# Competitiveness of US Household and Office Furniture Industry

Mingyao Song, Rado Gazo

Department of Forestry and Natural Resources, Purdue University,
175 Marsteller, West Lafayette, IN 47907-2083, USA

gazo@purdue.edu

**Abstract-Throughout the last decade, both the global and the U.S. furniture industry experienced continuous growth until they were heavily impacted by the global financial crisis and started the downward trend in 2008. This article examines the international competitiveness of the U.S. furniture industry by the trade theories of both inter-industry and intra-industry. According to indicators of trade performance, Balassa's revealed comparative advantage index and Vollrath's revealed competitive advantage indexes, U.S. does not have a comparative advantage among the furniture producing countries. The primary reason is competition from producers of developing countries, which has caused the U.S. furniture firms to either decrease production or close facilities (Pirc 2010). The standard Grubel-Lloyd index is used to examine the extent of intra-industry trade of major furniture trading countries in the world. This index is also applied to U.S. furniture's bilateral intra-industry trade. The results show that the global furniture industry is more likely to be characterized by inter-industry trade rather than intra-industry trade. U.S. does not have a high level of intra-industry trade because the values of U.S. furniture imports are much bigger than exports. The extent of bilateral intra-industry trade in furniture between U.S. and its major trading countries is small except with Canada and Japan. The U.S. is now facing unfavorable economic circumstances such as shrinking international demand and rising labor cost.**

***Keywords- Competitiveness; Manufacturer; Inter-Industry Trade; Intra-Industry Trade***

## I. INTRODUCTION

During the past decade, the total value of global furniture trade had grown steadily before being affected by global economic recession in 2008. This recession also had a negative influence on the U.S., the largest furniture importer in 2009. U.S. furniture industry is encountering internal problems and international competition. Therefore, it is important to assess the changes and present status of the U.S. macroeconomic circumstances and the U.S. furniture manufacturing industry. Furthermore, due to the intensification of global competition and the fact that the U.S. is the leading importer in the global furniture market, it is crucial to understand the patterns of international trade in this industry in order to assess challenges U.S. will face in competing with other principal trading nations and to find appropriate policies and strategies to improve competitiveness at both company and national levels.

## II. OVERVIEW OF U.S. FURNITURE INDUSTRY

### *A. Demand*

Housing starts, existing home sales, and home repairs & remodeling are main demand drivers for the U.S. furniture sector. Housing starts in 1997 were 1.5 million, rising steadily until peaking in 2005 and then declining sharply (Harris 2009). According to the National Association of Home Builders (2009), because of the mortgage crisis, the number of single-family housing starts declined from 1.7 million in 2005 to less than half a million in 2009, and also the median sales price of single-family housing starts declined 17.6% from 2006 to 2009. During the period from 2000 to 2009, the value of furniture imports increased 22.8 % to 26.7 billion dollars, while exports from the U.S. decreased 7.7 % to 4.8 billion dollars. Thus, the gross output of U.S. furniture manufacturing grew steadily from 2001 and fell with the recession in 2008. The total value of shipments for U.S. furniture industry was U.S. $79.8 billion in 2008 and decreased to U.S. $60.8 billion in 2009.

### *B. Employment*

According to Bureau of Labor Statistics (BLS), the total number of employees in U.S. furniture manufacturing was 642,440 in its peak in 2000 and declined continuously since then by a total of 43.9% until 2009. This decline of 282,230 represents an annual loss of 6.23%. Heavily impacted by the financial crisis, the employment decreased significantly from the mid-2008. However, along with the improving economic situation in recent years, the employment increased somewhat in 2010. Data on average weekly hours of all employees in furniture manufacturing area trended down from 2006 to the mid-2008 and then turned up in 2009. Period of 2008-2009 was a turning point and the worst years for furniture manufacturing during the past decade. Layoffs kept steady until 2008, but increased suddenly and greatly in mid-2008 and recovered to average level at the end of 2009.

### *C. Labor Productivity and Cost*

BLS defines unit labor costs as the ratio of hourly compensation to labor productivity. According to BLS, labor

productivity increased by 9.7 percent, from 91.3 in 2000 to 101.1 in 2009. Unit labor costs in U.S. furniture industry increased by 14.8 percent, from 99.8 in 2000 to117.2 in 2009, due to productivity increasing slower than hourly compensation. In 2009, the U.S. hourly compensation costs rose about 4 percent from the previous year to $33.53. The eight countries (Norway 53.89, Denmark 49.56, Belgium 49.4, Germany 46.52, Finland 43.77, Netherlands 43.50, France 40.08, and Sweden 39.87) with the highest costs in Europe were 30-60 percent higher than the U.S. level. The costs in Canada (29.96) and Japan (30.36) were about 10 percent lower than the U.S.

### *D. Leading States in Household and Office Furniture Manufacturing*

The furniture industry is highly segmented, and patterns of growth and decline have not been experienced equally by all sectors of the industry since 2000 (Cooney 2007), so we analyzed the present status of U.S. furniture industry by two categories: household furniture and office furniture. Both of their employment and products shipments declined significantly, including the two major clusters, California and North Carolina. According to the Annual Survey of Manufactures (2009), household furnishings accounted for U.S. $32.9 billion of the U.S. $60.8 billion in shipments reported for NAICS 337 section (furniture and related products). The household furniture industry's unemployment rate has been significant for North Carolina, Tennessee, and Virginia. The sector of office furniture has lost 73,435 manufacturing jobs, from a peak of 177,914 in 2000 to 104,479 in 2009. Shipments fell from a peak of $26.7 billion in 2008 to $19.6 billion in 2009. In general, the office furniture sector is much more centered on the Midwest-Northeast manufacturing belt than household furniture (Cooney 2007). One reason for the recession is that much of the production of furniture companies has shifted to offshore locations due to the leverage of manufacturing costs and the search for competitive advantage such as outsourcing (Quesada and Gazo 2006).

### *E. Imports and Exports*

During the period from 2000 to 2009, the value of U.S. furniture imports increased 22.8 percent to 26.7 billion dollars, while exports from the U.S. decreased 7.7 percent to 4.8 billion dollars. Canada was the largest importer of the U.S. furniture from 2000 to 2009. Mexico and the United Kingdom ranked in the second and third place respectively, as U.S. furniture's major export destinations during the same period.

Imports from China have grown significantly from 2000 to 2007 while declined in both 2008 and 2009. China has been the largest importer of furniture to the U.S. since 2002. Mexico and Canada ranked as the second and third largest importers in recent years. Imports from Vietnam also increased significantly in the research period. While Asian imports have made significant gains in certain segments of the market, most upholstered and some high-end wooden furniture is still manufactured in the U.S. (Schuler 2007).

## III. METHODOLOGY OF COMPETITIVENESS ANALYSIS

There are several perspectives from which the competitiveness of an industry can be assessed. The aim of our study is to examine the trade performance of U.S. furniture industry relative to other furniture producing countries. International trade theories are used to explain the exchange of goods and services between countries (Kayser 2008). To reflect the relative competitiveness of U.S. furniture industry, this article adopts the widely accepted trade indexes based on trade data mainly from 2000 to 2009.

### *A. Trade Performance*

#### *1) Trade Specialization Index (TSI):*

Balassa (1966) suggested that country's trade advantage in a particular industry could be obtained by calculating the TSI as a ratio of net trade to the total trade in the commodity category. Values of the TSI range between minus one and plus one. A positive value of the TSI indicates that the country has a comparative advantage in the trade of the commodity and it is a net-exporter of that commodity.

$$TSI= (X_{fu}-M_{fu})/ (X_{fu}+M_{fu})$$

$X_{fu}$ is the exports of U.S. furniture, and $M_{fu}$ is the imports of U.S. furniture

#### *2) Export Propensity Index (EPI):*

The EPI for a particular industry is defined as a proportion of exports over domestic production of that industry. A higher ratio of the EPI in a particular commodity indicates that country has a higher degree of specialization in producing the commodity and comparative advantage in that commodity.

$$EPI_{fu}= (X_{fu}/DP_{fu})*100$$

$X_{fu}$ is the exports of U.S. furniture, and $DP_{fu}$ is the domestic production of furniture in U.S.

*3) Import Penetration Index (MPI):*

The MPI is the percentage ratio of imports to total domestic sales of a commodity. It indicates the degree to which the international competition threatens a domestic industry.

$$MPI_{fu}= (M_{fu}/DS_{fu})*100$$

$M_{fu}$ is the imports of furniture by U.S., and $DS_{fu}$ is the total domestic sales of furniture in U.S.

*4) Export/Import Ratio (EIR):*

Verdoorn (1960) introduced the exports to imports ratio in order to identify a country's international trade competitiveness. The export/import ratio of U.S. furniture is calculated as:

$$EIR_{fu}= (X_{fu} / M_{fu})*100$$

$X_{fu}$ is the exports of U.S. furniture, and $M_{fu}$ is the imports of furniture by U.S. The higher the value of the ratio, the more a country has international trade competitiveness in a particular industry.

Sheehan et al. (1994) suggested the export/import ratio by taking natural logarithm (Ln) to the ratio.

$$LnEIR_{fu}=Ln(X_{fu}/M_{fu})*100$$

A positive value of this index indicates international trade competitiveness of a country in a particular industry. On the other hand, a negative value of the index implies that a country does not have international trade competitiveness in that industry.

*B. Balassa's Revealed Comparative Advantage Index (RCA)*

Revealed Comparative Advantage determines if country has comparative advantage for a product by comparing its representativeness in the export numbers of the country with the weight of its international trade in the total world market (Kayser 2008). This index is calculated by the following equation:

$$RCA = (X_{ij} / X_j / (X_{iw} / X_w)$$

where, RCAij is the Balassa's revealed comparative advantage index of country j in commodity i; Xij is the exports of commodity i by country j; Xj is the exports of all commodities by country j; Xiw is the exports of commodity i by all countries in the world and; Xw is the exports of all commodities by all countries in the world. If the value for RCA is higher than 1.00, the country has a revealed comparative advantage in the specific product.

*C. Vollrath's Revealed Competitive Advantage*

Vollrath (1991) found out that the Balassa's index of revealed comparative advantage has a problem of double counting since country j's exports of commodity i is not excluded from the world exports of commodity i, or from total world exports. Vollrath described a country's revealed competitiveness in terms of four measures, namely, relative export advantage (RXA) index, relative import advantage (RMA) index, relative trade advantage (RTA) index, and revealed competitiveness (RC) index. The RC index corrects the problem of double counting since the index takes country's commodity share of exports or imports over all traded commodities other than that commodity. $RXA_{ij}$ is the relative export advantage of country j in commodity i; $RMA_{ij}$ is the relative import advantage of country j in commodity i; $RTA_{ij}$ is the relative trade advantage of country j in commodity i; $RC_{ij}$ is the revealed competitiveness index of country j in commodity i.

$$RXA_{ij}= (X_{ij}/X_{nj})/ (X_{ir}/X_{nr})$$

$$RMA_{ij}= (M_{ij}/M_{nj})/ (M_{ir}/M_{nr})$$

$$RTA_{ij}=RXA_{ij}-RMA_{ij}$$

$$RC_{ij}=Ln (RXA_{ij})-Ln (RMA_{ij})$$

$X_{ij}$ is the exports of commodity i by country j; $X_{nj}$ is the exports of all commodities excluding commodity i by country j; $X_{ir}$ is the exports of commodity i by all countries in the world excluding country j; $X_{nr}$ is the exports of all commodities excluding commodity i, by all countries in the world excluding country j; $M_{ij}$ is the imports of commodity i by country j; $M_{nj}$ is the imports of all commodities excluding commodity i by country j; $M_{ir}$ is the imports of commodity i by all countries in the world excluding country j; $M_{nr}$ is the imports of all commodities excluding commodity i by all countries in the world excluding country j and; Ln is the natural logarithm.

If the $RXA_{ij}$ has a value greater than one, it reveals that country j has a competitive advantage in exports of commodity i. When the $RXA_{ij}$ has a value less than one, it reveals a competitive disadvantage. If the $RMA_{ij}$ has a value lower than one, it means that country j has a competitive advantage in imports of commodity i. $RMA_{ij}$ has a value higher than one when it has a competitive disadvantage. $RTA_{ij}$ value greater than zero indicates a net competitive advantage, and if $RTA_{ij}$ lower than zero

indicates a net competitive disadvantage of country j.

### *D. Standard Grubel-Lloyd Index*

Grubel and Lloyd (1975) explained that the inter-industry trade index is the ratio of the absolute value of differences in exports and imports to total trade of a particular industry or commodity group. A higher GL Index indicates higher degree of intra-industry trade.

$$GL_i=\{1-|X_i-M_i|/(X_i+M_i)\} \times 100$$

$X_i$ and $M_i$ represent, respectively, the value of exports and imports of a particular industry or commodity i and the vertical bars (|) denote the absolute value. The G-L index can be expressed in percentage terms in which values range between 0 and 100 (Bowen *et al.* 1998). If $GL_i = 100$, there is only intra-industry trade, no inter-industry trade. Conversely, if $GL_i = 0$, there is no intra-industry trade, only inter-industry trade.

## IV. SELECTION OF COMPETITORS AND DATA

The trade, production, and sales data used in the Trade Performance section were for period of 2000 to 2008, in the Group NAICS 337, and were obtained from International Trade Administration. All other trade data in this chapter are for period of 2000 to 2009, in the Group 821 of Section SITC (Rev.3), was obtained from the United Nations Commodity Trade Statistics Database, the most comprehensive trade database available.

The major trading countries in global furniture market were selected, taking into account the geographical location to reflect the diversity and change in countries participating in the global market for the past ten years. Overall, twelve countries were selected: U.S., Canada, Mexico, Germany, Italy, France, U.K., Poland, China, Japan, VietNam, and Malaysia.

## V. RESULTS

### *A. Overall Trade Performance*

TABLE I U.S. FURNITURE TRADE PERFORMANCE 1999-2008

| Year | TSI | EPI | MPI | EIR | LnEIR |
|---|---|---|---|---|---|
| 2000 | -0.69 | 3.78 | 20.64 | 18.07 | 2.89 |
| 2001 | -0.73 | 3.34 | 21.04 | 15.52 | 2.74 |
| 2002 | -0.79 | 2.81 | 22.98 | 12.03 | 2.49 |
| 2003 | -0.79 | 3.12 | 25.80 | 11.78 | 2.47 |
| 2004 | -0.79 | 3.34 | 28.52 | 11.47 | 2.44 |
| 2005 | -0.80 | 3.34 | 29.51 | 11.07 | 2.40 |
| 2006 | -0.79 | 3.68 | 30.73 | 11.52 | 2.44 |
| 2007 | -0.78 | 4.15 | 31.80 | 12.42 | 2.52 |
| 2008 | -0.74 | 5.13 | 31.78 | 15.08 | 2.71 |

Source: Calculations based on International Trade Administration (NAICS 337)

Negative values of TSI indicate that U.S. is a net importer. Values of the EPI of U.S. furniture industry were very low, and did not change much in the past decade, which implies that the U.S. furniture industry is less capable of exporting furniture from the amount it can produce and has a low degree of specialization. The degree of MPI of U.S. furniture industry was very high which indicates that the U.S. furniture industry has a high degree of international competition threatening its domestic sales and production. The degree of imports penetration is high and continues to increase during the period. Values of the EIR and LnEIR have kept low and stable during analysis period, which implies that U.S. did not have high international trade competitiveness in furniture. Overall, U.S. furniture industry showed a downward trend in comparative advantage. The primary reason is large imports of lower-priced furniture from developing countries.

### *B. Revealed Comparative Advantage*

Table 2 provides the Balassa's index of revealed comparative advantage. Results for U.S. vary in a range between 0.32 and 0.43, confirming that U.S. doesn't have a revealed comparative advantage in this economic sector. The trend of the index has been decreasing prior to 2005. Since 2005, the value of the RCA index for U.S. furniture trade stayed around 0.33, which is relatively low among the selected countries. This implies that U.S. was gradually losing comparative advantage in furniture. Countries with a relatively high degree of revealed comparative advantage in furniture are China, France, Italy, Poland, Canada, Mexico, Malaysia, and Viet Nam. In contrast, U.S., U.K., and Japan have a relatively high degree of revealed comparative disadvantage. The countries having a revealed comparative advantage are major furniture-exporting countries. Viet Nam has experienced a significant increase in its index of revealed comparative advantage. The Viet Nam's RCA index in 2000 was 1.66. But, it has increased by 182.5 %, to 4.69 in 2009. Poland had a value of the RCA index at 7.29 in 2000, and then it decreased to a value of 5.71 in 2009. China and France have also experienced a significant increase in the degree of their

revealed comparative advantage. China had a value of the RCA index at 1.91 in 2000, and then it went up to 2.76 in 2009. France had a similar degree of revealed comparative advantage as China had during the period of 2000-2009. It is also important to note that Japan is the country that experienced the lowest index of revealed comparative advantage throughout the analysis period. Canada and Italy have also experienced a decrease in the values of RCA during the analysis period while Malaysia has experienced relatively stable RCA index since 2000.

TABLE II REVEALED COMPARATIVE ADVANTAGE INDEX FOR FURNITURE IN U.S. AND OTHER MAJOR TRADING COUNTRIES 2000-2009

| Year | U.S. | China | Germany | France | Italy | United Kingdom | Poland | Canada | Mexico | Japan | Malaysia | Viet Nam |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 0.43 | 1.91 | 0.89 | 1.66 | 3.65 | 0.56 | 7.29 | 1.94 | 2.07 | 0.10 | 1.68 | 1.66 |
| 2001 | 0.41 | 1.95 | 0.91 | 1.80 | 3.56 | 0.53 | 7.21 | 1.84 | 2.12 | 0.11 | 1.61 | 1.85 |
| 2002 | 0.35 | 2.01 | 0.86 | 1.73 | 3.39 | 0.47 | 7.00 | 1.84 | 2.08 | 0.11 | 1.55 | 2.52 |
| 2003 | 0.32 | 2.02 | 0.82 | 1.71 | 3.24 | 0.46 | 7.19 | 1.77 | 2.21 | 0.12 | 1.51 | 3.13 |
| 2004 | 0.32 | 2.15 | 0.81 | 1.78 | 3.15 | 0.52 | 6.76 | 1.72 | 2.25 | 0.13 | 1.51 | 3.80 |
| 2005 | 0.32 | 2.31 | 0.90 | 2.01 | 3.04 | 0.50 | 6.59 | 1.66 | 2.26 | 0.15 | 1.52 | 4.58 |
| 2006 | 0.33 | 2.38 | 0.93 | 2.17 | 3.04 | 0.49 | 6.26 | 1.62 | 2.08 | 0.15 | 1.55 | 4.95 |
| 2007 | 0.33 | 2.40 | 0.91 | 2.25 | 2.91 | 0.59 | 6.00 | 1.37 | 1.82 | 0.15 | 1.52 | 5.28 |
| 2008 | 0.35 | 2.60 | 1.00 | 2.46 | 3.01 | 0.56 | 5.95 | 1.16 | 1.65 | 0.19 | 1.58 | 4.99 |
| 2009 | 0.33 | 2.76 | 1.02 | 2.47 | 2.84 | 0.48 | 5.71 | 1.01 | 1.52 | 0.19 | 1.56 | 4.69 |

Source: Calculations based on the United Nations Commodity Trade Statistics Database

### *C. Revealed Competitive Advantage*

Tables 3 through 6 show the RXA, RMA, RTA, and RC for furniture in the U.S. and other major furniture countries in the world market from 2000 to 2009. Values of the RXA index of U.S. furniture are lower than one, which indicate that U.S. furniture has experienced a revealed competitive disadvantage in exports of furniture since 2000. Poland had the highest degree of revealed competitive advantage in furniture exports throughout the analysis period, though it has experienced a reduction in its revealed competitive advantage in furniture exports since 2000. The Viet Nam had a revealed competitive disadvantage in exports of furniture during the period, and has experienced the largest increase in competitive advantage in furniture exports from 2000 to 2009. The U.K. and Malaysia have a stable degree of revealed competitive advantage in furniture exports with small fluctuations during the period. China and France exhibited an increasing value of the RXA index reflecting a revealed competitive advantage for their furniture exports. The U.S., Germany, France, the U.K. and Canada have had a competitive advantage in their furniture imports during the analysis period. China and Viet Nam had a competitive disadvantage in furniture imports with the very low values of RMA. Although the U.S. had a competitive advantage in imports of furniture throughout the analysis period, the degree of competitive advantage in imports decreased by 33.1 percent from peak of 5.14 in 2005 to low of 3.44 in 2009. U.S. had a net revealed competitive disadvantage in furniture with the lowest negative values of RTA and RC during the analysis period. In addition, China, Italy, Malaysia, and Viet Nam's values of the RTA and RC indexes in 2004 are relatively higher than other selected countries. France experienced negative revealed competitive advantages before 2006.The U.S. has a low degree of both comparative and competitive advantage in furniture based on the Balassa's revealed comparative advantage index, and Vollrath's revealed competitive advantage index. Increasing imports of furniture is the biggest long-term challenge for the U.S. furniture industry (Harris 2009) when exports of furniture remains nearly flat (Bullard and West 2002).

TABLE III RELATIVE EXPORT ADVANTAGE (RXA) INDEX FOR FURNITURE IN U.S. AND OTHER MAJOR TRADING COUNTRIES 2000-2009

| Year | U.S. | China | Germany | France | Italy | United Kingdom | Poland | Canada | Mexico | Japan | Malaysia | Viet Nam |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 0.37 | 2.00 | 0.88 | 1.73 | 4.19 | 0.55 | 8.01 | 2.04 | 2.15 | 0.09 | 1.71 | 1.67 |
| 2001 | 0.36 | 2.05 | 0.90 | 1.89 | 4.09 | 0.52 | 7.97 | 1.93 | 2.22 | 0.10 | 1.63 | 1.87 |
| 2002 | 0.31 | 2.15 | 0.84 | 1.81 | 3.86 | 0.46 | 7.76 | 1.93 | 2.16 | 0.10 | 1.57 | 2.57 |
| 2003 | 0.28 | 2.18 | 0.80 | 1.78 | 3.66 | 0.45 | 8.04 | 1.83 | 2.30 | 0.11 | 1.53 | 3.22 |
| 2004 | 0.28 | 2.37 | 0.79 | 1.86 | 3.53 | 0.50 | 7.53 | 1.78 | 2.34 | 0.12 | 1.53 | 3.94 |
| 2005 | 0.28 | 2.61 | 0.88 | 2.13 | 3.36 | 0.49 | 7.32 | 1.71 | 2.35 | 0.14 | 1.54 | 4.80 |
| 2006 | 0.29 | 2.75 | 0.92 | 2.31 | 3.34 | 0.48 | 6.91 | 1.67 | 2.15 | 0.14 | 1.57 | 5.20 |
| 2007 | 0.30 | 2.82 | 0.91 | 2.40 | 3.20 | 0.58 | 6.63 | 1.39 | 1.86 | 0.14 | 1.53 | 5.59 |
| 2008 | 0.31 | 3.14 | 1.00 | 2.64 | 3.30 | 0.55 | 6.57 | 1.17 | 1.68 | 0.18 | 1.60 | 5.25 |
| 2009 | 0.30 | 3.47 | 1.02 | 2.66 | 3.08 | 0.47 | 6.30 | 1.01 | 1.54 | 0.18 | 1.58 | 4.94 |

Source: Calculations based on the United Nations Commodity Trade Statistics Database

TABLE IV REVEALED IMPORT ADVANTAGE (RMA) INDEX FOR FURNITURE IN U.S. AND OTHER MAJOR TRADING COUNTRIES 2000-2009

| Year | U.S. | China | Germany | France | Italy | United Kingdom | Poland | Canada | Mexico | Japan | Malaysia | Viet Nam |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 3.63 | 0.07 | 1.33 | 2.29 | 0.42 | 1.07 | 0.79 | 1.37 | 0.61 | 1.01 | 0.13 | 0.03 |
| 2001 | 3.62 | 0.09 | 1.40 | 2.41 | 0.40 | 1.09 | 0.80 | 1.33 | 0.69 | 1.08 | 0.14 | 0.04 |
| 2002 | 4.34 | 0.09 | 1.35 | 2.27 | 0.39 | 1.23 | 0.72 | 1.29 | 0.61 | 1.05 | 0.20 | 0.05 |
| 2003 | 4.71 | 0.11 | 1.31 | 2.28 | 0.40 | 1.38 | 0.85 | 1.29 | 0.60 | 1.01 | 0.21 | 0.07 |
| 2004 | 4.95 | 0.11 | 1.22 | 2.11 | 0.45 | 1.54 | 0.80 | 1.46 | 0.57 | 0.97 | 0.25 | 0.07 |
| 2005 | 5.14 | 0.09 | 1.30 | 2.21 | 0.48 | 1.44 | 0.84 | 1.48 | 0.56 | 0.94 | 0.29 | 0.12 |
| 2006 | 4.93 | 0.09 | 1.21 | 2.20 | 0.52 | 1.37 | 0.81 | 1.61 | 0.62 | 0.90 | 0.29 | 0.14 |
| 2007 | 4.30 | 0.11 | 1.10 | 1.99 | 0.58 | 1.63 | 0.84 | 1.65 | 0.68 | 0.87 | 0.29 | 0.14 |
| 2008 | 3.83 | 0.11 | 1.20 | 2.17 | 0.60 | 1.72 | 0.96 | 1.75 | 0.69 | 0.83 | 0.34 | 0.15 |
| 2009 | 3.44 | 0.12 | 1.39 | 2.52 | 0.63 | 1.59 | 0.95 | 1.70 | 0.57 | 0.98 | 0.29 | 0.16 |

Source: Calculations based on the United Nations Commodity Trade Statistics Database

TABLE V RELATIVE TRADE ADVANTAGE (RTA) INDEX FOR FURNITURE IN U.S. AND OTHER MAJOR TRADING COUNTRIES 2000-2009

| Year | U.S. | China | Germany | France | Italy | United Kingdom | Poland | Canada | Mexico | Japan | Malaysia | Viet Nam |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | -3.25 | 1.92 | -0.45 | -0.56 | 3.77 | -0.52 | 7.23 | 0.67 | 1.54 | -0.92 | 1.58 | 1.64 |
| 2001 | -3.26 | 1.96 | -0.49 | -0.52 | 3.69 | -0.57 | 7.17 | 0.60 | 1.52 | -0.98 | 1.49 | 1.83 |
| 2002 | -4.04 | 2.06 | -0.51 | -0.46 | 3.47 | -0.77 | 7.03 | 0.63 | 1.55 | -0.94 | 1.37 | 2.53 |
| 2003 | -4.43 | 2.07 | -0.51 | -0.49 | 3.26 | -0.93 | 7.20 | 0.55 | 1.71 | -0.90 | 1.32 | 3.15 |
| 2004 | -4.67 | 2.26 | -0.43 | -0.24 | 3.08 | -1.03 | 6.73 | 0.31 | 1.77 | -0.85 | 1.28 | 3.87 |
| 2005 | -4.87 | 2.52 | -0.41 | -0.08 | 2.88 | -0.95 | 6.47 | 0.23 | 1.79 | -0.80 | 1.25 | 4.68 |
| 2006 | -4.64 | 2.66 | -0.29 | 0.11 | 2.82 | -0.89 | 6.11 | 0.06 | 1.53 | -0.76 | 1.28 | 5.06 |
| 2007 | -4.00 | 2.71 | -0.20 | 0.41 | 2.62 | -1.06 | 5.78 | -0.26 | 1.18 | -0.72 | 1.25 | 5.45 |
| 2008 | -3.52 | 3.03 | -0.21 | 0.47 | 2.70 | -1.16 | 5.62 | -0.58 | 0.99 | -0.65 | 1.26 | 5.10 |
| 2009 | -3.14 | 3.34 | -0.37 | 0.14 | 2.45 | -1.12 | 5.35 | -0.69 | 0.97 | -0.81 | 1.30 | 4.78 |

Source: Calculations based on the United Nations Commodity Trade Statistics Database

TABLE VI REVEALED COMPETITIVENESS (RC) INDEX FOR FURNITURE IN U.S. AND OTHER MAJOR TRADING COUNTRIES 2000-2009

| Year | U.S. | China | Germany | France | Italy | United Kingdom | Poland | Canada | Mexico | Japan | Malaysia | Viet Nam |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | -2.27 | 3.28 | -0.41 | -0.28 | 2.31 | -0.67 | 2.32 | 0.40 | 1.26 | -2.39 | 2.57 | 3.98 |
| 2001 | -2.32 | 3.10 | -0.44 | -0.24 | 2.32 | -0.75 | 2.30 | 0.37 | 1.16 | -2.38 | 2.43 | 3.90 |
| 2002 | -2.65 | 3.19 | -0.47 | -0.23 | 2.29 | -0.99 | 2.37 | 0.40 | 1.26 | -2.31 | 2.05 | 4.04 |
| 2003 | -2.83 | 2.98 | -0.50 | -0.24 | 2.21 | -1.13 | 2.25 | 0.35 | 1.35 | -2.23 | 1.97 | 3.82 |
| 2004 | -2.88 | 3.10 | -0.44 | -0.12 | 2.06 | -1.11 | 2.24 | 0.19 | 1.41 | -2.08 | 1.80 | 4.04 |
| 2005 | -2.92 | 3.41 | -0.38 | -0.04 | 1.94 | -1.08 | 2.16 | 0.15 | 1.43 | -1.92 | 1.66 | 3.70 |
| 2006 | -2.83 | 3.39 | -0.27 | 0.05 | 1.87 | -1.04 | 2.15 | 0.04 | 1.25 | -1.86 | 1.69 | 3.63 |
| 2007 | -2.67 | 3.29 | -0.20 | 0.19 | 1.71 | -1.04 | 2.06 | -0.17 | 1.01 | -1.79 | 1.68 | 3.67 |
| 2008 | -2.51 | 3.35 | -0.19 | 0.19 | 1.71 | -1.13 | 1.93 | -0.40 | 0.89 | -1.52 | 1.56 | 3.53 |
| 2009 | -2.44 | 3.32 | -0.31 | 0.05 | 1.59 | -1.22 | 1.89 | -0.52 | 0.99 | -1.70 | 1.71 | 3.44 |

Source: Calculations based on the United Nations Commodity Trade Statistics Database

### *D. Extent of Intra-Industry Trade*

In this section, the standard Grubel-Lloyd index is used to measure the extent of U.S. and other selected countries' intra-industry trade in furniture with the rest of the world and U.S. bilateral intra-industry trade in furniture with its major trading countries. In period of 2000-2009, the index for U.S., as a net-importer of furniture, was 0.4 or less, indicating low levels of intra-industry trade. Germany and France had a comparative disadvantage in the furniture trade, so high levels of intra-industry trade in furniture occurred. It is mainly due to the fact that more than half of their furniture trade flows are within Europe (CSIL 2008), and intra-industry trade tends to be prevalent between Western European countries that are similar in their capital–labor ratios, skill levels, etc. (Krugman and Obstfeld 2003). Viet Nam has experienced comparative advantage in the furniture trade and the degree of intra-industry trade in its furniture was lower. China showed an overall stable trend and very low levels of intra-industry trade. Malaysia, Poland, and Italy also did not have high levels of intra-industry trade since their furniture exports were greater than their imports, resulting in lower levels of intra-industry trade among these countries. On the

other hand, Mexico and the U.K. experienced overall medium levels of intra-industry trade in furniture during the analysis period.

Table 8 indicates the levels and historical trend of U.S. bilateral intra-industry trade in furniture with its eleven major furniture-trading countries. An examination of the G-L values over the analysis period shows that Canada, Japan, and the U.K. are the most significant trading partners of U.S.'s intra-industry trade in furniture. However, China, Poland, Malaysia, Italy, and Viet Nam have the lowest values of GL because of their high levels of inter-industry trade with U.S. in furniture. The levels of U.S. furniture bilateral intra-industry trade with France, Germany, and Mexico have become lower throughout the analysis period.

Most major furniture-producing countries have relatively low levels of intra-industry trade. The global furniture industry is more likely to be characterized by inter-industry trade than intra-industry trade. This reflects the significance of comparative advantage and factor endowments.

TABLE VII INTRA-INDUSTRY TRADE IN FURNITURE (%), U.S., AND U.S.'S MAJOR FURNITURE-TRADING PARTNERS WITH THE REST OF THE WORLD 2000-2009

| Year | U.S. | Canada | China | France | Germany | Italy | Japan | Malaysia | Mexico | Poland | United Kingdom | Viet Nam |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 40.32 | 75.42 | 0.00 | 85.94 | 85.94 | 20.86 | 22.29 | 12.39 | 49.09 | 28.89 | 60.79 | 4.04 |
| 2001 | 37.89 | 76.80 | 8.95 | 86.99 | 86.99 | 20.81 | 20.08 | 14.46 | 53.22 | 27.79 | 55.24 | 4.52 |
| 2002 | 31.39 | 78.08 | 8.41 | 87.65 | 87.65 | 21.58 | 22.24 | 20.92 | 49.62 | 25.67 | 44.91 | 4.40 |
| 2003 | 27.50 | 80.64 | 11.01 | 85.69 | 85.69 | 23.77 | 23.60 | 21.48 | 46.20 | 27.51 | 40.18 | 5.88 |
| 2004 | 27.13 | 86.55 | 10.05 | 89.54 | 89.54 | 26.87 | 27.12 | 25.91 | 44.37 | 26.15 | 39.47 | 4.61 |
| 2005 | 26.48 | 90.00 | 7.16 | 90.48 | 90.48 | 30.57 | 28.47 | 28.83 | 43.67 | 27.06 | 39.58 | 6.19 |
| 2006 | 27.27 | 96.53 | 7.04 | 94.11 | 94.11 | 32.92 | 29.35 | 28.33 | 49.39 | 27.37 | 40.35 | 6.59 |
| 2007 | 28.50 | 94.35 | 7.47 | 99.98 | 99.98 | 35.61 | 32.04 | 28.51 | 58.39 | 29.88 | 40.00 | 7.13 |
| 2008 | 31.24 | 85.78 | 7.03 | 99.24 | 99.24 | 34.80 | 37.52 | 29.14 | 62.19 | 33.19 | 38.96 | 7.78 |
| 2009 | 30.47 | 75.06 | 7.84 | 95.53 | 95.53 | 37.09 | 33.56 | 25.31 | 55.84 | 30.79 | 37.06 | 8.03 |

Source: Calculations based on the United Nations Commodity Trade Statistics Database

TABLE VIII BILATERAL INTRA-INDUSTRY TRADE IN FURNITURE (%) BETWEEN U.S. AND ITS MAJOR FURNITURE-TRADING PARTNER COUNTRIES 2000-2009

| Year | Canada | China | France | Germany | Italy | Japan | Malaysia | Mexico | Poland | United Kingdom | Viet Nam |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 68.68 | 2.10 | 48.57 | 49.44 | 3.50 | 80.44 | 3.08 | 47.76 | 2.66 | 92.53 | 5.86 |
| 2001 | 67.34 | 1.73 | 49.11 | 51.56 | 3.47 | 66.67 | 3.08 | 46.05 | 5.69 | 78.48 | 7.72 |
| 2002 | 64.27 | 1.41 | 35.62 | 38.24 | 4.44 | 50.89 | 1.82 | 36.76 | 3.26 | 79.15 | 1.37 |
| 2003 | 63.89 | 1.14 | 27.26 | 31.82 | 4.37 | 59.49 | 0.95 | 31.64 | 2.84 | 74.87 | 6.86 |
| 2004 | 68.73 | 0.94 | 30.48 | 26.55 | 5.04 | 77.93 | 1.59 | 30.60 | 2.89 | 68.62 | 1.91 |
| 2005 | 71.44 | 1.02 | 38.14 | 32.48 | 5.00 | 85.92 | 5.58 | 29.77 | 3.92 | 75.67 | 0.64 |
| 2006 | 75.35 | 1.12 | 47.84 | 38.31 | 5.78 | 87.01 | 1.85 | 30.77 | 14.23 | 83.80 | 0.26 |
| 2007 | 85.70 | 1.40 | 52.69 | 32.08 | 5.34 | 97.94 | 1.24 | 27.77 | 7.82 | 70.81 | 1.07 |
| 2008 | 94.19 | 1.52 | 68.81 | 41.85 | 6.55 | 68.82 | 1.57 | 33.36 | 5.26 | 75.05 | 0.37 |
| 2009 | 94.61 | 1.16 | 28.99 | 27.92 | 6.66 | 89.66 | 3.02 | 35.34 | 3.28 | 61.83 | 0.47 |

Source: Calculations based on the United Nations Commodity Trade Statistics Database

## VI. DISCUSSION AND CONCLUSIONS

Our analysis of selected countries showed diverse development paths. Globalization is affecting labor-intensive industries, including furniture industry, and there are more and more products with low prices, so new strategies and advantages are required to face international competitors, such as new business models, improvement of productivity, and increased cooperation in terms of technology, outsourcing and supply chain (Zhu 2004). Lower labor cost is the advantage for developing countries, but there are other factors affecting development of their furniture industry. Viet Nam government has taken various support measures to help develop the furniture industry. For example Forest Service Commission certification of a number of furniture manufacturers provides their products with a competitive advantage (Xie 2009). In addition, most raw materials, such as tropical and temperate hardwood timber are imported, especially increasingly hardwoods from the United States. The imported materials are processed into furniture and then exported back to the United States and other countries (China Wood Industry 2008). The rapid development of Chinese furniture industry is related to the formation of industry clusters with specific industrial supply chain and supporting services based on the Italian model. Developed countries accounted for 75 percent of the value of Chinese furniture exports. Rapid development of real estate and application of advanced equipment also contributes to the development of Chinese furniture industry. Another change for Chinese

furniture industry is that more and more furniture manufacturers are trying to make the transition to mass customization, which creates value-added products and services (Zhu 2004). Japanese consumers do not pay attention to weight and size, but to the good quality of materials and components and to the popular design. Half of the wooden furniture in Japanese market is imported, because there is almost no profit to process imported timber into furniture in Japan (Guan 2006). Due to the slowdown of economic development and demand of housing market, there is limited commercial space in home furnishing market in Canada (Guan 2007). Kitchen furniture is an important part in furniture production of France. Due to the cost of materials and labor, many manufacturers moved their factories to countries in Eastern Europe, like Poland and Romania and then import the components to France to make furniture (Qi 2007). To solve the problem of high labor cost, Germany continues to outsource its furniture manufacturing and increases furniture imports (Qi 2007). Italy is one of the largest furniture producing countries in the world. Most of the manufacturers are small-to-medium enterprises with high degree of industrial agglomeration, providing the Italian furniture industry with competitive advantage in the international market. Today, the life cycle of furniture is short and manufacturers need stay current, so it is important to get the information on market demand timely through industrial clusters in the agglomeration of production and information (Lu 2011).

The U.S. is losing international competitiveness in furniture industry. Although the current situation in the U.S. furniture industry is not optimistic, many opportunities still exist. Continued exploration of new markets, adding value to current products, highly skilled workers, specific applied technologies of manufacturing, and innovation are essential for those opportunities and success in the future (Pirc 2010). The following are recommendations for U.S. furniture industry:

- Exploration of new markets, like entering European market for U.S.'s best-known brands and outstanding designers to gain increase in sales and value of exports;
- Shift away from cost cutting and price reduction to higher quality and good service;
- New business models needed
- Maintain and strengthen clusters of manufacturing for sharing resources and efficient supply chains;
- Mass customization;
- Innovation to improve products' value-added to obtain more profit;
- Advanced equipment for automatic production;
- Economic steps by government to stimulate furniture industry's recovery and trade.

Innovation, technology, and reasonable marketing strategies are very important for furniture industry in U.S. and they should be focused on much more than labor cost cutting and selling price-cutting. The market environment changes rapidly, the firms need to maintain and increase competitiveness in both domestic and global market. Distribution efficiency has become important for furniture industry. Buehlman and Schuler (2009) also noted that in future, furniture manufacturers will outsource more work to specialized entities, allowing themselves to focus on efficient supply chain, efficient distribution operations, customers service and export markets.

REFERENCES

[1] Balassa, B. 1966. Tariff Reductions and Trade in Manufactures among Industrial Countries. American Economic Review 56: 466-473.

[2] Bowen, H. P., A. Hollander, and J. M. Viaene 1998. Applied International Trade Analysis. The University of Michigan Press, Michigan.

[3] Buehlman, U and A. Schuler. 2009. The U.S. household furniture industry: Status and opportunities. Forest Products Journal 59(9):20-28.

[4] Bullard, S.H. and C.D.West. 2002. Furniture manufacturing & Marketing: Eight strategic issues for the 21st century. Forest and Wildlife Research Center. Mississippi State University. Bulletin FP 227:1-24.

[5] China Wood Industry. 2008. Viet Nam Had More Exports to the U.S. China Wood Industry 22(6).

[6] Cooney, S. 2007. U.S. Furniture Manufacturing: Overview and Prospects. CRS Report for Congress.

[7] CSIL. 2008. The World Furniture Outlook 2008. CSIL Centre for Industrial Studies, Milan, Italy.

[8] Grubel, H. G. and P. J. Lloyd 1975. Intra-Industry Trade: The Theory and Measurement of International Trade in Differentiated Products. The Economic Journal 85(339):646.

[9] Guan, N. 2006. Recovery of Japan Furniture Market. International Wood Industry (9).

[10] Guan, N. 2007. Slowdown of Demand from Canada Home Furnishing. International Wood Industry (10).

[11] Harris, J. 2009. Industry Report-Furniture and Related Products NAICS Code 337. Office of Health and Consumer Good U.S. Department of Commerce, Washington, DC. http://www.trade.gov/td/ocg/outlook09_furniture.pdf. Accessed September 23, 2009.

[12] Kayser, P.A.B. 2008. The Brazilian Shoe Industry and the Chinese Competition in International Markets. Thesis of M.A., Latin American Studies, Ohio University, OH.

[13] Krugman, P. R. and M. Obstfeld 2006. International Economics: Theory & Policy. 7 ed. Boston: Pearson – Addison Wesley.

[14] Lu, J. 2011. Learing From the Experience of Agglomeration of Italy Furniture Industry. Enterprise Vitality (2).

[15] Pirc, A. 2010. A Brief Overview of the U.S. Furniture Industry. Louisiana Forest Products Development Center. http://www.lfpdc.lsu.edu/publications/

[16] working_papers/wp89.pdf. Accessed March 25, 2011.

[17] Qi, J. 2007. Germany's Furniture is Shrinking. International Wood Industry (4).

[18] Qi, J. 2007. Strategies of France Furniture Industry for Going into China. International Wood Industry (6).

[19] Quesada H. and R. Gazo 2006. Mass Layoffs and Plant Closures in the U.S. Wood Products and Furniture Manufacturing Industries. Forest Products Journal, 56(10): p. 105 and Fig. 6.

[20] Schuler, A. and S. Lawser 2007. The U.S. Furniture Industry: Yesterday and Today. Wood Digest, 6:1.

[21] Sheehan, P., N. Pappas and E. Cheng 1994. The Rebirth of U.S. Industry, U.S. Trade in Elaborately Transformed Manufactures 1979-1993. Centre for Strategic Economic Studies, Victoria University of Technology, Melbourne.

[22] Verdoorn, P. J. 1960. 'The Intra-Block Trade of Benelux,' in E.A.G. Robinson (ed), Economic Consequences of the Size of Nations. Macmillan, London.

[23] Vollrath T. 1991. A Theoretical Evaluation of Alternative Trade Intensity Measures of Revealed Comparative Advantage. Weltwirtschaftliches Archiv, 127: 265-279.

[24] Xie, M. 2009. Viet Nam Will Have More Exports than Malaysia. China Wood-Based Panels (4).

[25] Zhu, J. 2004. Promoting competitiveness of Chinese Furniture Manufacturing Industry with the Information Engineering. Thesis for Master's Degree, Nanjing Forestry University. http://www.docin.com/p-86197070.html. Accessed March 25, 2011.


**Rado Gazo** is a Professor of Wood Processing and Industrial Engineering at Purdue University. Wood Research Laboratory at Purdue University is more than 100 years old and is well known for its research, teaching and extension programs in secondary wood products and process engineering. At Purdue, Rado teaches several classes including Properties of Wood, Secondary Wood Products Manufacturing and Furniture Design for CNC. When not in a classroom, he conducts research and technology transfer in value-added wood products manufacturing and industrial engineering areas. He often works as a consultant to furniture companies.His research interests include competitiveness of furniture manufacturers, application of industrial engineering techniques to forest products manufacturing and CT scanning of wood. Rado has worked with over 100 companies, authored or co-authored 63 successful proposals for grants and contracts, totaling $3.5 million. He has published 30 refereed research journal articles, 6 book chapters, 45 refereed proceeding articles and 175 other publications. He has given 33 invited and over 100 professional presentations on the subject of secondary wood products manufacturing.

**Mingyao Song** is a master student of Wood Processing and Industrial Engineering at Purdue University, where he learned a lot both in academic and practical from his advisor professor Rado Gazo. His main research interests include wood products business and engineering techniques to forest products manufacturing. He has published three research journal articles and has given two professional presentations.