Assessing the impact of policies and regulations on timber supply: A British Columbia case study
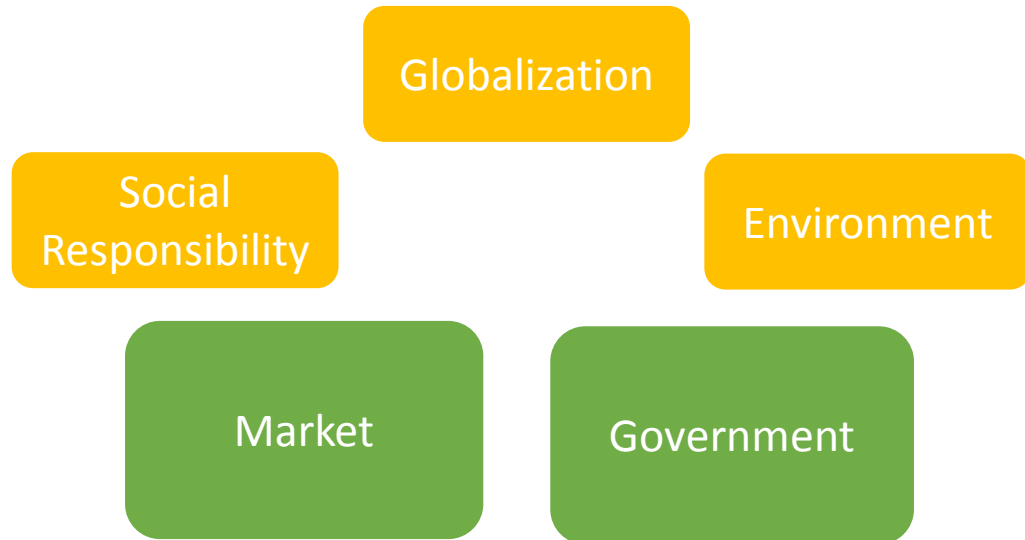
Western Forest Economists &
International Society of Forest Resource
Economics 2015 Meeting

June 2nd, 2015
Mahsa Mojahednia, Harry Nelson
and Chris Gaston

Outline

- Project Overview
  - Background
  - Objectives
  - Case study
- Methodology
- Data
- Results

Background

www.cathedralgrove.eu

www.bridgat.com

www.bridgat.com

www.izradapomeri.com

www.unyssey.ca

Globalization

Social Responsibility

Environment

Market

Government

- Government
  - Policies and regulations

- Market
  - Changes in demand
  - Global trade
  - Prices
  - Costs

Literature Review

Econometric models		
Aggregate supply-Vast Region	**Government policy**	**Studies in British Columbia**
Brännlund et al. (1985) - Sweden	Mutanen and Toppinen (2005) - Finland	Constantino (1986) - Coast
Wear and Pattanayak (2003) - South eastern US		Margolick and Uhler (1992) - Coast
	Zhang and Buongiorno (2012) - China	Zhang (1996) - Coast
Turner et al. (2006) - 180 Countries		Fooks et al. (2010) - Coast
Bolkesjø et al. (2010) - Norway	Bao-dong et al. (2014) - China	Sun et al. (2015) - Coast

- Main objective : Modeling timber supply
- Gap: Few models focus on *public ownership or vast regions*

- Main objective : Modeling timber supply and investigate impacts of policy change
- Gap: Few models consider *political and regulatory factors*

- Main objective: Log export bans
- Main objective: Estimating timber supply
- Gap: Not considering *timber supply and policy changes simultaneously . Model for Interior. Different log grades.*

Research objectives

Objectives

- Estimate a timber supply model for British Columbia

- Identify relationships between government policies, market changes and timber supply

- Calculating supply elasticity for the different grades

Achieving the objectives

- Introduce harvest levels based on log quality as a dependant variable

- Introduce independent variables (government and market factors)

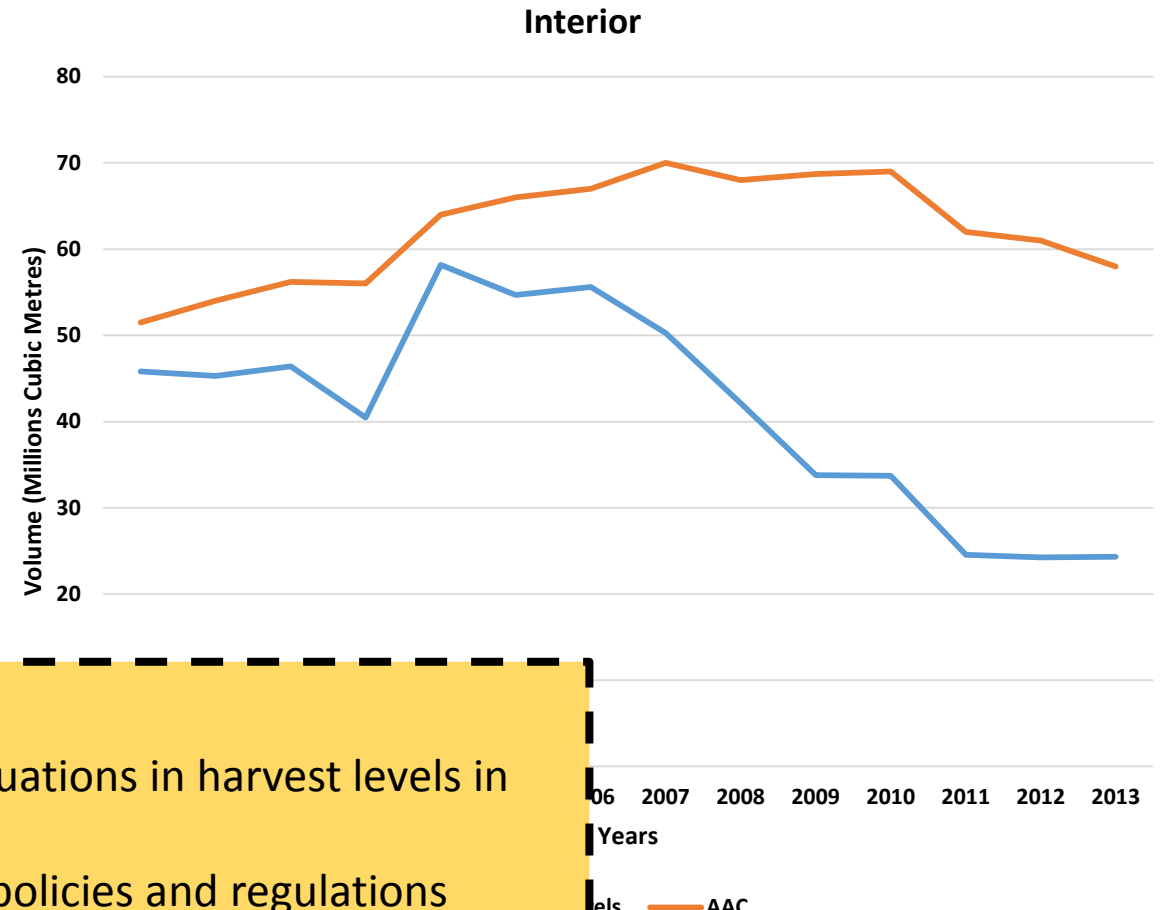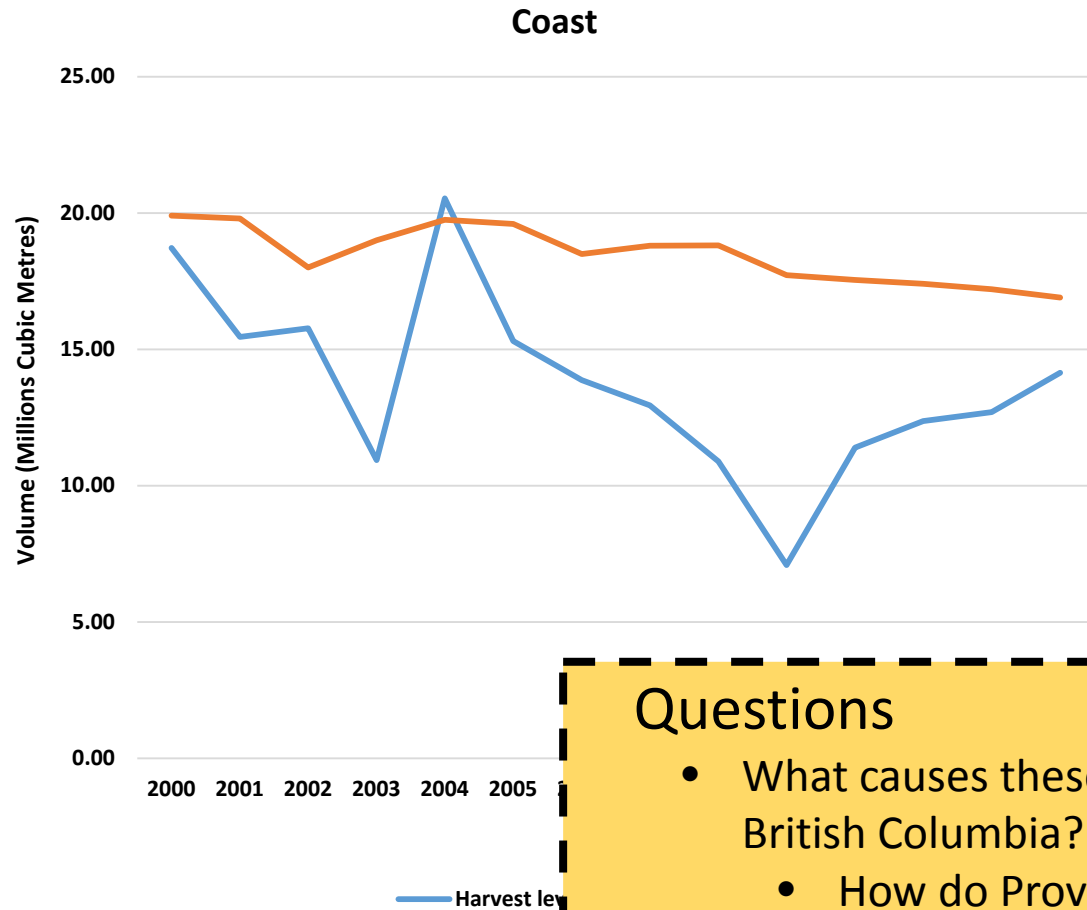- Use different econometric methods to estimate the best model

Case study

British Columbia

- 65 million hectares forest land
- 7% of the world`s timber total
- 95 % owned by public, regulated by the Ministry of Forests, Lands and Natural Resources Operations
- Major log producer

FOREST LAND
- Forest
- Urban
- Agriculture
- Non-Forest
- Alpine

Coast

Interior

Source: www.for.gov.bc.ca

Introduction   Data   Methodology   Results   Conclusion

AAC and actual harvest levels

Coast

Interior

Y-axis (both charts): Volume (Millions Cubic Metres)

Coast Y-axis values: 0.00, 5.00, 10.00, 15.00, 20.00, 25.00

Interior Y-axis values: 20, 30, 40, 50, 60, 70, 80

Coast X-axis years: 2000, 2001, 2002, 2003, 2004, 2005

Interior X-axis years: 06, 2007, 2008, 2009, 2010, 2011, 2012, 2013
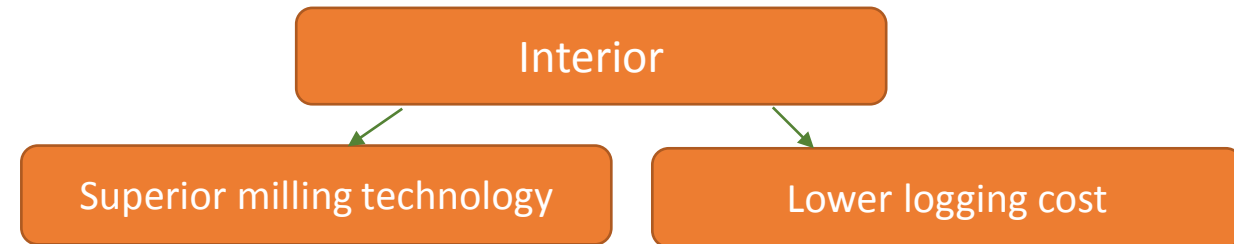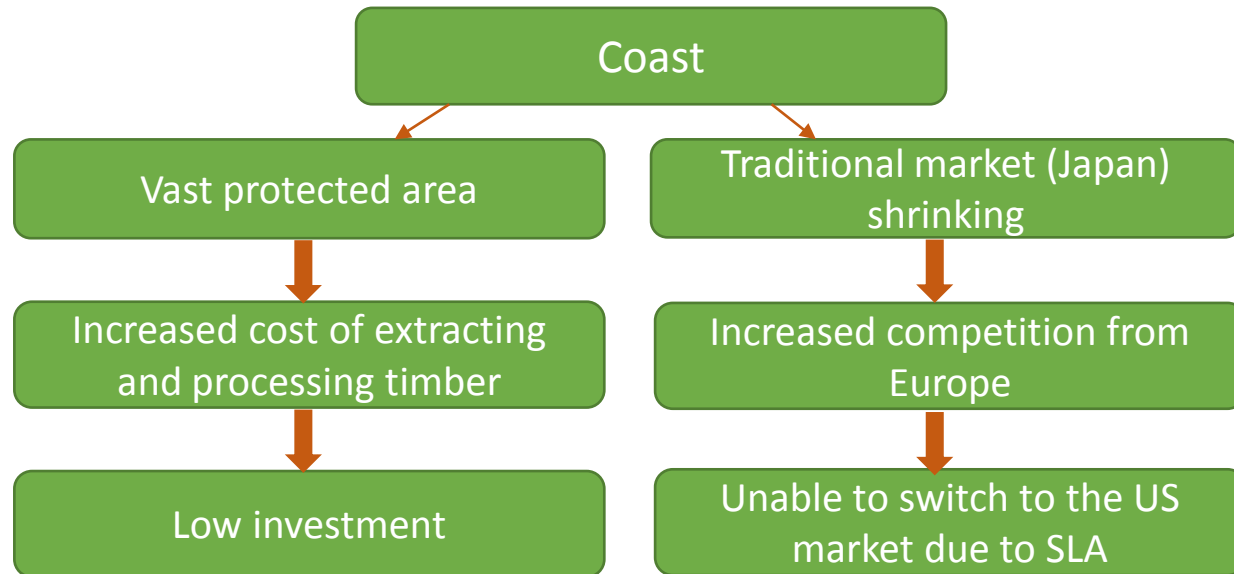
Legend: Harvest levels — AAC

Questions
- What causes these fluctuations in harvest levels in British Columbia?
  - How do Provincial policies and regulations impact harvest levels?
  - How do markets affect harvest levels?

Source: Harvest Billing System (2013) and Nelson

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Policy

- Liberal party in 2001


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Coast
├── Vast protected area
│      └── Increased cost of extracting and processing timber
│             └── Low investment
└── Traditional market (Japan) shrinking
       └── Increased competition from Europe
              └── Unable to switch to the US market due to SLA

Interior
├── Superior milling technology
└── Lower logging cost
```

- Moving from administrative system to a more market based one

Policy

The Forestry Revitalization Plan

Table 1. Changes in policy, British Columbia, 2003

Policy	Action	Projected benefits
Tenure reallocation	• 20% take back from major licensees. Reallocating about 50% to woodlots, community forest and First Nations. The other 50% to be auctioned in BC Timber Sale.	• Diversifying British Columbia`s forest economy • Open opportunities for new investments and creating more jobs • Helping to set market based stumpage rates • More logs flow into open market • Market pricing System
Elimination of cut control, appurtenancy restrictions and timber processing	• Licensees decide how much to harvest based on price, market, and other factors. No penalties for failing to cut timber • Based on market condition and efficiency licensees choose to log, process or do both • Take or pay in which the licensees are free to harvest any log (any species or grade), have the option of leaving the standing timber regarding stumpage fee and silviculture objectives	• Increase competitiveness and licensees can response better to market condition • Better business opportunities and more jobs and efficient industry

Data

- Monthly data
  - Coast: 2000-2013
  - Interior: 2004-2013
- Dummy variables to show the change in policy and seasonality
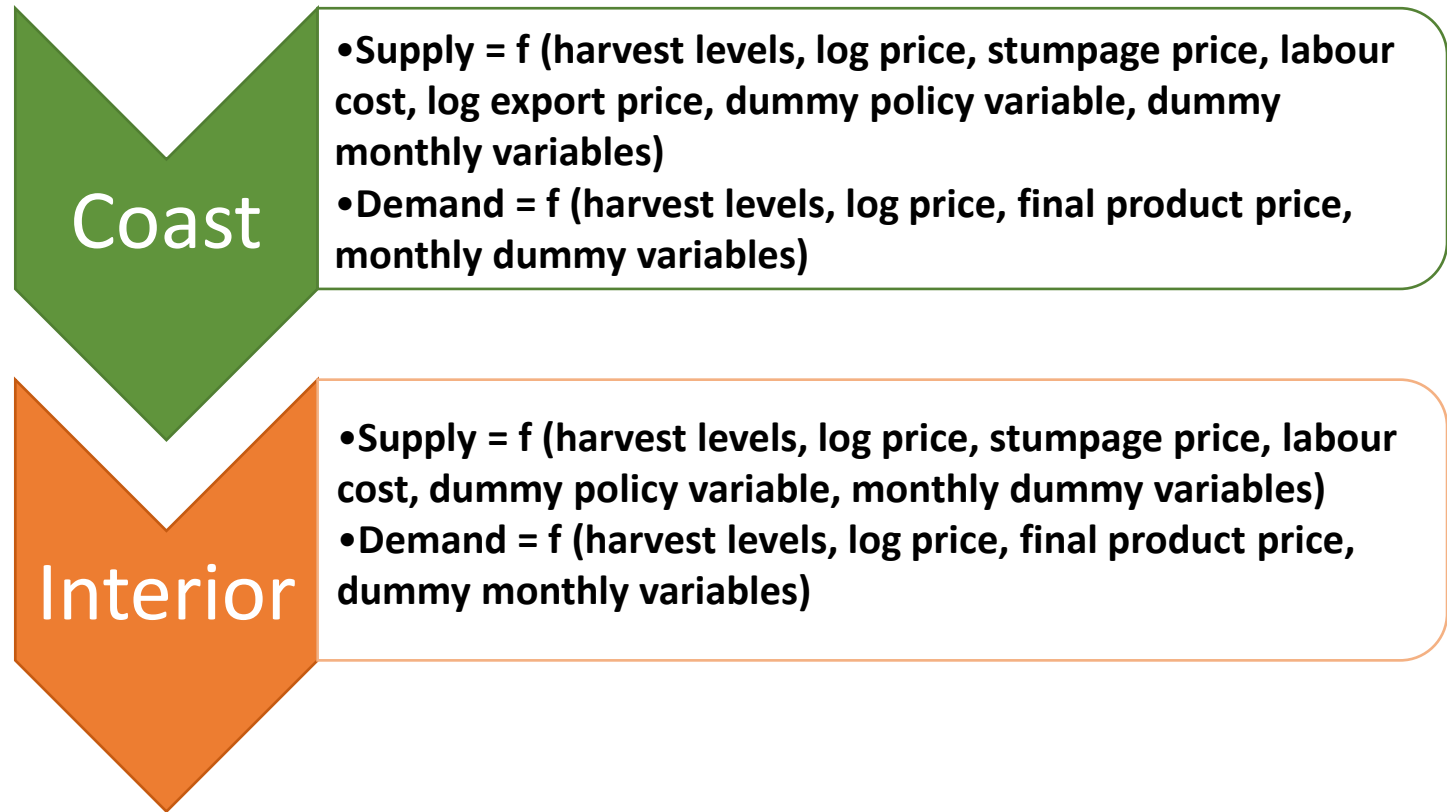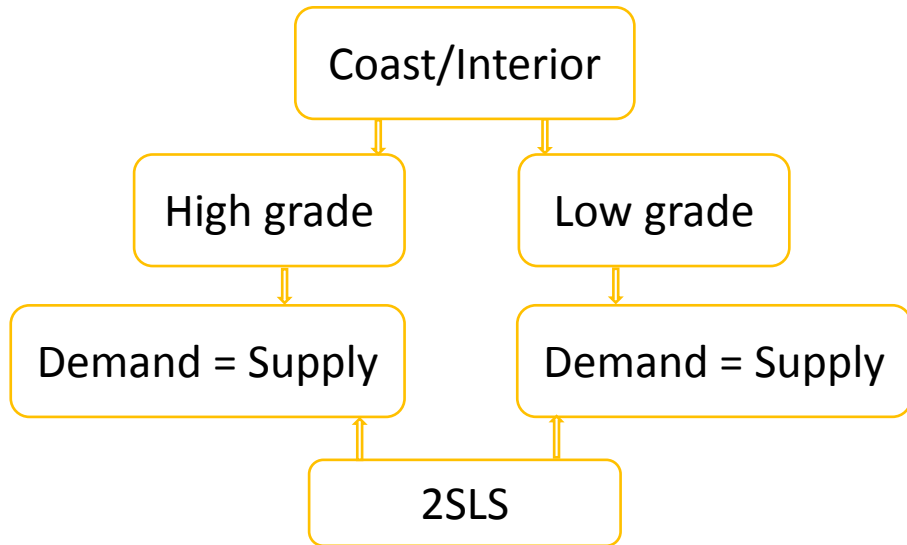- Market
  - Price
  - Cost

Table 2. Variables used in demand and supply models

Variables	Source
Harvest levels and stumpage	Harvest Billing System
Log prices	Log market reports
Log export prices	BC Stats
Wage	Statistics Canada
Lumber composite	Random Lengths website
Pulp Northern Bleached Softwood Kraft	Industry intelligence Inc.

Methodology

- ## Theoretical model
  - Assuming price endogeneity
  - Simultaneous equations models
    - Two Stage Least Square method

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          ┌──────────────────┐
          │   Coast/Interior  │
          └──────────────────┘
            ↓              ↓
  ┌─────────────┐   ┌─────────────┐
  │  High grade │   │  Low grade  │
  └─────────────┘   └─────────────┘
        ↓                 ↓
  ┌──────────────┐   ┌──────────────┐
  │Demand = Supply│  │Demand = Supply│
  └──────────────┘   └──────────────┘
        ↑                 ↑
          ┌─────────────┐
          │     2SLS     │
          └─────────────┘
```

Coast
- **Supply = f (harvest levels, log price, stumpage price, labour cost, log export price, dummy policy variable, dummy monthly variables)**
- **Demand = f (harvest levels, log price, final product price, monthly dummy variables)**

Interior
- **Supply = f (harvest levels, log price, stumpage price, labour cost, dummy policy variable, monthly dummy variables)**
- **Demand = f (harvest levels, log price, final product price, dummy monthly variables)**

Results

Table 3. Results of 2SLS estimation for BC Coast timber supply, 2000-2013

Log grade	Owen price elasticity	Cross price elasticity	policy	Wage	Export price	First difference stumpage
High	1.77 (2.44)***	0.11 (0.69)	0.65 (2.92)***	0.86 (1.12)	0.34 (2.75)***	0.01 (0.26)
Low	1.01 (3.75)***	-0.06 (-0.43)	-0.53 (-4.12)***	-2.34(-5.58)***	-0.05 (-1.93)	0.03 (0.75)

Table 4. Results of 2SLS estimation for BC Interior timber supply, 2004-2013

Log grade	Owen price elasticity	Cross price elasticity	policy	Wage	First difference stumpage
High	0.28 (3.58)***	0.21 (5.10)***	-0.24 (-5.41)***	-0.54 (-1.88)*	-0.17 (-2.35)**
Low	-0.12 (-0.94)	-0.10 (-1.08)	0.12 (4.05)***	-0.69 (-2.64)***	0.21 (3.45)***

***= significant at 1% level, **= significant at 5% level, *= significant at 10% level

Discussion

- Changes in policy impact the timber supply. Differs based on log grade and region
- Elastic supply for the Coast and inelastic supply for the Interior

Table 5. Comparison of the Results with other studies for BC Coast timber supply

Study	Own price elasticity	
Constantino (1986)	0.3	
Zhang (1996)	0.11	
Fooks et al. (2013)	1.03	
Sun et al. (2015)	0.43	
Current research	High grade: 1.77	Low grade:1.01

- No other similar studies for BC Interior

Limitations
- Log prices for the Interior were not available during 2000 to 2003
- First difference stumpage instead of stumpage
- High correlation of labour cost, harvest levels and fuel cost

Thank you

mahsa.mojahednia@alumni.ubc.ca