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Swedish Timber Market Model
- An alternative approach to FSM

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“Standard” approach

Use empirically estimated supply and demand functions to simulate market equilibrium quantities and prices.

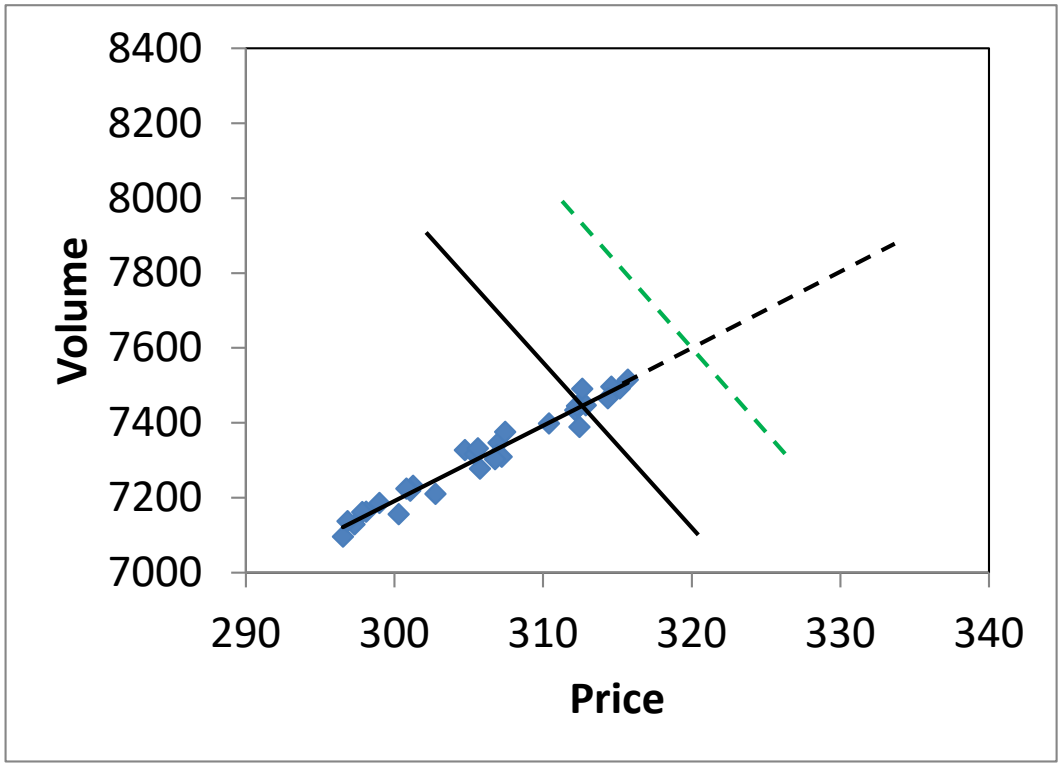
$$\text{Supply} = f(\text{timber prices, forest inventory, management costs, interest rate})$$

$$\text{Demand} = f(\text{timber price, prices of other factors, captial})$$

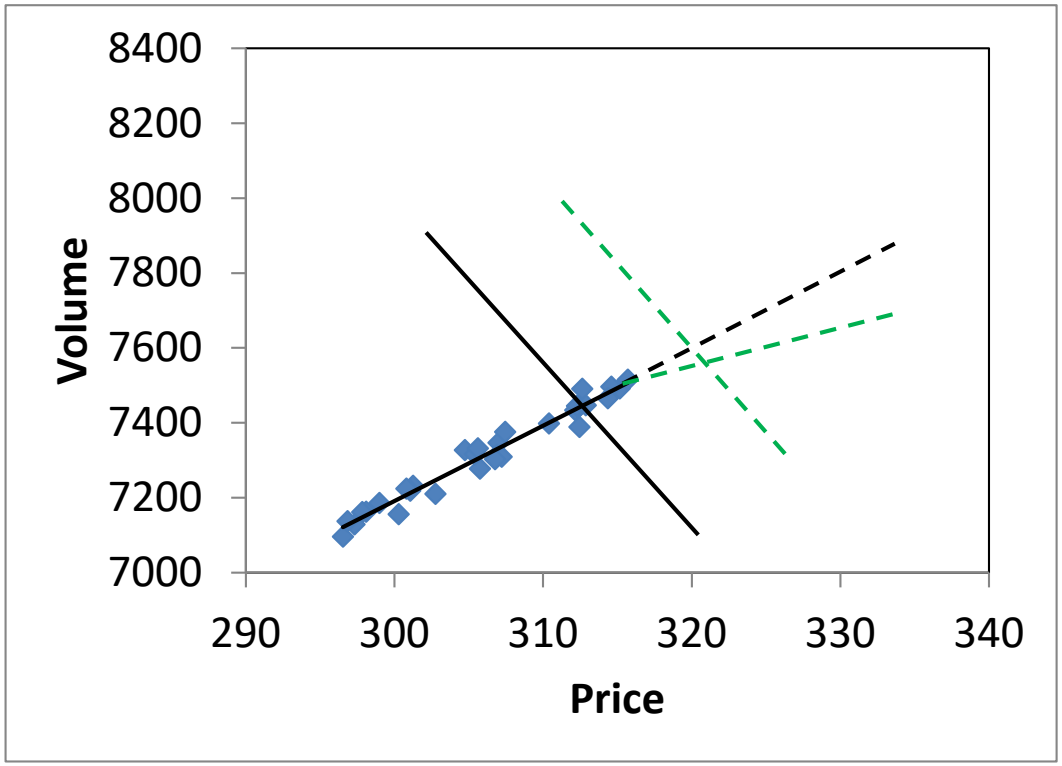
Weakness

- Not suitable for all types of policy analysis
- Uncertainty due to extrapolation

Extrapolation of empirically estimated supply function



Extrapolation of empirically estimated supply function



Lucas critique

Lucas (1976): *A change in policy can systematically alter the structure of econometric models.*

It suggets that the supply and demand fucntions are policy-dependent.

> “If we want to predict the effect of a policy experiment, we should model the "deep parameters" (relating to preferences, technology, and resource constraints) that are assumed to govern *individual* behavior”.

The Swedish Timber Market Model

1. Determine the supply function(s) for each policy scenario

Assume that

a) wood markets are efficient so that market equilibrium harvests maximize the present value of total surplus
b) demand function for each timber assortment and for fuelwood is exogenously given
c) Coefficients of supply function(s) can be determined by maximizing the present value of total surplus

2. Simulate market equilibrium harvests and prices using the obtained supply functions and the exogenously given demand functions

The Swedish Timber Market Model

Gong & Löfgren (2003): *Welfare Gains from Perfect Competition*

Gong, Löfgren, & Rosvall (2013): Economic evaluation of biotechnological progress

Guo & Gong (2016): Potential and cost of increasing forest carbon sequestration

Application of the Swedish Wood Market Model: an example

Purpose: Assess the consequences of increasing demand for fuelwood

Products: sawtimber, pulpwood, and fuelwood

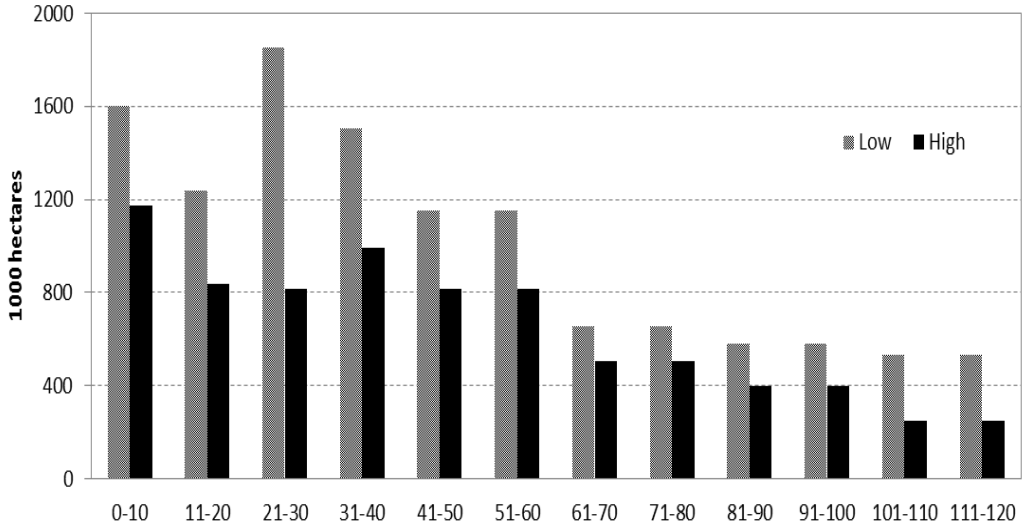
Demands: Geijie, Bostedt and Brännlund (2011)

Policy scenarios:

- Business As Usual
- Increasing demand for fuelwood (3% per year during 10 years)

19.5 million ha forests included in the analysis

Age-class distribution at the starting point



Comparison with price elasticities estimated by of Geijie, Bostedt and Brännlund (2011).

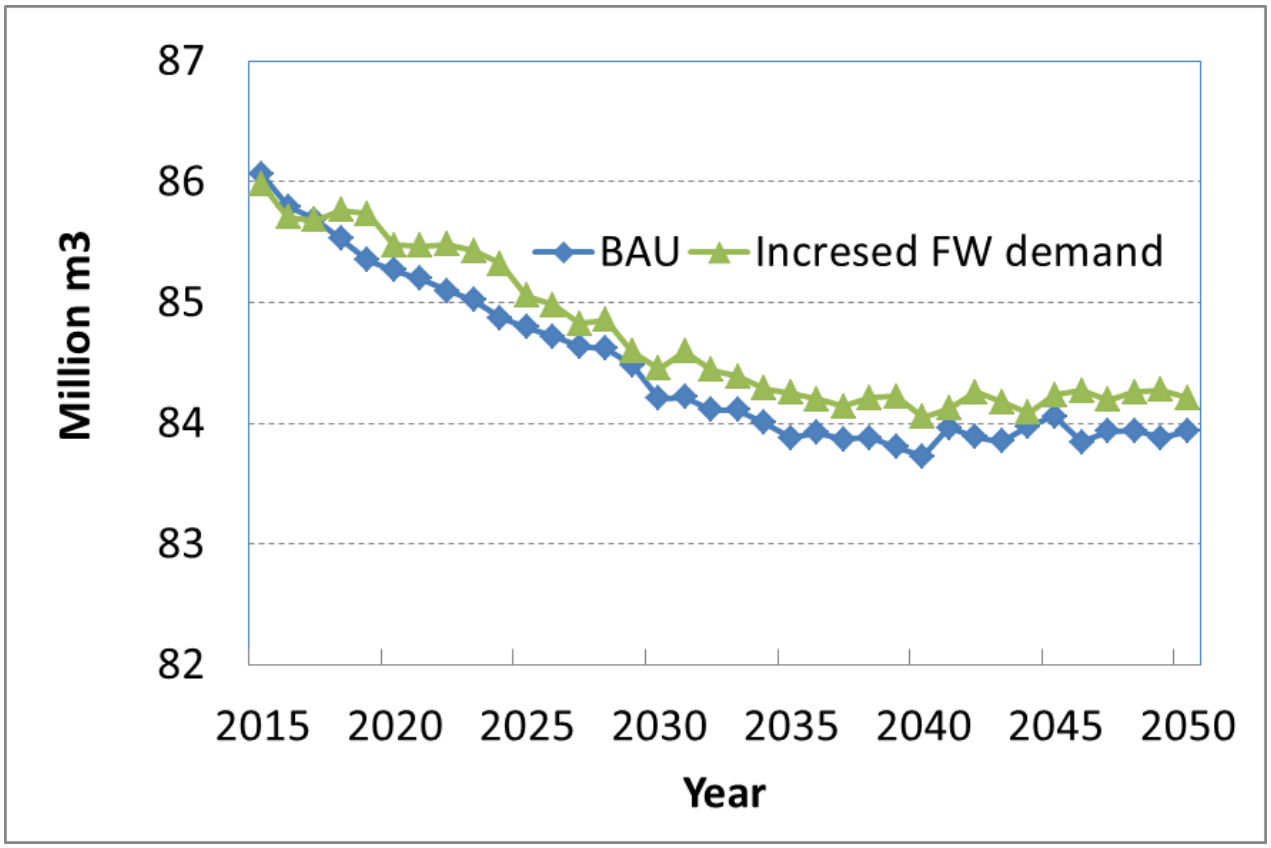
	P^s	P^p	P^f
Sawlog			
BAU	0.938	-0.21	-0.12
GBB (2011)	0.28	-0.01	-0.22
Pulpwood			
BAU	-0.04	0.75	0.048
GBB (2011)	-0.03	0.14	-0.04
Fuelwood			
BAU	-0.098	-0.42	1.76
Increased FW demand	-1.85	-0.13	0.55

The supply functions:

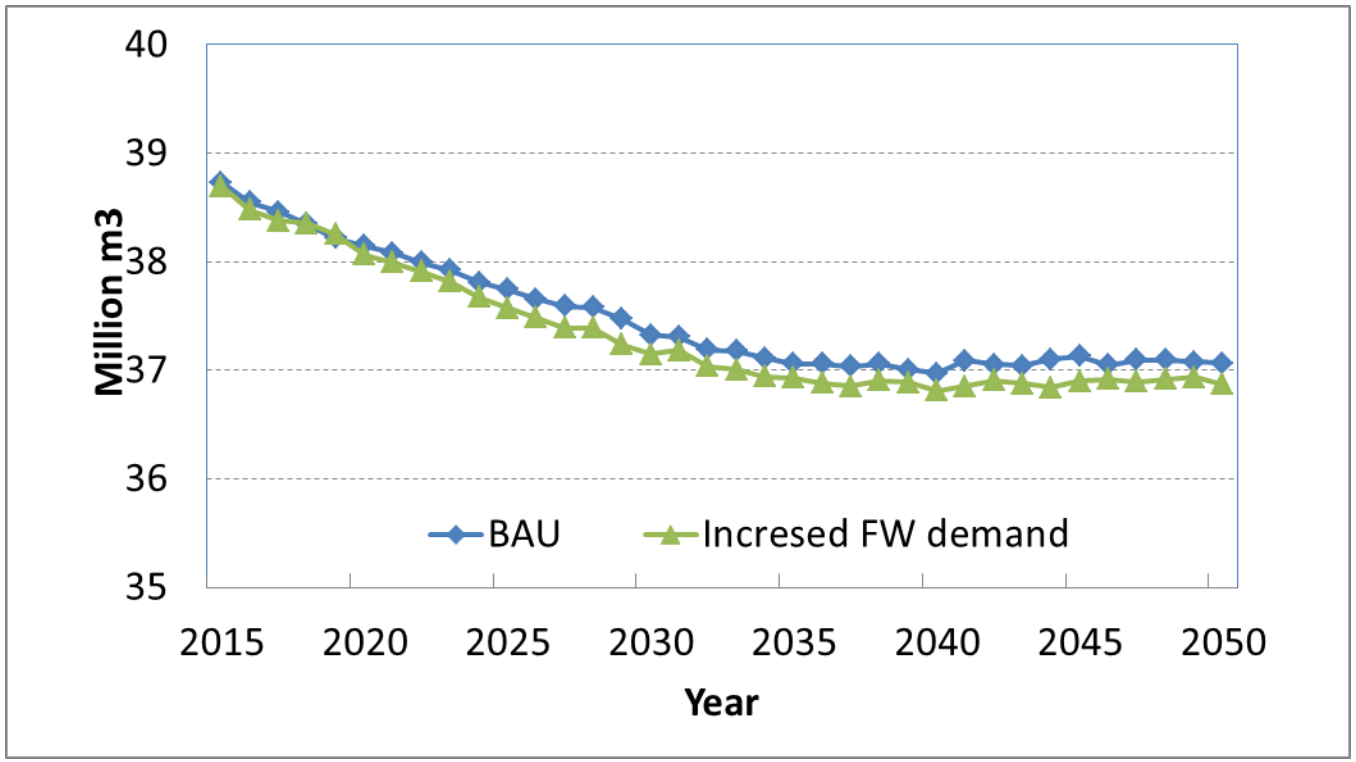
$$S_t = \alpha_1 (V_t)^{\alpha_2} (p_t^s)^{\alpha_3} (p_t^p)^{\alpha_4} (p_t^f)^{\alpha_5}$$

	α_3	α_4	α_5
Sawlog			
BAU	0.938	-0.21	-0.12
Increased FW demand	0.938	-0.21	-0.12
Pulpwood			
BAU	-0.04	0.75	0.048
Increased FW demand	0.04	0.88	-0.250
Fuelwood			
BAU	-0.098	-0.42	1.76
Increased FW demand	0.090	-0.62	1.85

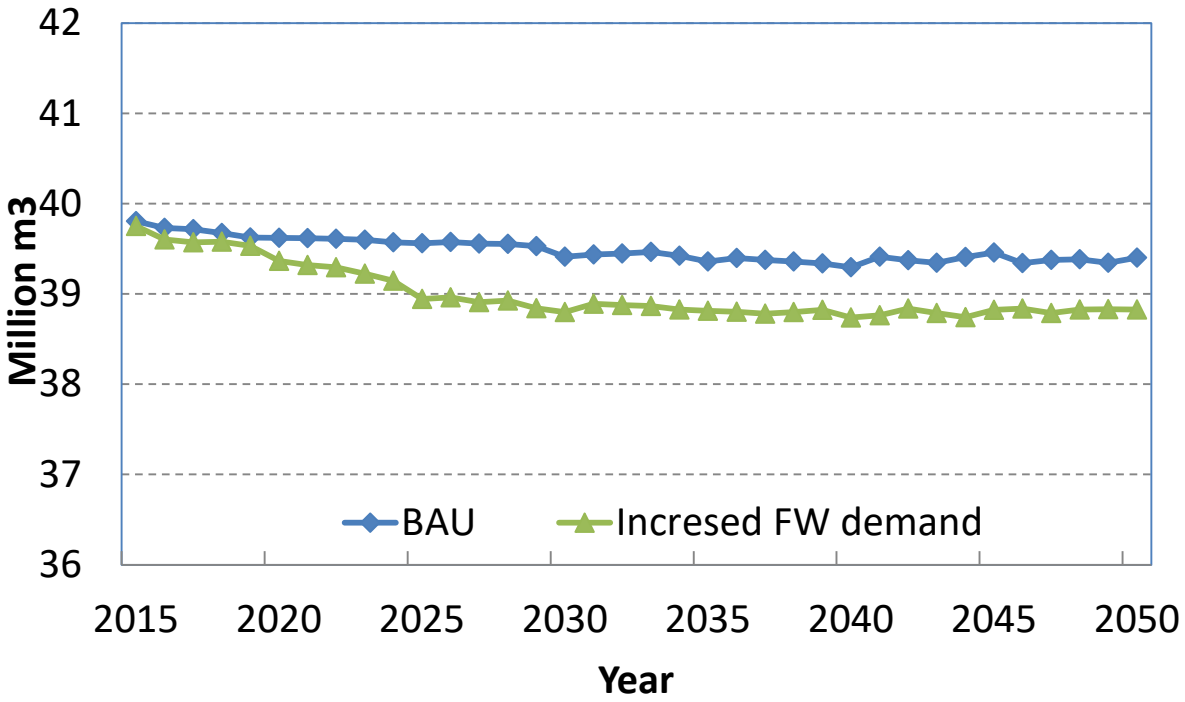
Total harvest



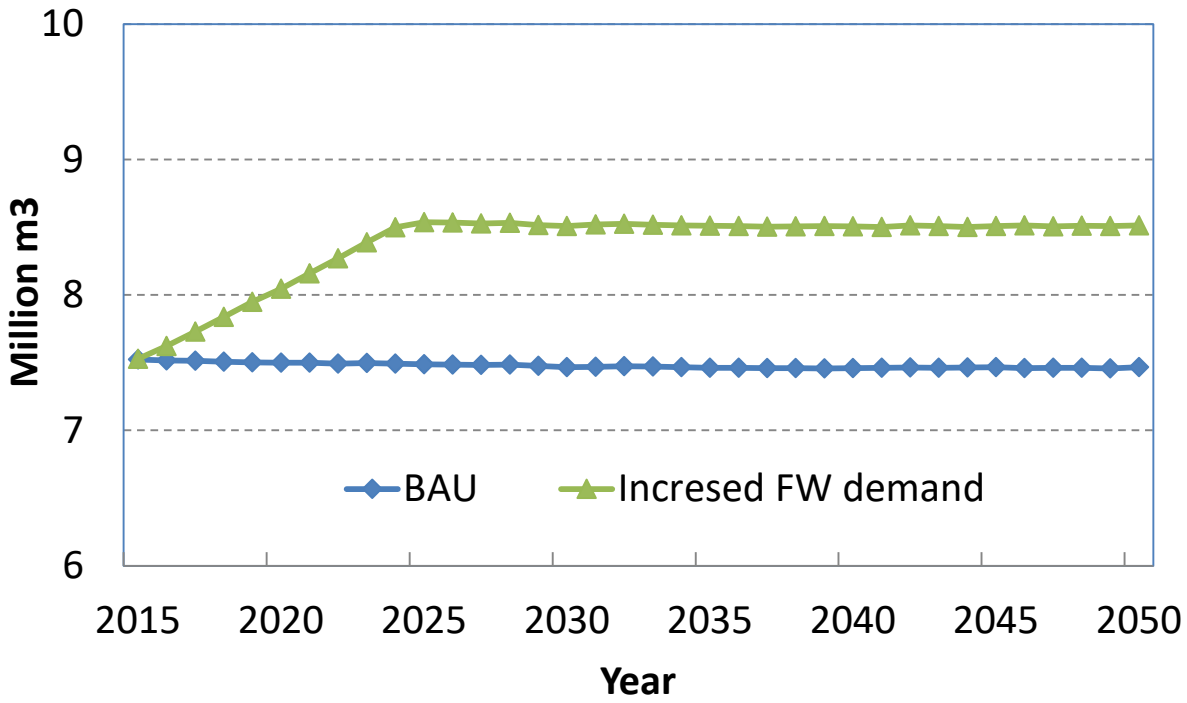
Annual harvest of sawtimber



Annual harvest of pulpwood



Annual harvest of fuelwood



Price of firewood