6</td>
<td>14.3</td>
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<tr>
<td>With Land Cost</td>
<td>3.2</td>
<td>4</td>
<td>5.9</td>
</tr>
</tbody>
</table>

8% discount rate; land cost at $2000/ha pine good land to $2500/ha better
Plantation Returns, Brasil, 2017
Without and With Land Purchase

<table>
<thead>
<tr>
<th></th>
<th>Eucalyptus Pulp Sao Paulo</th>
<th>Eucalyptus Sawtimber S.P.</th>
<th>Pinus - Santa Catarina</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Without Land Cost</strong></td>
<td>8.1</td>
<td>10.7</td>
<td>14.3</td>
</tr>
<tr>
<td><strong>With Land Cost</strong></td>
<td>2.6</td>
<td>3.6</td>
<td>6.2</td>
</tr>
</tbody>
</table>

8% discount rate; land at $5000 / ha EuCs; to $5500 / ha Pine
Recap of Prospects for Higher Prices if 10% Change = 0.68 Billion Bd Ft

- Supply Decrease / Demand Increase
- Canadian Lumber CVD (one time S shift):
  - -5% Canadian Share
  - +1 billion bd ft USA; 860 million bd ft in South
- Fire, Insect, Disease: maybe -1 billion bd ft
- New wood products, mills, CLT + more housing demand: 1 billion bd ft+
- Maybe 3-4 billion bd ft “gain” over several years
- Yields ~40% - 50% price increase (so far)
Recap of Prospects for Lower Prices if 10% Price Change = 0.68 Billion Bd Ft

- Supply Increases / Demand Decreases
- 5% per year increase in softwood sawtimber 2012-2017 in South; 35% Total
- Net of maybe 0.85 billion bd ft (BBF) per year
- Foreign production, lower prices; maybe ~0.68 BBF
- Housing starts stable ~1.2 – 1.3 million houses
- Less private regulation, more fed timber +2.5 BBF
- Less competition, maybe oligopsony
- Net “loss”: Maybe +5-6 billion bd ft new Supply
- Maybe >50% price decrease – offsets D/S gains
The Bottom Line

- Higher timber prices elusive for near future
- Need net S decrease / D increase shifts of more than 25% to get back to 2008 equilibrium price
- Probably more than 1 Billion Board Feet / Yr
  - Increasing supply now
  - Greater than decrease supply / increase demand
- More pressure for current equilibrium prices
- Largest planted area bulge in 15-30 year age class
- Less planting occurring now
- This should be the time to plant, since bulge will be gone at harvest, if current mill capacity remains
## Acknowledgements - SOFAC

**Southern Forest Resource Assessment Consortium**

[http://www.cnr.ncsu.edu/sofac/](http://www.cnr.ncsu.edu/sofac/)

<table>
<thead>
<tr>
<th>American Forest Management</th>
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<td>American Forest &amp; Paper Association</td>
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<td>Potlach Forest Holdings</td>
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Give me a one-handed economist! All my economists say, On the one hand on the other.

— Harry S. Truman —