

# Price Formation and Price Dynamics in the Forest Products Sector

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# This Presentation

- Concepts of Supply and Demand
- Price Movements over Time
- Examples of Recent Phenomena in Forest Sector Markets

# Supply and Demand Concepts

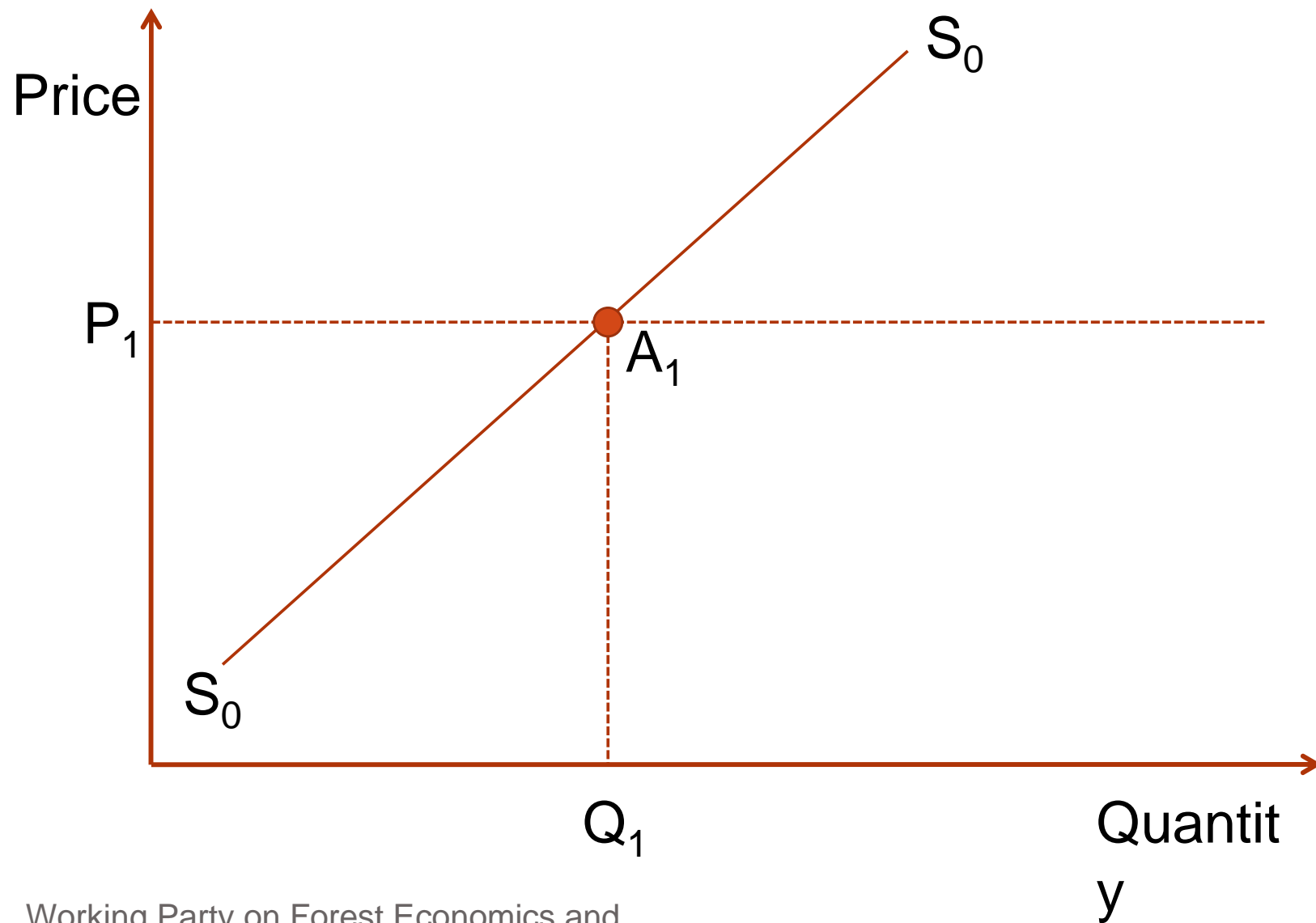
# Basic Concepts of Supply

- What drives a decision by an individual or firm on the quantity of product supplied?
  - The price of the output
  - The costs of the production inputs
  - Existing capacity to produce (short-run only)
    - In timber, this is the standing inventory volume
- Supply features
  - As the price of the output changes, quantity of output changes, through movements along the supply schedule (curve)
  - As the costs of the inputs change, quantity of output changes, manifested by shifts in the supply schedule (curve)

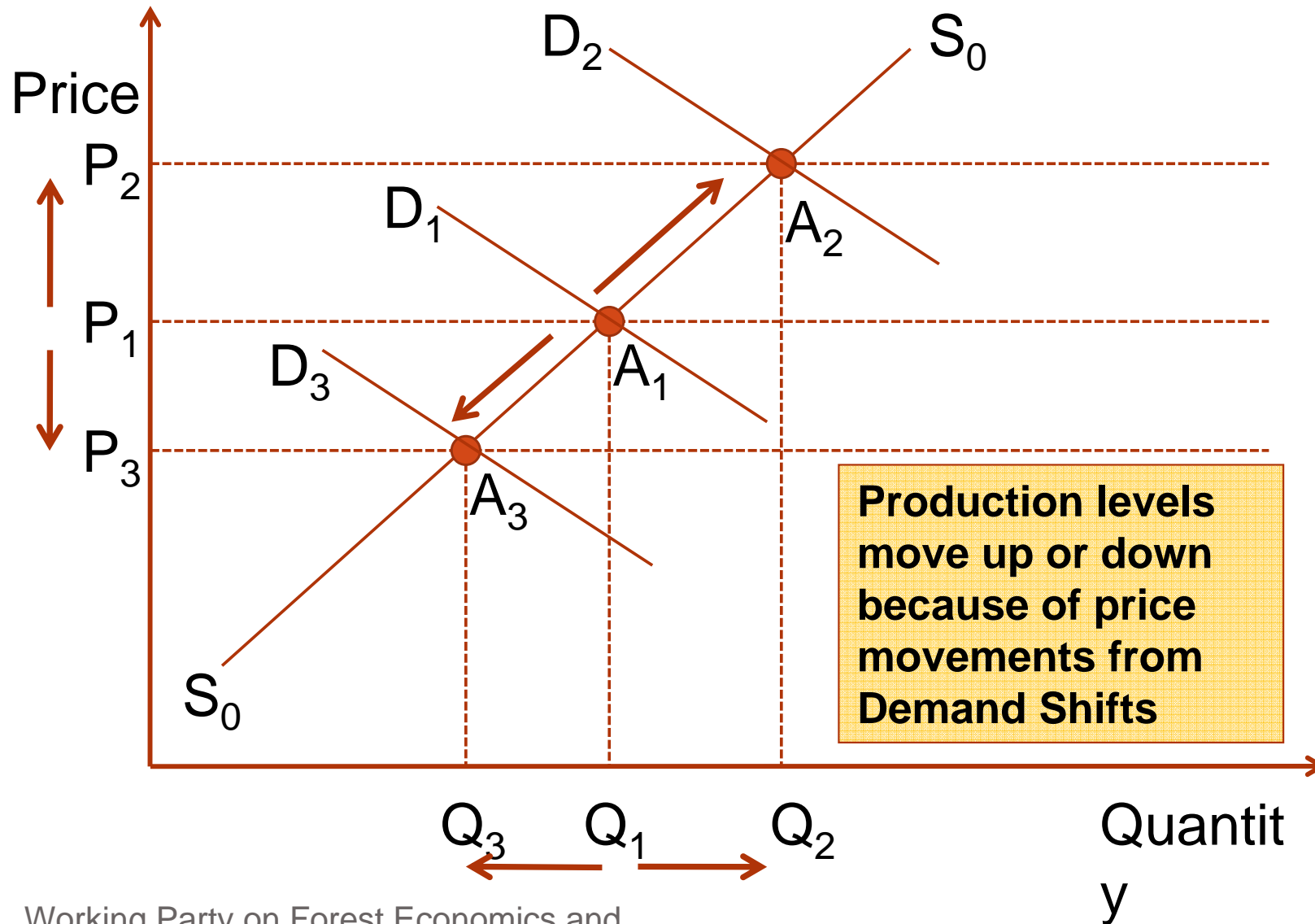
# Inventory versus Supply

- Timber inventory (or timber stocks) is how much timber is standing on the landscape.
- Timber supply is an economics term, indicating how much wood is sold in the market at a given price.

# Supply Curve



# Supply Curve

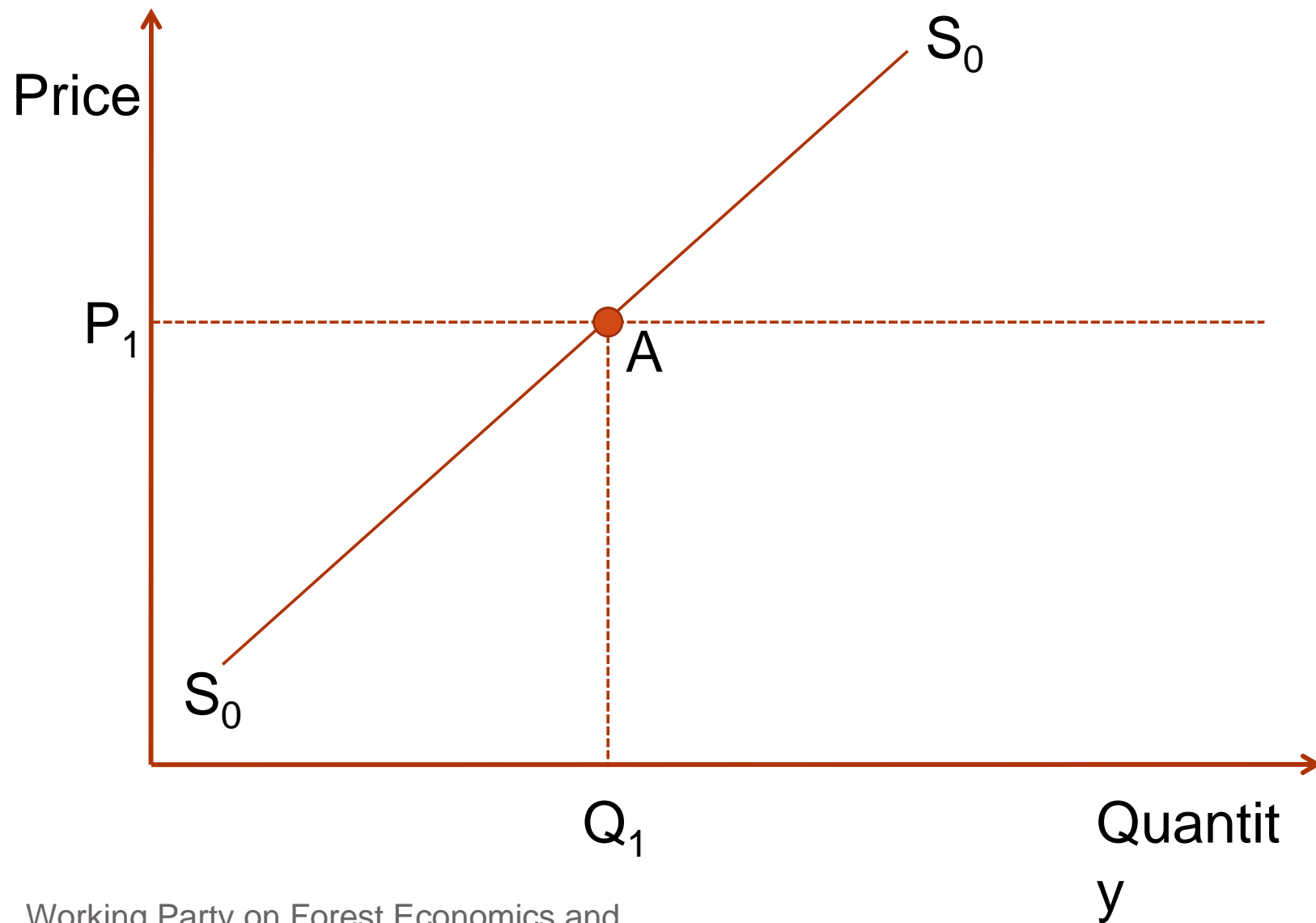




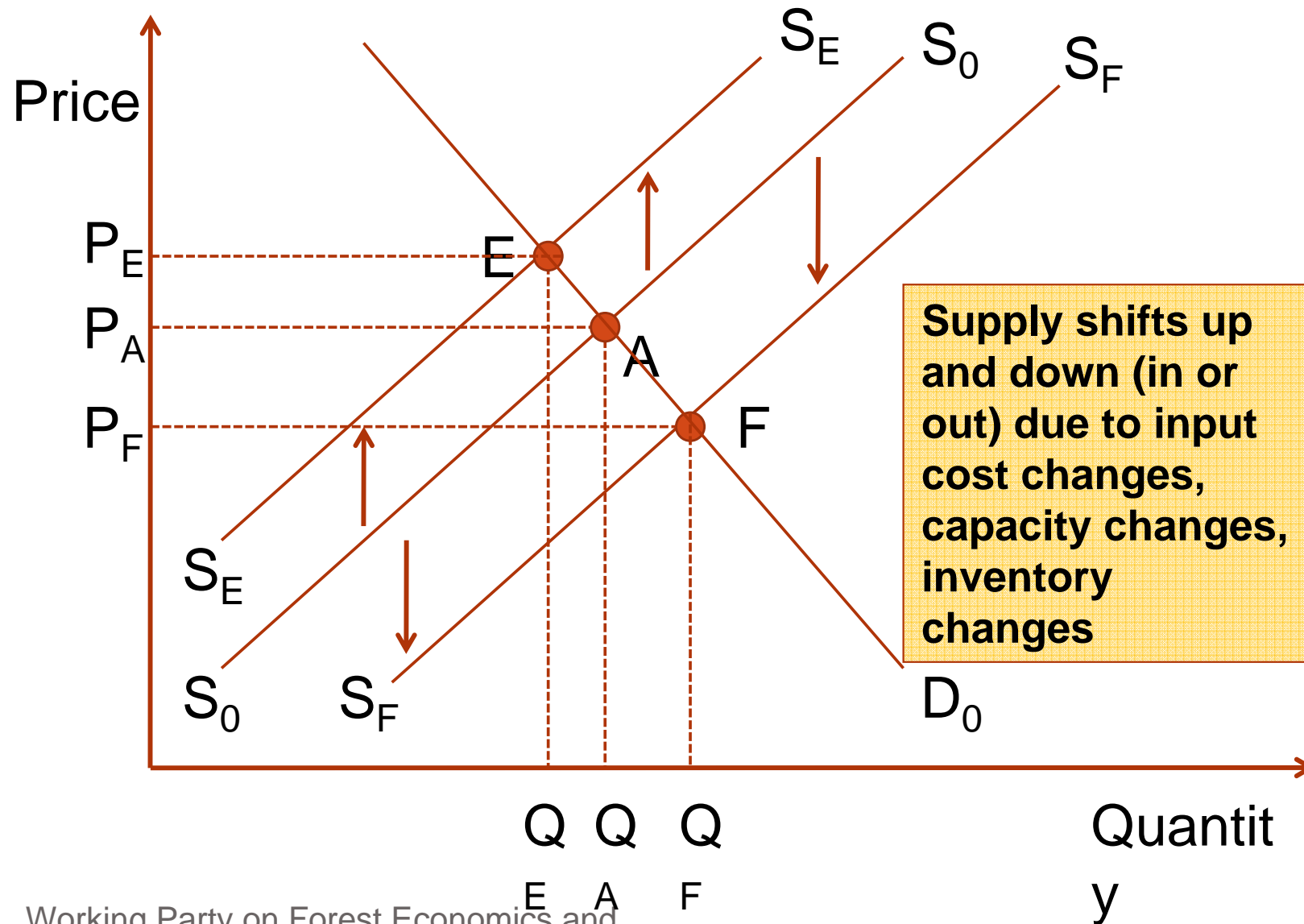
# Supply: Shifts

- Shifts occur because of:
  - Changes in input costs
  - Production capacity changes for producing factories/mills
  - Timber inventory changes in the timber sector
  - Changes in futures prices
    - Act as shifters of supply—higher futures prices might induce current period supply shifts
    - Could affect future timber inventory levels and expected timber prices received

# Supply Curve



# Supply Curve: Cost Changes



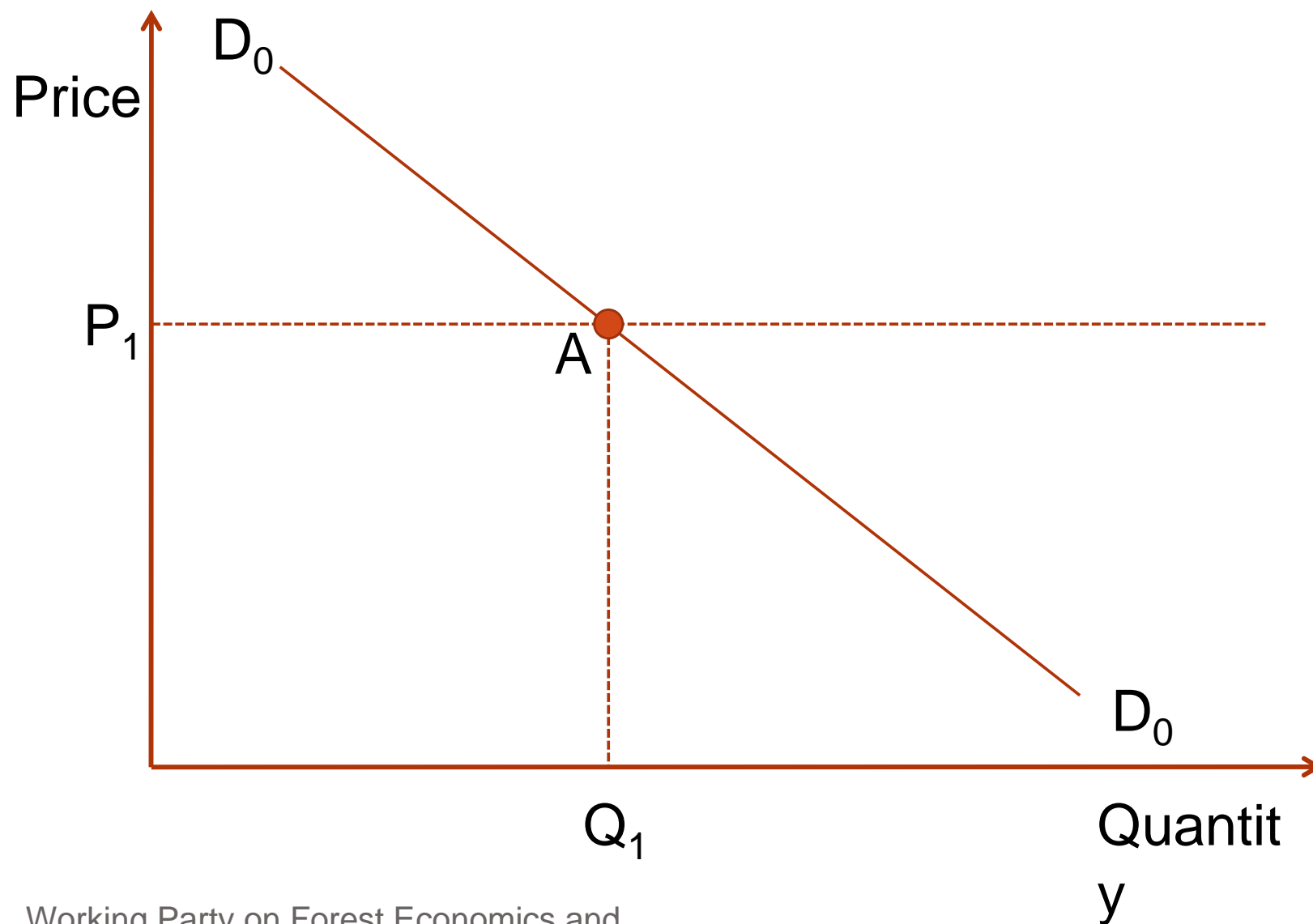
# Supply Curve Summary

- Price Changes Effects on Supply
  - Price rises move upward along Supply, to higher quantities at higher prices
    - Supply curves are very steep in the short-run, leading to large price swings and small quantity swings
  - Price declines move downward along Supply, to lower quantities at lower prices
- Input Cost (or Capacity) Effects on Supply
  - Cost increases lead to supply quantity decreases, at a given price: shifts occur
  - Capacity (inventory) increases cause supply quantity increases, at a given price: shifts occur

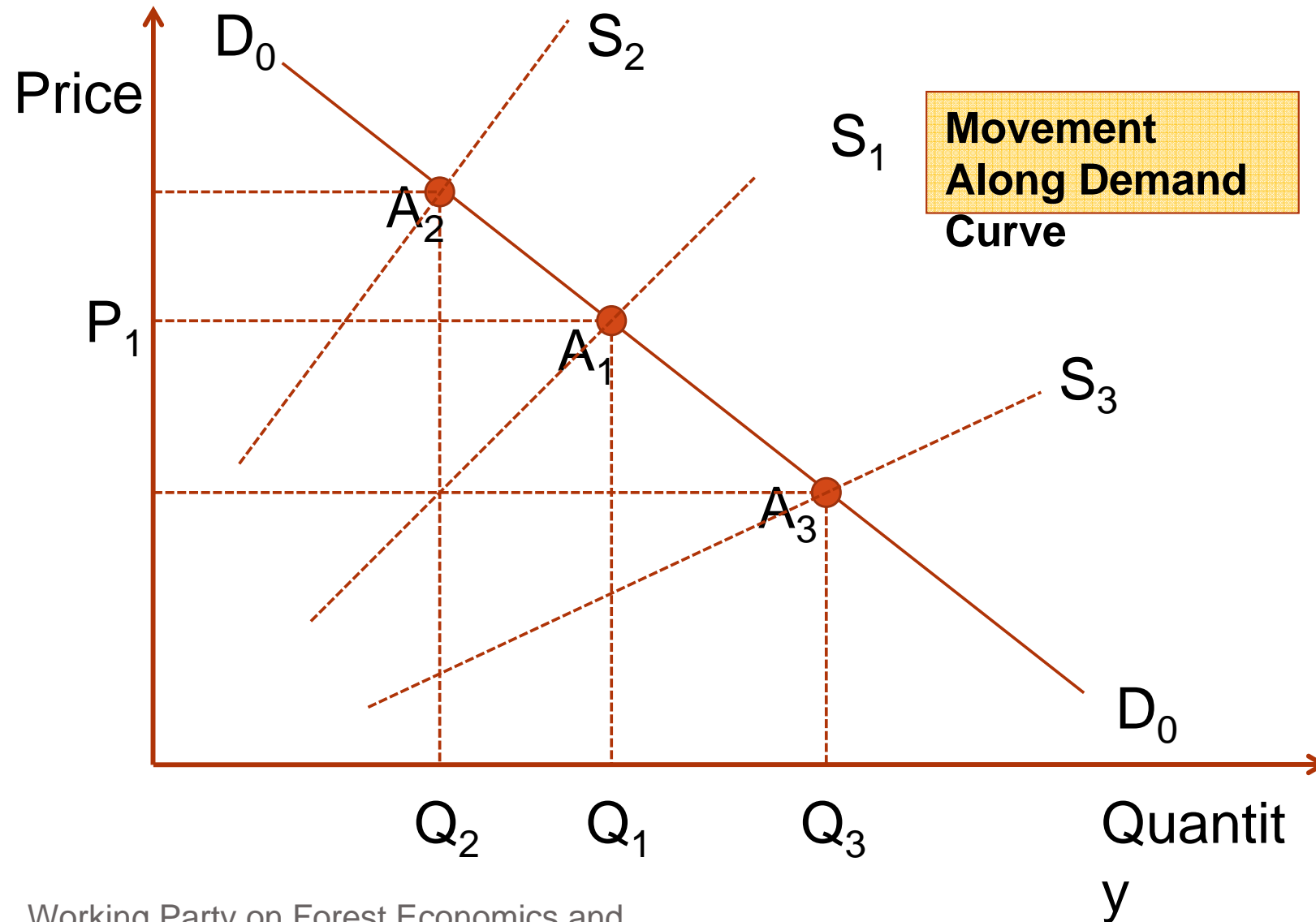
# Basic Concepts of Demand

- What drives a decision by an individual or firm on the quantity of product purchased or demanded?
  - The price of the product (or intermediate input)
  - The price of substitute products (or intermediate inputs)
  - The price of complementary products (or intermediate inputs)
  - The costs of the production inputs (intermediate inputs)
  - Existing capacity to produce (intermediate inputs, short-run only)
  - Output/Income
  - Trade
- Demand features
  - As the price of the product changes, quantity demanded changes, through movements along a demand schedule (curve)
  - As the prices of substitutes or complements change, output or income or wealth change, trade conditions change, the quantity purchased changes through shifts in the demand schedule (curve)

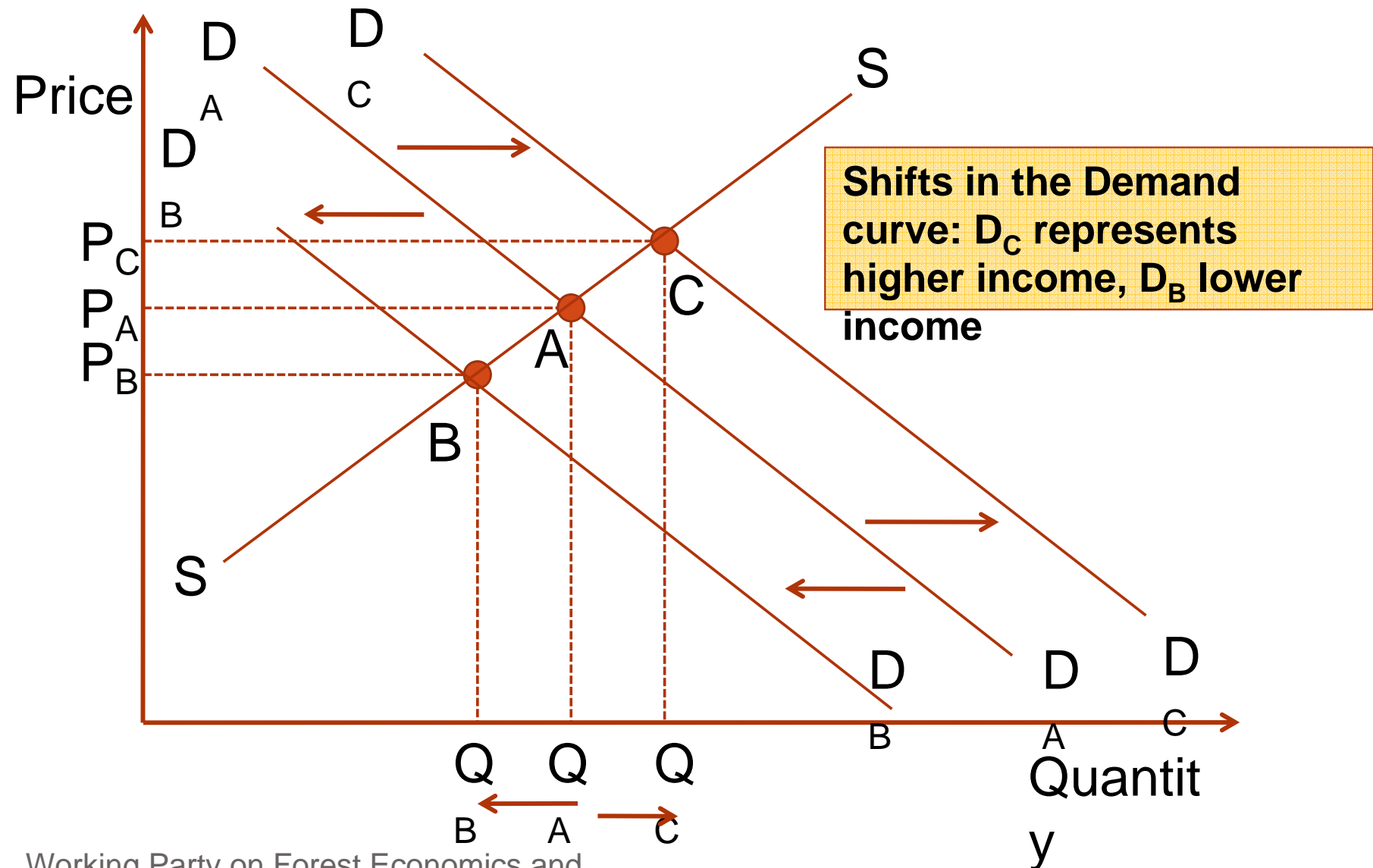
# Demand Curve



# Demand Curve: Price Changes



# Demand Curve: Income Changes





# Demand Curve Summary

- Price Changes Effects on Demand
  - Price rises move upward along demand, to lower quantities at higher prices
  - Price declines move downward along demand, to higher quantities at lower prices
- Income or Other Market changes Effects on Demand
  - Income rises lead to demand increases, at a given price
  - Income declines lead to demand decreases, at a given price
  - Same dynamics can be observed with changes in prices of substitutes, complements, capacity changes

# Prices Over Time

# Prices Over Time

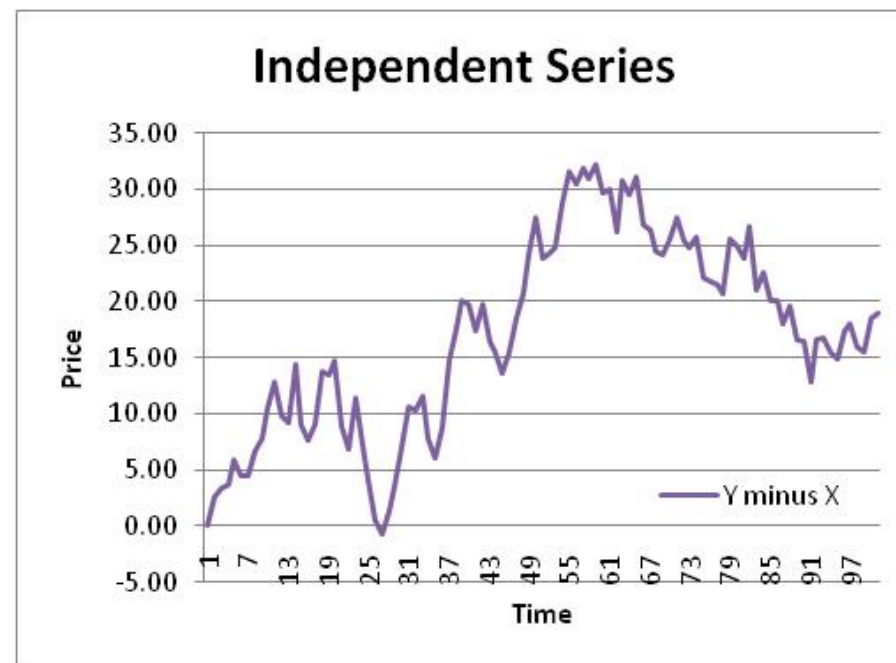
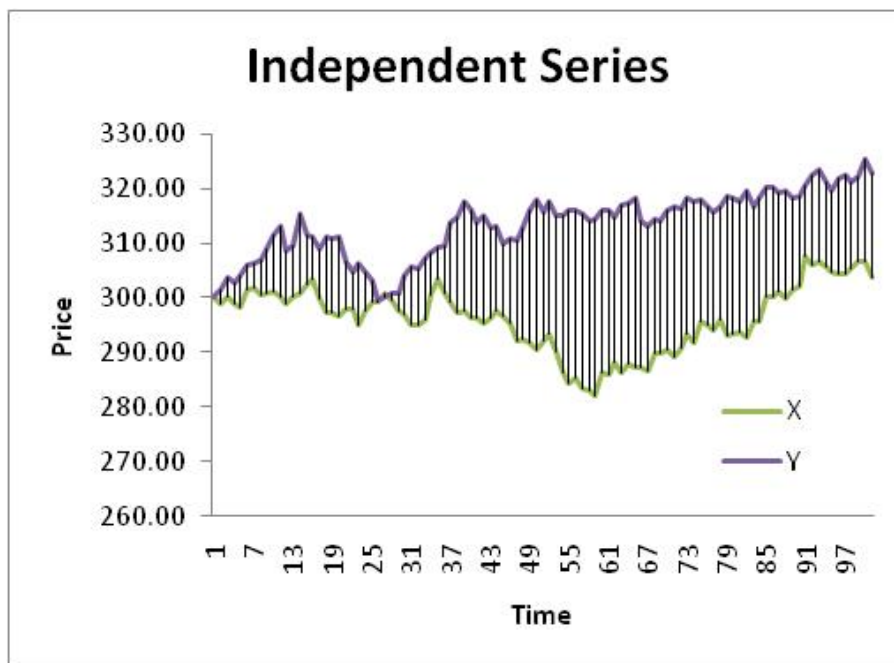
- Prices are observed more often and across a wider variety of goods than are quantities.
- Price movements can be used to monitor market conditions, and they are indicators of scarcity.
- Price movements are the combination of both demand shifts and supply shifts
- Prices of similar products in different locations can undergo interesting dynamics relative to each other.
  - Apparently independent movements
  - Apparently tightly connected movements
  - Combination of independent and connected

# Economic Factors Linking Prices Across Space

- Spatial Price Relationships Mainly Reflect Effects of the Costs of Transfer
- Idea:
$$|X_t - Y_t| \leq d_t$$
  - Where  $d_t$  = transfer cost (shipping, tariffs, insurance)
  - Price differences are kept less than  $d$  through arbitrage
- It is possible that distances or other costs are too great to keep prices together
- Cointegration: When two or more price series possess a stable, long-run relationship that keeps them together. (Robert Engle & Clive Granger, 1987—Sveriges Riksbank Prize in Economic Sciences, a.k.a. Nobel Prize in Economics in 2003)
- You can imagine that prices could wander independently if they are less than  $d$  and that  $d$  could even change over time.

# Prices and Time:

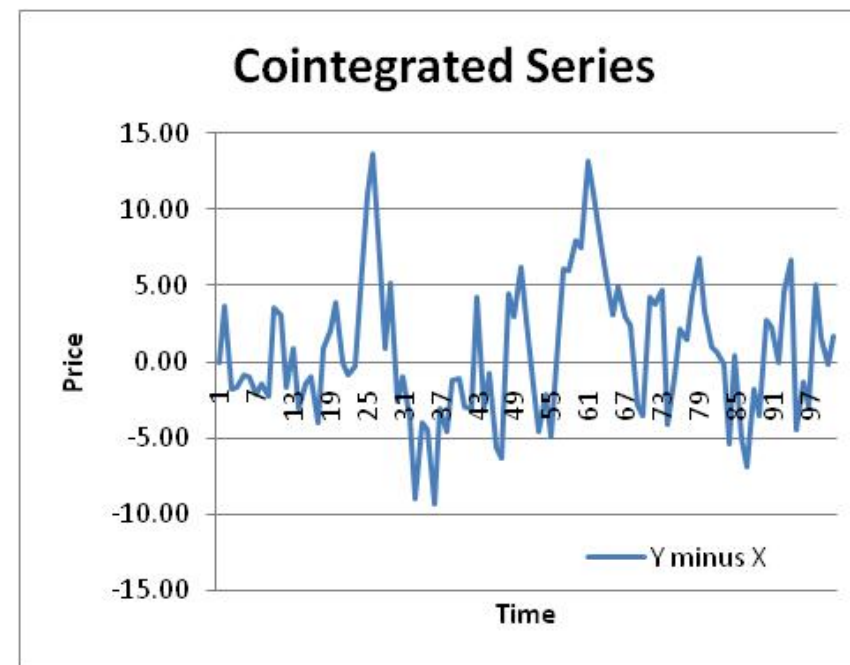
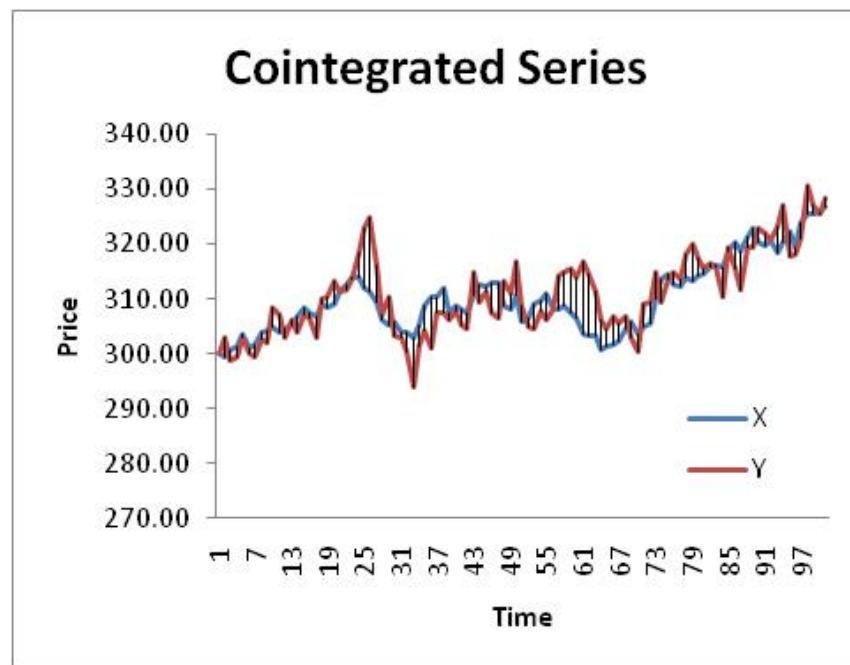
## Insight into Market Relationships



- Prices X and Y are free to wander independently.
- Price differences wander indefinitely.

# Prices and Time:

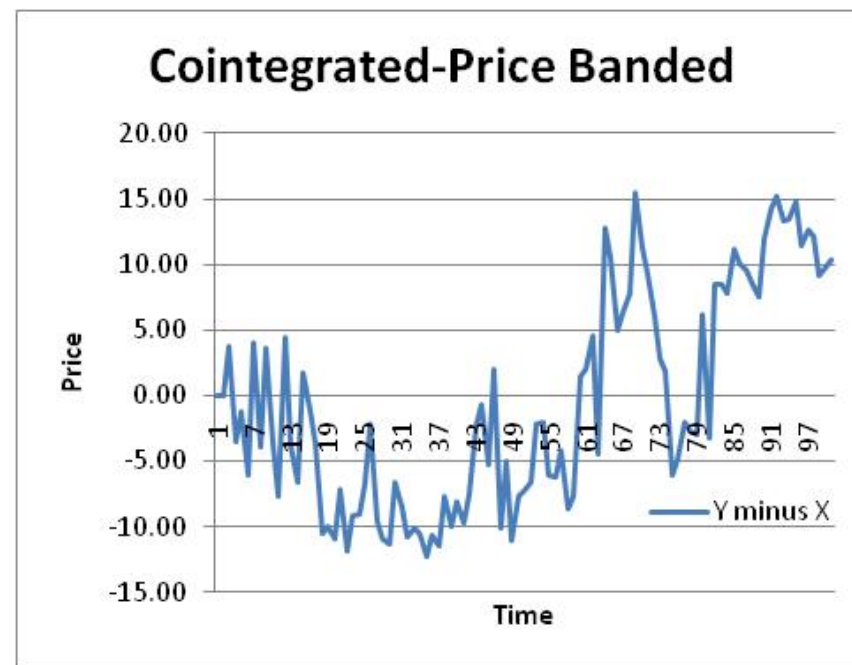
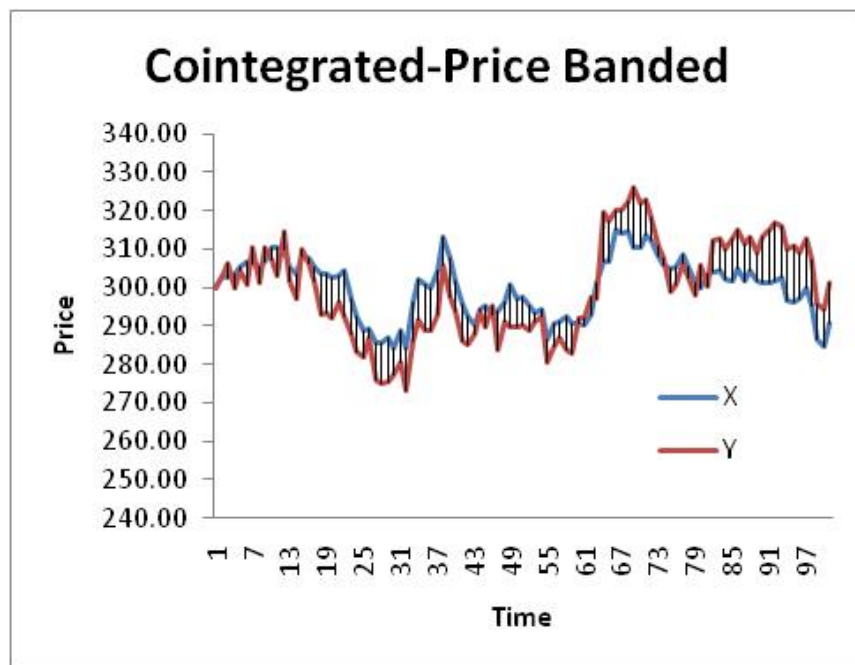
## Insight into Market Relationships



- Prices X and Y are connected, dependent upon each other.
- Price differences vary but stay close to a long-run average.

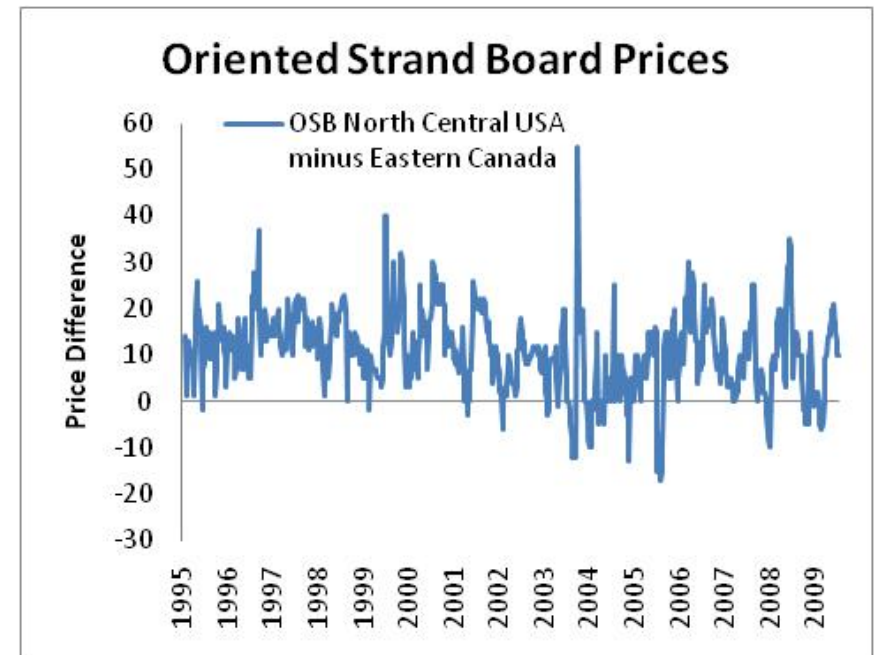
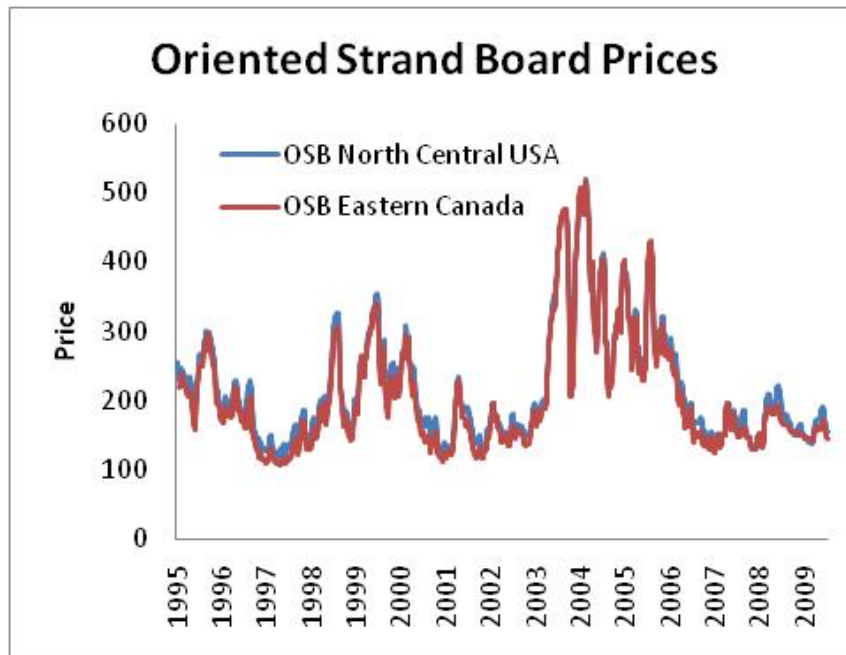
# Prices and Time:

## Insight into Market Relationships



- Prices X and Y are connected, dependent upon each other, may wander independently when within a price band equal to transfer costs, but snap back when they stray from that price band.

# Prices at Two Oriented Strand Board Producing Locations



Data source: Random Lengths,

2010

- These prices are connected, dependent upon each other, but they appear to wander when within a price band and snap back when they are very far apart.



# Summary of Price Movements Over Time

- Prices for the same product may wander independently of each other, because:
  - The producing (or consuming) locations are too far apart spatially for arbitrage opportunities to arise
  - Their price differences are too small to induce realignments
- Evidence exists suggesting spatial connections in the latter form.
- Price bands can change over time, because:
  - Output price inflation
  - Shipping cost changes
  - Trade barriers or insurance cost changes

# Related Issue: Timber Price Volatility

- Future timber prices are uncertain
  - Prices may not be stationary
  - Leads to lower investment levels
- Current timber prices are volatile
  - Steep supply curves—vulnerable to demand shifts
  - Large scale catastrophes
  - Weather/harvest conditions
- Timberland prices are sometimes considered counter-cyclical
  - Maybe not true always (e.g., not true now)
  - So volatility of prices is counterbalanced by lack of correlation with (say) stock markets
  - May explain part of great growth in real estate investment trusts in the US and elsewhere

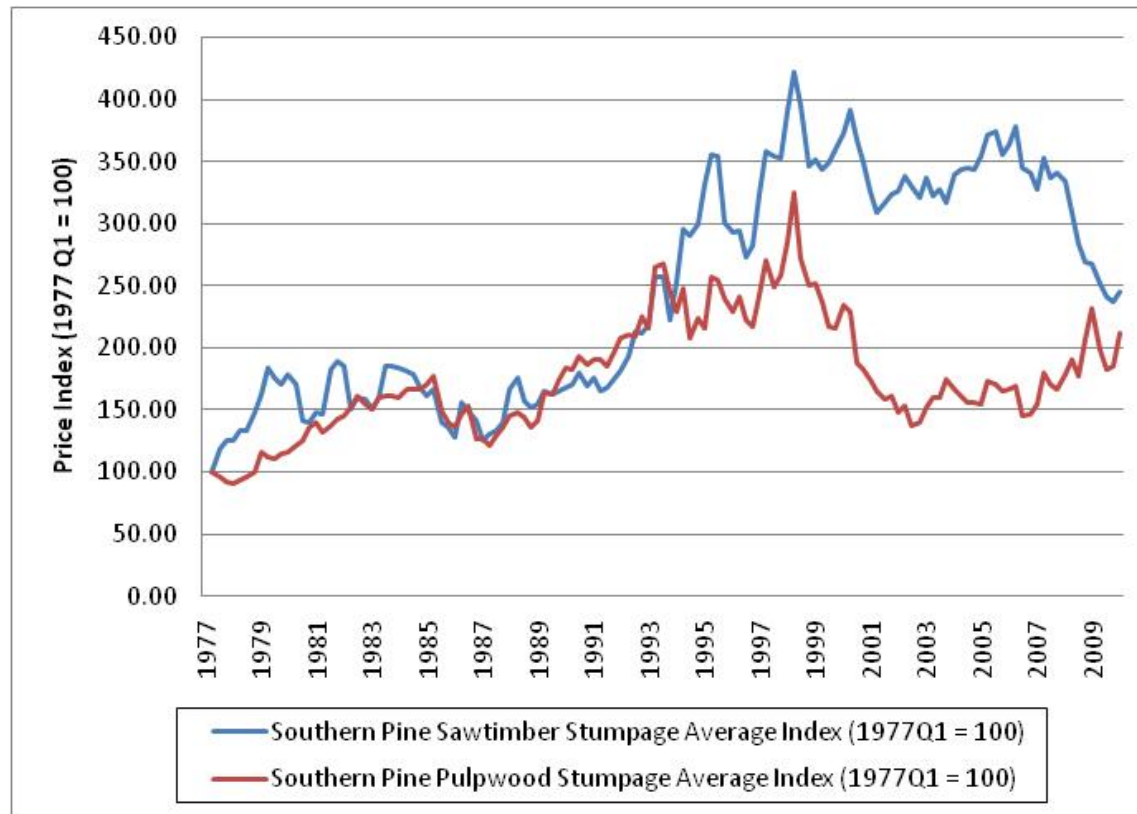
# Related Issue: Wood Energy and Pellet Markets

- Emergence of rapidly growing demand for wood fiber as an energy source, particularly in Europe
- Long-term effect would be to:
  - Increase total timber output
  - Raise prices for timber
  - Create new competition for wood, at the expense of traditional sectors
    - Particularly small diameter reliant industries

# Recent Market Phenomena

# Rising Pulpwood Prices, Falling Sawtimber Prices

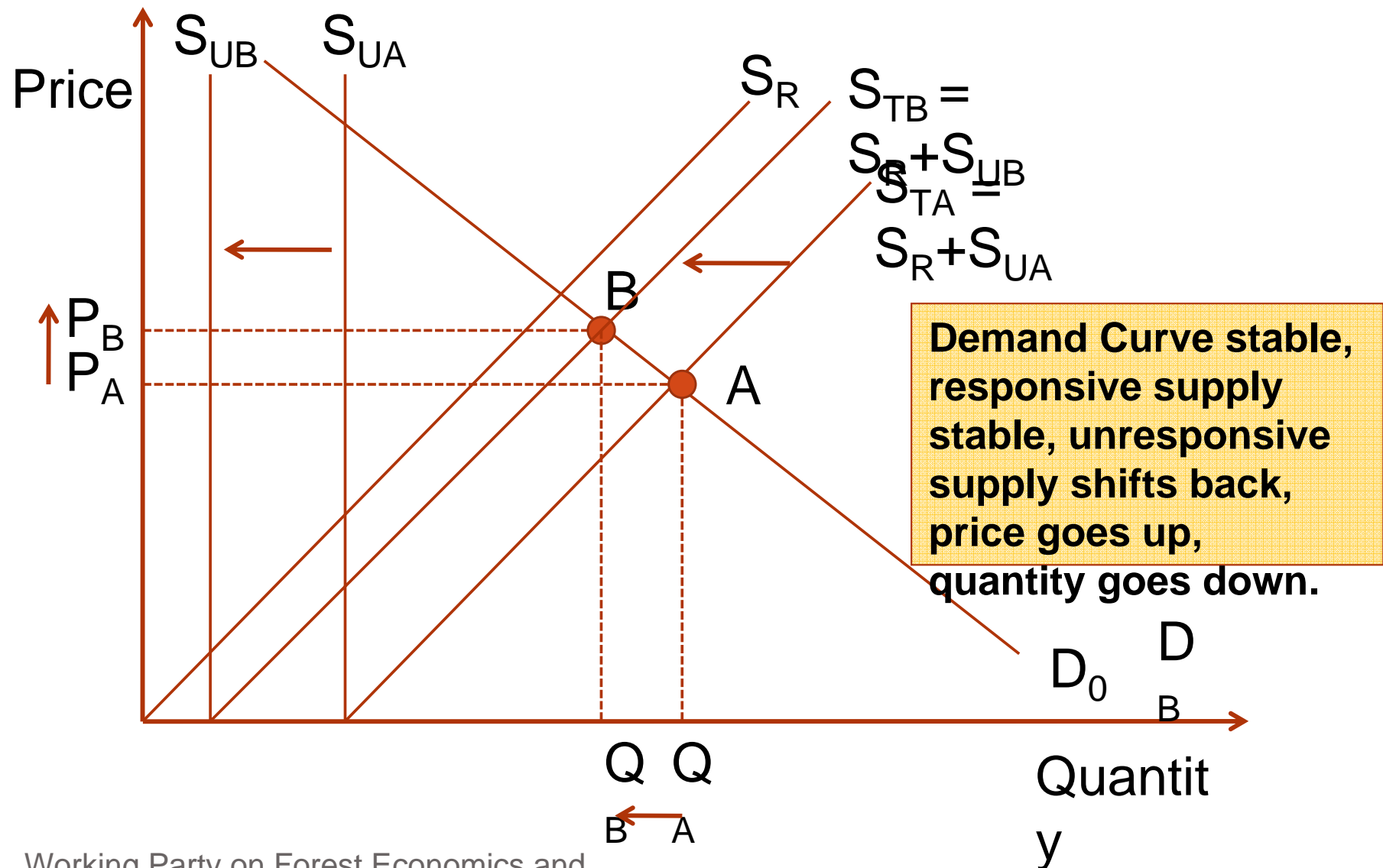
- Southern pine in the US South has divergent sawtimber and pulpwood price trends, due to different housing and paper sector trends



# Explaining the Phenomenon

- Pulpwood produced by a
  - Price responsive market segment, where pulpwood is the primary harvested product
  - Price unresponsive market segment, derived from sawtimber harvests
- Construction markets are depressed, so sawtimber markets are depressed, so unresponsive market segment of pulpwood supply is nearly absent.
- Paper prices are rising, due to recovery from capacity reductions of 1990's and early 2000's, higher world paper prices, and a weaker dollar.

# Explaining the Phenomenon: The Segmented Pulpwood Market

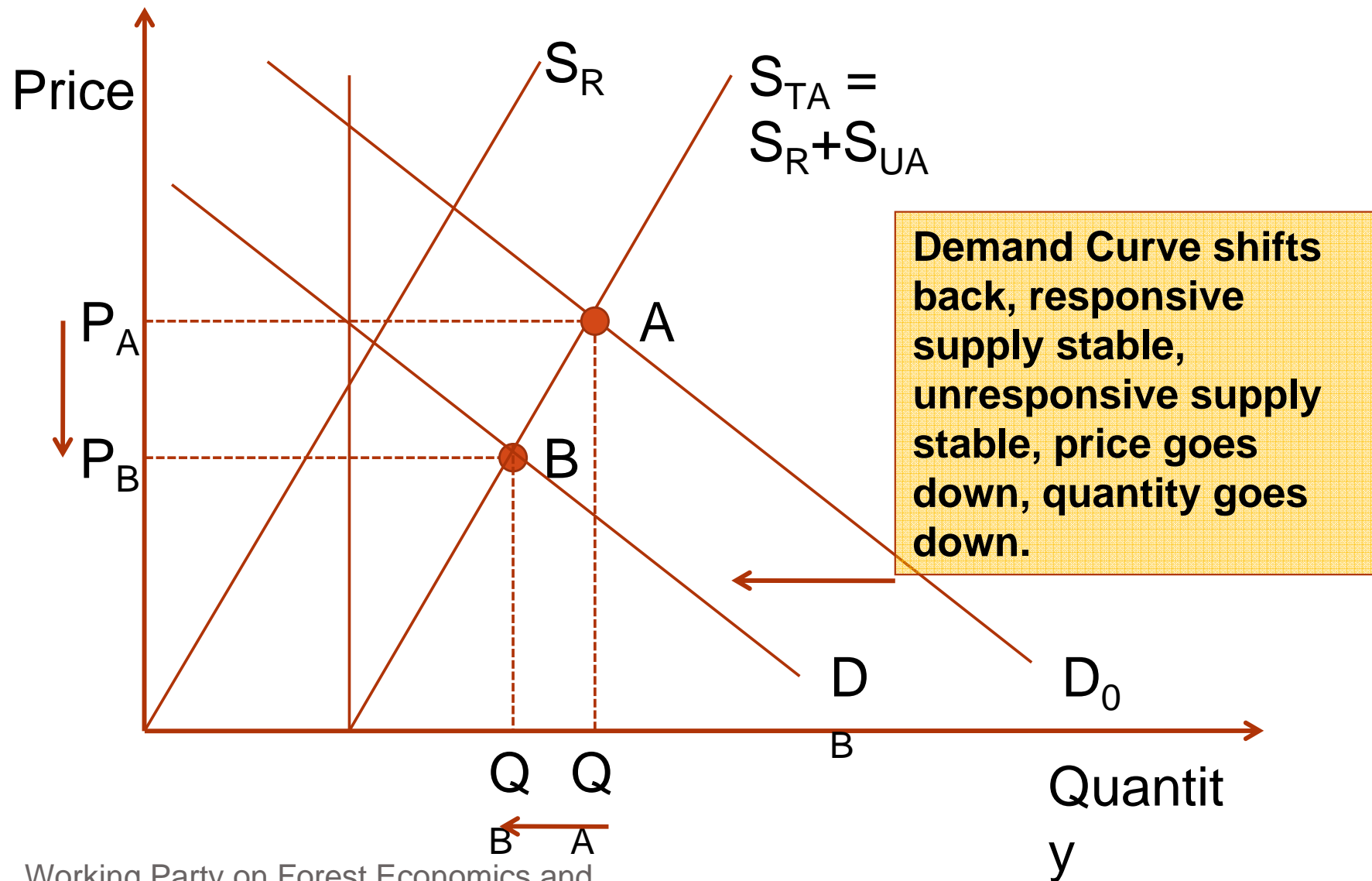


# Limited Quantity Shifts, Low Prices: Fixed Government Timber Supply

- Government timber supply curve may be price unresponsive
- Private sector timber supply curve may remain stable.
- Demand shifts back.



# Fixed Government Timber Supply Effect



# Fixed Government Supply: Long-term Impacts

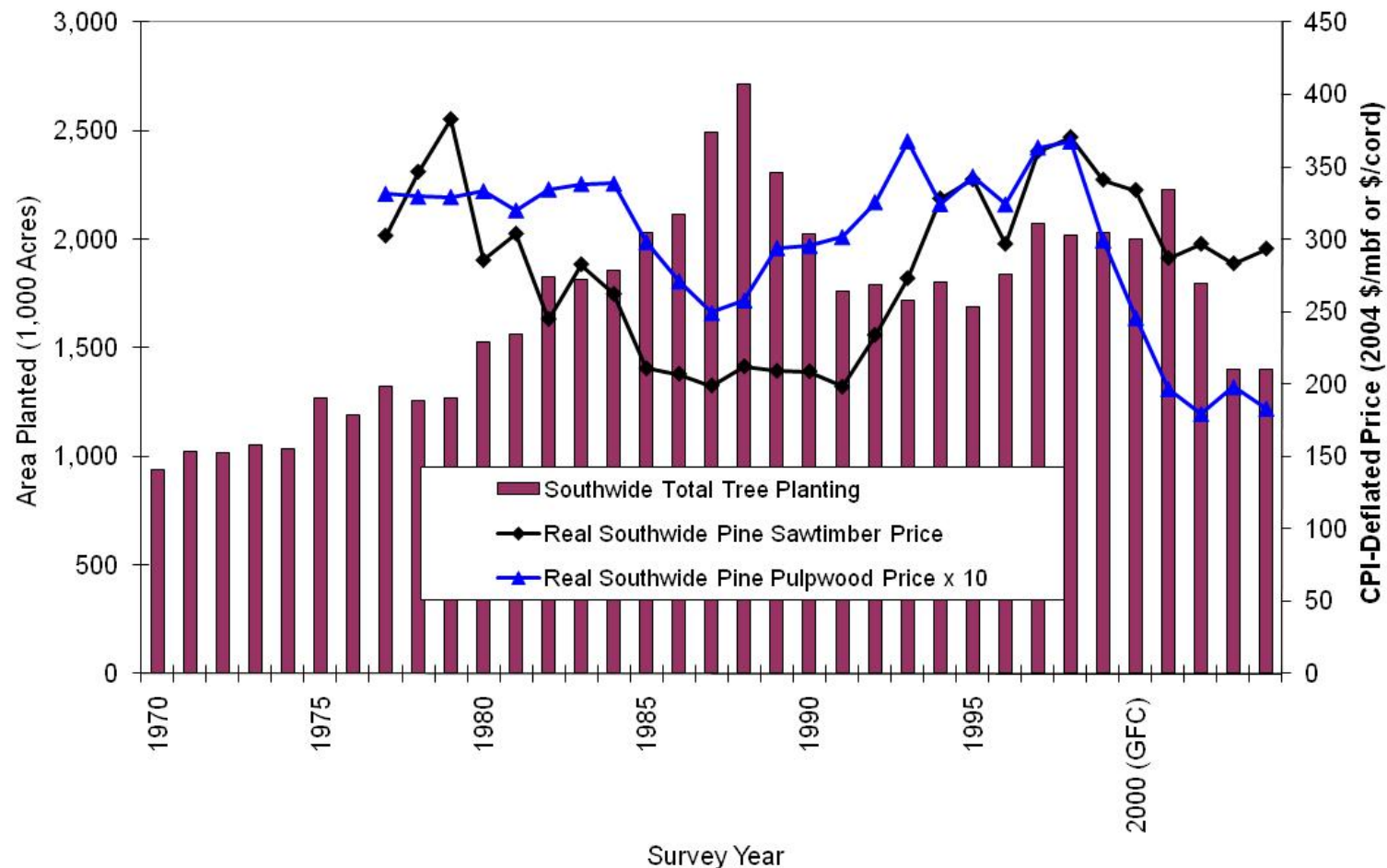
- Low prices for roundwood
  - In the face of declining demand and steep supply curves, steep price drops
- Accumulating log inventories at mill yards
- Accumulation of older/larger material in timber inventories
- Decline of younger/smaller material in timber inventories

# Lower Planting Rates

- Lower planting rates are caused by:
  - Less replacement of existing plantations post-harvest, due to lower harvests of existing forests, due to a weak economy
  - Weak long-term outlook on timber prices
- This is a phenomenon observed in the US

# Pine Plantations in the US South

Tree Planting and Real Pine Timber Prices, 1970-2004



# Summary Ideas

- Economics refers to supply schedules and demand schedules
  - Intersection determines price and quantity
  - Shifts in either supply or demand or both cause the price and quantity changes observed
- Prices for similar or identical products from two locations can move together at times, diverge at other times
  - Together because of
    - Arbitrage
    - Similar shifts in supply and demand in respective markets
  - Apart because
    - Too expensive to move products between markets

# Summary Ideas (Continued)

- Divergent housing and paper markets are behind some unusual sawtimber and pulpwood relative price movements
  - Prices for sawtimber have fallen, pulpwood risen
- Fixed government harvests can keep production up somewhat
  - With weak demand, prices fall a lot due to steep supply curves

# Questions



Olympic N.F., Washington, August 1933: K.D. Swan