Econometric Analysis of China’s Plywood Market

Minli Wan¹, Anne Toppinen¹ & Riitta Hänninen²

¹ Department of Forest Sciences, University of Helsinki, Helsinki, Finland
² Finnish Forest Research Institute, Vantaa, Finland

Joint Pre-Conference to the IUFRO World Congress in Seoul
Hokkaido, 17-20 August 2010
China is a major player in the global forest products market, both as a producer and consumer. China’s primary wood-processing industry and wood-consuming sectors have experienced rapid growth.

Due to limited availability of reliable time series data, academic research on China’s wood products market is scarce, especially the econometric market analysis of wood industry is missing.

Plywood is the most important primary wood product in China in terms of consumption, production and exports and also an important raw material for China’s huge wooden furniture industry.

By analyzing the market situation and economic factors affecting the demand, supply and exports of Chinese plywood, our motivation is trying to fill this gap for some small part.
Outline of Presentation

- Development of China’s plywood industry
- Econometric models
- Methods and data
- Results
- Conclusion and Discussion
Fuled by rapid economic growth, huge population, improved living standard, lifestyle changes, expansion of the furniture and interior decoration industries and developments in the residential construction industry, housing reforms and inflows of FDIs, China’s plywood industry has grown dramatically.

According to the SFA, China’s plywood production: 2.13 million m³ (1993) → 35.62 million m³ (2007). In 2003, China became the world’s largest plywood producer.

China’s plywood industry is highly fragmented (over 5000 plywood mills):
- Small mills play a vital role; medium mills: 30%; large mills: less than 10%.

From 1993 to 2007, China’s plywood trade had developed at a frantic pace.
Figure 1. China’s Imports of Logs and Plywood 1993-2007

Volume (1000 m³)

Year

Logs
Plywood
Figure 1 indicates that 1998 was a watershed for China’s imports of logs and plywood.

Figure 2 demonstrates the reverse trends in the trade of China’s plywood:
- Plywood imports: 2.23 million m³ (1993) → 306,600 m³ (2007),
- Plywood exports: 94,000 m³ (1993) → 8.78 million m³ (2007),
- China has become a net plywood exporter since 2001 and has become the world’s largest plywood exporter since 2003.

Plywood consumption (= production + imports – exports):
4.26 million m³ (1993) → 27.14 million m³ (2007)
Figure 2. China’s Production and Trade of Plywood 1993-2007

Volume (1000 m³)

Year

Imports  Exports  Production
Econometric Models

- **Plywood demand model**
  - Plywood demand was modeled as consumer demand and presented as a function of consumer income and plywood price:
  \[ LACP_t = a + bLGDP_t + cLEPR_t + u_t \]  
  \[ (1) \]

- **Plywood supply model**
  - Plywood supply was presented as a function of end-use sector activity (production of wooden furniture), plywood price and raw material (log) price:
  \[ LQP_t = a + bLWFQ_t + cLEPR_t + dLIPR_t + u_t \]  
  \[ (2) \]

- **Plywood export model**
  - Plywood export was explained by consumer income in the export markets and export price of Chinese plywood:
  \[ LEP_t = a + bLUS_t + cLEPR_t + u_t \]  
  \[ (3) \]
Methods and Data

- We applied the Engle-Granger (1987) error-correction modeling approach to make econometric estimations in two steps: long-run and short-run effects.
  - Before modeling, we utilized JB and ADF methods to test for normality and stationarity of a time series to meet the basic requirements of regression analysis;
  - Then, we used OLS regression method to estimate three empirical equations;
  - Again, we used ADF method to test for stationarity of the residuals to ensure non-spurious regression results.

- Annual time series data (1993-2007) were from official sources: China Statistical Yearbook, China Customs Statistics, the State Forestry Administration of China, the National Bureau of Statistics of China, the World Bank Development Indicator Database and the US Bureau of Labor Statistics.
Results

- **Plywood demand model** (Adjusted $R^2=0.85$, F test values=0.00)
  
  $$LACP_t = 3.13 + 1.11LGDP_t - 0.33LEPR_t + u_t$$  
  $$(1.14) \quad (6.77) \quad (-1.00)$$  
  $$\Delta LACP_t = -0.20 + 2.93\Delta LGDP_t - 0.52\Delta LEPR_t - 0.99*ECT(t-1)$$  
  $$(-1.02) \quad (1.80) \quad (-0.75) \quad (-2.73)$$

- **Plywood supply model** (Adjusted $R^2=0.79$, F test values=0.00)
  
  $$LQP_t = 11.23 + 0.72LWFQ_t - 1.67LIPR_t + u_t$$  
  $$(3.18) \quad (3.90) \quad (-3.35)$$  
  $$\Delta LQP_t = 0.15 + 0.40\Delta LWFQ_t + 0.94\Delta LIPR_t - 0.92*ECT(t-1)$$  
  $$(1.92) \quad (1.92) \quad (1.51) \quad (-4.50)$$

- **Plywood export model** (Adjusted $R^2=0.91$, F test values = 0.00)
  
  $$LEP_t = -175.91 + 17.13LUS_t + u_t$$  
  $$(-11.60) \quad (12.04)$$  
  $$\Delta LEP_t = 0.22 + 4.82\Delta LUS_t - 0.50*ECT(t-1)$$  
  $$(0.88) \quad (0.43) \quad (-2.08)$$
Conclusion

- Our empirical results demonstrate that both consumer income and product price are important demand determinants, but the income effect is the dominating driver.

- As expected, an increase in raw material price has a significant negative impact, but end-use sector does not have a significant effect on China’s plywood supply.
  - The significant impact of log price on supply $-1.67LIPR_t (-3.35)$ indicates the challenges to investors for China’s plywood industry.
  - China’s strong dependency on imported roundwood makes the industry vulnerable for the raw material price development and the availability of logs.

- The growth in China’s plywood exports is mainly due to consumer income growth in the target market.
Discussion

- This paper estimated, for the first time, the long-run and short-run elasticities of demand, supply and exports of plywood in China.
- Due to data limitations, it was only possible to estimate relatively simple time series models.
- Knowledge of the findings emphasizing the important role of economic factors in the plywood market and trade can serve as a useful reference for government agencies and public authorities, as well as wood products companies who are investing and doing business in China.
谢谢 各位