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Analysis of Import Demand for Wooden Beds in the U.S.

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The market of wooden beds in the U.S. has been flooded with imports from China and Vietnam in recent years. Static and dynamic Almost Ideal Demand System models are used to assess the import demand for wooden beds from the top seven supplying countries. The analyses reveal that the antidumping investigation on China has some temporary trade depression effect on China, but trade diversion occurs to Vietnam, Indonesia, Canada, and Brazil. The formal implementation of antidumping duties since 2005 has not shown any significant effect on the trade pattern. U.S. consumers spend more on beds from newly industrialized countries and there are moderate degrees of substitution among wooden beds from most countries.

Key Words: antidumping, cointegration, demand elasticity, furniture, trade diversion

JEL Classifications: C32, D12, F14, Q23

The consumption of furniture in the U.S. has been growing steadily. Annual furniture retail sales have been over $100 billion since 2003. However, the ratio between imports and domestic shipments of furniture has increased from 17% in 1997 to 40% in 2005 (Drayse, 2008; Gazo and Quesada, 2005). Traditionally, the U.S. imported furniture from Canada, Italy, and Taiwan. In recent years, furniture from countries such as China, Vietnam, and Malaysia has substituted for that from traditional suppliers and has begun to dominate the import market. According to the International Trade Commission (ITC), the import value of wooden bedroom furniture climbed from $0.6 billion in 1996 to $5.1 billion in 2008 (U.S. ITC, 2009). In particular, with regard to wooden beds, China has become the largest supplier in the import market and accounted for a 44% share of the total imports over 2001–2008. These imports have become a serious threat to the domestic furniture manufacturing industry and aroused wide concerns. To protect the domestic industry, an antidumping investigation on Chinese firms was conducted from October 2003 to December 2004 (U.S. ITC, 2004). Various antidumping duties have been imposed on individual Chinese firms since January 2005.

The rising imports from China and competitiveness of the U.S. furniture industry have been the subject of several studies. Based on a survey in 2001, Robb and Xie (2003) investigated the manufacturing strategy of 72 Chinese furniture companies. Cao et al. (2004) examined the rapid growth of the Chinese furniture industry with regard to timber imports, production, and furniture exports. Gazo and Quesada (2005) reviewed and compared the

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comparative advantages of 25 furniture exporting countries in the U.S. market. Buehlmann et al. (2006) surveyed the attitudes of retailers in the U.S. toward the U.S., Canada, and China as manufacturing sources for furniture. To enhance the competitiveness of domestic furniture firms under the growing pressure from imports, Schuler, Taylor, and Araman (2001) propose a number of strategies, including using mergers and acquisitions to improve efficiency, importing components and finishing them to high U.S. market standards, and providing what offshore suppliers cannot do well in U.S. markets. Overall, existing studies have mainly examined trade patterns across supplying countries through qualitative analyses. No studies have examined the impact of the antidumping investigation on wooden bedroom furniture from China in 2003 and its implications to the U.S. furniture industry. Thus, there is a critical need to comprehend the trade pattern, consumer behavior, and market competition for furniture imports.

The overall objective of this study is to assess the growing import demand for wooden beds in the U.S. from 2001 to 2008 and evaluate its impact on the domestic industry. The methodology used is static and dynamic Almost Ideal Demand System (AIDS) models with techniques from time series econometrics (Deaton and Muellbauer, 1980; Enders, 2004). The two-step approach by Engle and Granger (1987) is adopted in evaluating the cointegration and long-run equilibrium for each supplying country. The focal product is wooden beds, one of the major products in wooden bedroom furniture (U.S. ITC, 2004). The data used are monthly import prices and quantities of wooden beds for seven countries from January 2001 to December 2008.

To accomplish the overall objective, several specific objectives are pursued in this study. First, consumer behavior is examined within the changing market setting for wooden beds. Imported wooden beds from seven traditional and newly industrialized countries are considered together as the choices for U.S. consumers. The AIDS model is used given it has been widely used in evaluating market competition and import demand (Henneberry and Hwang, 2007; Yang and Koo, 1994). Furthermore, because the preferences of consumers may change over time, the long-run behavior is examined in the static AIDS model and the short-run market adjustments are assessed through the dynamic AIDS model. Expenditure and Marshallian own-price elasticities are used to evaluate consumer choices among the imported beds from different supplying countries. Thus, one major contribution of this study is that short-run and long-run U.S. consumer behavior is differentiated through the static and dynamic AIDS models with related time-series econometrics.

Second, the effectiveness of the antidumping action in 2003 and duties imposed on China is evaluated. Theoretically, when an antidumping duty is applied on a commodity imported from a country, a decline in the import quantity is expected (Dale, 1980). However, the duty effect may not be fully attainable when market participants interact strategically. One trade phenomenon is called investigation effect (Staiger and Wolak, 1994). The development of an antidumping case can substantially change trade patterns during the long process. Therefore, in analyzing the trade impact of an antidumping action, trade investigation effect and final duty effect should be evaluated together (Lloyd, Morrissey, and Reed, 1998). In this study, the whole antidumping investigation took 15 months and experienced several distinct stages. Preliminary analysis reveals that a single dummy variable is too simple to represent it. Thus, several key dates are identified and three dummy variables are added to the AIDS model to evaluate the impact of this trade intervention. This analysis will provide empirical evidence of the effectiveness of U.S. trade policy for wooden bedroom furniture and should be helpful to the domestic furniture industry and governmental agencies.

Finally, competition among the major supplying countries in the import market of wooden beds is analyzed. This is achieved through analyzing the cross-price elasticities among these suppliers (Deaton and Muellbauer, 1980). From these elasticities, the degrees of substitute or complement relationship between the major suppliers can be disclosed (Feleke and Kilmer,

2007). The estimation of various elasticities is valuable to both marketers confronting global competition and policymakers facing the need to protect the domestic industry.

The rest of this article is organized as follows. An overview of the import market of wooden beds is presented first. Then the static and dynamic AIDS models applied to this import market are detailed. This is followed by a description of data sources, time period selections, and variable construction. Finally, empirical results are reported and conclusions and policy implications are offered.

Market Overview and the Antidumping Investigation against China

The U.S. has experienced rapid growth in imports of wooden bedroom furniture in recent years. In particular, wooden beds are one of the major products in wooden bedroom furniture, as defined by U.S. ITC (2004). In 2001, U.S. imports of wooden beds were $0.5 billion. It rapidly climbed to $0.7 billion in 2002, $0.9 billion in 2003, and then over $1.2 billion since 2005. This rapid import growth has aroused wide concerns in the U.S.

Historically, the major suppliers of wooden beds in the U.S. import market are Canada, Indonesia, Italy, and Taiwan. For example, the import value from Canada was $35.0 million in 1996, accounting for 24.8% of the import share. In contrast, its corresponding value in 2008 was $22.9 million, only 1.9% in this market. Italy has been one of the main furniture exporters to the U.S. Imports from Italy steadily grew from $17.7 million in 1996 to $51.1 million in 2003 with an annual growth rate of 27%. After reaching the peak value, its imports began to decline and the value was $14.0 million only in 2008. Overall, both Canada and Italy have dramatically lost market share in the wooden beds market in the U.S. over recent years.

In contrast, newly industrialized Asian countries, especially China and Vietnam, have gradually gained more market shares from these traditional suppliers such as Canada. In particular, the growth of the modern Chinese furniture industry has greatly benefited from inexpensive labor and abundant capital in coastal cities, supportive government policies, and dynamic local and external networks established by Chinese firms (Drayse, 2008). China has been steadily increasing its exports to the U.S. and since 2001, it has become the leading supplier. The import value from China was only $5.6 million in 1996 but climbed to $197.4 million in 2001, $477.3 million in 2003, and $418.1 million with a 35.4% market share in 2008. In addition, Vietnam has also become an important supplier in the U.S. import market. Vietnam began to export its wooden beds to U.S. with a value of $0.5 million only in 2001 but reached $357.8 million in 2008. Imports from Vietnam have increased so fast that they account for more than 30% of the market share in 2008. Meanwhile, imports from Indonesia grew from $57.1 million in 2001 to $83.2 million in 2008, and imports from Malaysia grew from $15.9 million in 2001 to $97.6 million in 2008. As a result, imports from China, Vietnam, Indonesia, and Malaysia together comprised of more than 70% of the import market share over 2001–2008.

This trade pattern, especially the large amount of imports from China, has resulted in strong reaction from domestic manufacturers in several major furniture production states in the U.S., including North Carolina, Mississippi, and Virginia (Drayse, 2008). In October 2003, the American Furniture Manufacturers Committee for Legal Trade and its individual members filed a petition with the ITC and the Department of Commerce. The petitioners alleged that wooden bedroom furniture from China has been dumped in the U.S. at less than fair value. The investigation of the antidumping allegation against wooden bedroom furniture from China followed typical investigation stages. Major events during the process were the petition in October 2003, the affirmative decision for the preliminary less-than-fair-value (LTFV) determination in July 2004, and the formal implementation in January 2005.

Several conclusions were reached through the investigation by the U.S. ITC (2004). The volume of subject imports was large both in absolute terms and relative to the consumption in the U.S. during the period of investigation

(2001−2003). There was also a moderate to high degree of substitutability between domestic and imported wooden bedroom furniture, and therefore, price has been a critical factor for consumers to determine their purchases. In addition, the subject imports had a great adverse impact on the domestic industry. From 2001 to 2003, the capacity of the U.S. furniture industry fell by 2.9% and its quantity of shipments declined by 9.8%. Therefore, the Department of Commerce and ITC concluded that the U.S. furniture industry was materially injured by wooden bedroom furniture imports from China.

Based on the damage to the U.S. furniture industry, final antidumping duties ranging from 0.83% to 198.08% have been imposed on individual Chinese firms since January 2005 (U.S. ITC, 2004). As shown in Figure 1, China's import share dropped temporarily after the preliminary LTFV determination in July 2004. In contrast, imports from Vietnam, Indonesia, Malaysia, and Brazil increased dramatically during the same period. This market dynamics brings up interesting questions with regard to the competition among these countries and trade diversion effects related to the antidumping policy. Overall, the development of the

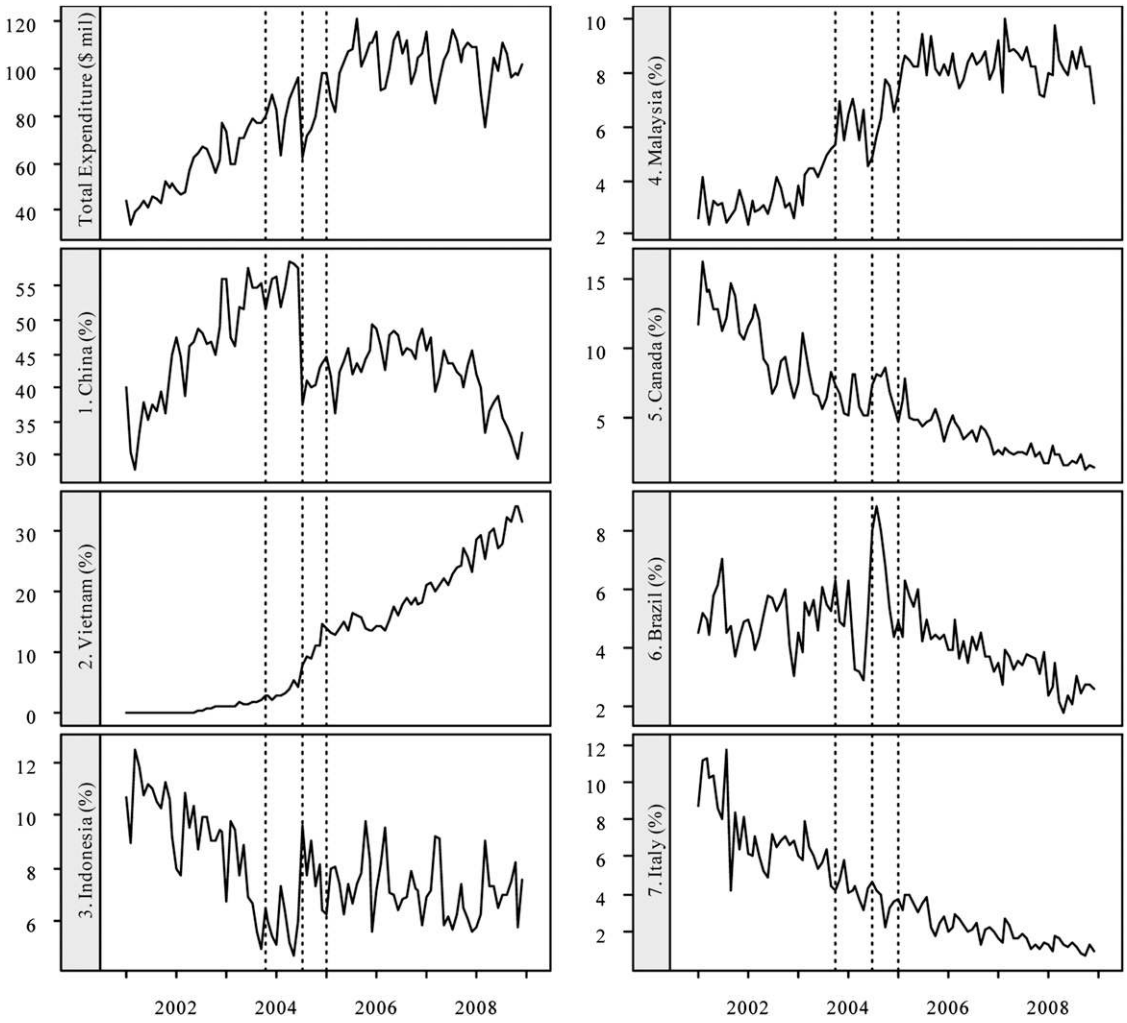

Figure 1. Monthly Total Expenditure (m_t) of Wooden Beds by the U.S. and Import Share (w_{it}) by Country from January 2001 to December 2008 (Note: the vertical lines indicate the key dates of antidumping investigation, i.e., October 2003, July 2004, and January 2005)

import market of wooden bedroom furniture presents us with an ideal empirical setting for using a demand system like the AIDS model to that purpose.

Methodology

The AIDS model, originally introduced by Deaton and Muellbauer (1980), has been widely adopted in estimating demand elasticities and evaluating import competition in the literature (Feleke and Kilmer, 2007; Henneberry and Hwang, 2007; Yang and Koo, 1994). The popularity of the AIDS model is the result of its several advantages. First of all, it is consistent with consumer theory so theoretical properties of homogeneity and symmetry can be tested and imposed through linear restrictions on the parameters. The AIDS model as a demand system also overcomes the limitations of a single equation approach and examines how consumers make decisions among bundles of goods to maximize their use under budget constraints. In addition, with the development of time-series econometrics, dynamic AIDS model (Eakins and Gallagher, 2003) have been developed in recent years to consider the properties of individual time-series through the error correction technique pioneered by Engle and Granger (1987). In this study, both static and dynamic AIDS models are used to examine the import market of wooden beds in the U.S.

Static Almost Ideal Demand System Model

Consider a conventional static AIDS model for imported wooden beds augmented by a set of policy dummy variables as follows:

$$(1)\qquad w_{it} = \alpha_i + \beta_i^s \ln(m_t/P_t^*) + \sum_{j=1}^{N} \gamma_{ij}^s \ln p_{jt} + \sum_{k=1}^{K} \varphi_{ik}^s D_{kt} + u_{it}$$

where w is the import share of beds; m is the total expenditure on all imports in the system; P^* is the aggregate price index; m/P^* is referred to as the real total expenditure; p is the price of beds; D is the antidumping dummy variables; α, β, γ, and φ are parameters to be estimated; and u is the disturbance term. The superscript s in the parameters denotes static (long-run) AIDS model. For the subscripts, i indices country names in the import share and also the equation in the demand system ($i = 1, 2, \ldots, N$), j indices country names in the price variable ($j = 1, 2, \ldots, N$), t indices time ($t = 1, 2, \ldots, T$), and k indices the dummy variables ($k = 1, 2, \ldots K$). In this study, the maximum values of these indices are n = 8 (seven countries plus the rest of world as a residual supplier), $T = 96$ (monthly data from January 2001 to December 2008), and $K = 3$ (three policy dummy variables as defined subsequently).

Several of these variables are defined and calculated using the import prices and quantities for individual countries. The total expenditure is defined as $m_t = \sum_{i=1}^{N} p_{it}q_{it}$, in which q is the quantity of beds. The import share can be computed as $w_{it} = p_{it}q_{it}/m_t$. The aggregate price index is often approximated by the Stone's Price Index as $\ln P_t^* = \sum_{j=1}^{N} w_{jt} \ln p_{jt}$.

To comply with economic theory, the static AIDS model is required to satisfy the following properties:

$$(2a)\ \text{Adding-up restrictions: } \sum_{i=1}^{N} \alpha_i = 1;\quad \sum_{i=1}^{N} \beta_i^s = 0; \sum_{i=1}^{N} \gamma_{ij}^s = 0; \sum_{i=1}^{N} \varphi_{ik}^s = 0$$

$$(2b)\ \text{Homogeneity: } \sum_{j=1}^{N} \gamma_{ij}^s = 0$$

$$(2c)\ \text{Symmetry: } \gamma_{ij}^s = \gamma_{ji}^s$$

where the adding-up restriction can be satisfied through dropping one equation from the estimation (Feleke and Kilmer, 2007). The homogeneity and symmetry restrictions can be imposed on the parameters to be estimated and assessed by likelihood ratio tests.

Dynamic Almost Ideal Demand System Model

This static AIDS model, also known as long-run AIDS model, implicitly assumes that consumer behavior is always in equilibrium and there is no difference between short-run and long-run behavior (Anderson and Blundell, 1983). In reality, consumers' behavior can be influenced by various factors such as consumption habits (Houthakker and Taylor, 1970; Sexauer,

1977), short-run adjustments, and policy intervention (Feleke and Kilmer, 2007). Thus, the assumptions of the static AIDS model may be too restrictive in some cases. In addition, time-series data used in the static AIDS model may be nonstationary and that may invalidate the asymptotic distribution of the estimators. Finally, the static AIDS model is incapable of evaluating short-run dynamics (Li, Song, and Witt, 2004). To overcome these problems with the static AIDS model, the notion of cointegration has been introduced and the dynamic AIDS model has been developed (Karagiannis, Katranidis, and Velentzas, 2000). Two approaches have been widely used in cointegration analysis. The Engle-Granger two-stage approach (Engle and Granger, 1987) focuses on the time-series property of the residuals from the long-run equilibrium relationship and its major advantage is that implementation is relatively easy (Enders, 2004). In contrast, the Johansen approach (Johansen, 1988; Johansen and Juselius, 1990) concentrates on the relationship between the rank of a matrix and its characteristic roots in a vector autoregression and it can detect multiple cointegrating vectors.

In this study, both cointegration approaches are explored in the preliminary data analysis. With a moderate number of observations ($T = 96$) and a large number of parameters in a vector autoregression system, preliminary analyses reveal that the Johansen approach can only reach convergence for systems with no more than three countries. In the literature, studies using the Johansen approach also usually can handle no more than four commodities (e.g., Kaabia and Gil, 2001). In this study, given the main objective is to evaluate the competition among major suppliers, the two-stage approach by Engle and Granger is adopted to cover more countries and to consider cointegration in the dynamic AIDS model.

Specifically, the Engle-Granger two-stage approach has several steps (Enders, 2004). First, the stationarity of the variables used in the static AIDS model needs to be examined through unit root tests, e.g., the Augmented Dickey-Fuller (ADF) test. If these variables are integrated with the same order, a cointegration test on the residuals calculated from the static AIDS model is conducted to determine if the residuals are stationary. If a residual is stationary, it suggests that a long-run equilibrium and cointegration relationship exists for the variables in that equation. Consequentially, the estimates from the static AIDS model can be interpreted as the long-run equilibrium relation among these variables (Karagiannis, Katranidis, and Velentzas, 2000).

If the cointegration relationship is confirmed, the residuals ($\hat{u}_{it}$), also referred to as the error correction terms, are saved to construct the dynamic AIDS model as follows:

$$(3)\quad \Delta w_{it} = \psi_i \Delta w_{i,t-1} + \lambda_i \hat{u}_{i,t-1} + \beta_i^d \Delta \ln(m_t/P_t^*) + \sum_{j=1}^{N} \gamma_{ij}^d \Delta \ln p_{jt} + \sum_{k=1}^{K} \varphi_{ik}^d D_{kt} + \xi_{it}$$

where Δ is the first-difference operator; $\hat{u}$ is the residual from the static AIDS model and other variables are the same as defined previously; ψ, λ, β, γ, and φ are parameters to be estimated; and ξ is the disturbance term. The superscript d in the parameters indicate dynamic (short-run) AIDS model. The parameter ψ measures the effect of consumption habit. The parameter λ measures the speed of short-run adjustment and is theoretically expected to be negative. The dummy variables are added to consider the potential impacts of the antidumping investigation and policy. Preliminary analyses reveal that intercepts and variables with more lags on the right-hand side, as experimented in Boonsaeng and Wohlgenant (2009), are not significant in this study so they are suppressed. Similar to the static AIDS model, the dynamic system is required to satisfy the properties of adding-up, homogeneity, and symmetry, as expressed in Equation (2) with the corresponding parameters being substituted. The adding-up restriction is satisfied through dropping one equation during the estimation. The homogeneity and symmetry restrictions can be imposed on the parameters and then evaluated by likelihood ratio tests.

The lagged import share on the right-hand side is introduced to consider consumption habit. Consumption habits, including habit persistence and inventory adjustment, may have various impacts because current consumption is

usually related to past consumption. Houthakker and Taylor (1970) first incorporate consumption habit into a dynamic demand model. A positive coefficient for the variable indicates a habit persistence effect so past consumption has a positive impact on current consumption. A negative coefficient indicates an inventory adjustment effect. Usually, it is expected to be positive for nondurable goods and negative for durable goods.

Estimation and Diagnostic Tests

Both the static and dynamic AIDS models can be estimated by the seemingly unrelated regression procedure. In this study, the software R is used to estimate all the models (R Development Core Team, 2009). To avoid the singular variance—covariance matrix of residuals, one of the equations in the system is dropped for estimation. In this study, seven countries and the rest of world as a group are included in the system, whereas the latter is dropped in the estimation process. To test the theoretical properties, linear restrictions of homogeneity and symmetry are imposed on the system. Whether the restrictions are accepted can be examined by likelihood ratio tests.

One concern with AIDS models is whether the expenditure variable is exogenous (Edgerton, 1993). If the expenditure variable is correlated with the error term, the seemingly unrelated regression estimator may become biased and inconsistent. The Durbin-Wu-Hausman test is often used to address this concern (Henneberry, Piwethongngam, and Qiang, 1999). The test starts with an auxiliary regression with the variable of real total expenditure being regressed on a set of instrumental variables. The instrumental variables used in this study are personal consumption expenditures for durable goods in the U.S., the lagged value of the real total expenditure, and the import price variables by country. The regression residual is then included in the static AIDS model as an additional explanatory variable in each equation. At the end, a likelihood ratio test can be constructed to address the null hypothesis of expenditure exogeneity, i.e., whether the parameter estimates for the residual variables in the AIDS models are jointly equal to zero. If the null hypothesis is rejected, the endogeneity of the expenditure variable can be corrected by replacing the real total expenditure variable by its predicted value from the auxiliary regression (Henneberry and Mutondo, 2009).

The adequacy of the model specification in the static and dynamic models can be examined through several diagnostic tests (Shukur, 2002). The Breusch-Godfrey (BG) test can be used to evaluate the hypothesis of no serial correlation in the variables (Edgerton and Shukur, 1999). The Breusch-Pagan (BP) test is used to detect the presence of heteroscedasticity (Holgersson and Shukur, 2004). The Ramsey's Regression Specification Error Test (RESET) is adopted to test the functional misspecification (Shukur and Edgerton, 2002). The assumption of normally distributed error term is assessed using the Jarque-Bera (JB) LM test (Holgersson and Shukur, 2001).

Demand Elasticities

Several elasticities can be computed to evaluate the response of consumer preferences and import quantities to changes in expenditure and prices. In this study, expenditure elasticity, Marshallian price elasticities, and Hicksian price elasticities are calculated using the estimated parameters from the AIDS models and the average import shares over the study period. From the static AIDS model, the long-run elasticities can be calculated as:

$$\eta_i^s = 1 + (\beta_i^s / \bar{w}_i) \tag{4a}$$

$$\varepsilon_{ij}^s = -\delta_{ij} + (\gamma_{ij}^s / \bar{w}_i) - (\beta_i^s \bar{w}_j / \bar{w}_i) \tag{4b}$$

$$\rho_{ij}^s = -\delta_{ij} + (\gamma_{ij}^s / \bar{w}_i) + \bar{w}_j \tag{4c}$$

where η, ε, and ρ are the expenditure elasticity, Marshallian price elasticity, and Hicksian price elasticity, respectively; β_i^s and γ_{ij}^s are parameter estimates from the static AIDS model; the Kronecker delta δ_{ij} is equal to 1 if $i = j$ (i.e., own-price elasticity) and 0 if $i \neq j$ (i.e., cross-price elasticity); and $\bar{w}$ is the average import share over 2001–2008. These elasticities are linked through the Slutsky equation: $\rho_{ij}^s = \varepsilon_{ij}^s + \eta_i^s \bar{w}_j$. For the dynamic AIDS

model, short-run elasticities can be similarly calculated through this formula with the corresponding parameters (i.e., β_i^d, γ_{ij}^d) being substituted. The standard errors for elasticities can be computed through the delta method (Greene, 2003).

Data Sources and Variables

Based on the Harmonized Tariff Schedule (HTS), the wooden bedroom furniture involves four statistical categories: wooden beds, parts, framed glass mirrors, and others (U.S. ITC, 2004). The commodity considered in this study is wooden beds with the code of HTS 9403.50.9040. This is because wooden beds are the major product within wooden bedroom furniture and both import value and quantity data are available from the ITC. The period of January 2001 to December 2008 is selected for several reasons. From 2001 to 2003, imports had increased so rapidly that the antidumping investigation treated it as "period of investigation." In addition, the import market for wooden beds in the U.S. has undergone a dramatic change during the past decade. China has become the leading supplier of wooden bedroom furniture since 2001 and Vietnam has started its export to the U.S. from January 2001 on.

Major suppliers are selected according to the statistical data from U.S. ITC (2009). The aggregate import value of the top seven suppliers represented 85% of the total import during the period of 2001–2008. These countries are 1 – China (44.2%); 2 – Vietnam (11.7%); 3 – Indonesia (7.8%); 4 – Malaysia (6.3%); 5 – Canada (6.3%); 6 – Brazil (4.4%); and 7 – Italy (4.2%). All the other countries are aggregated into a group called the rest of the world (15.0%).

The monthly cost–insurance–freight values in dollar and quantities in piece by country are collected from the U.S. ITC (2009). They are used to construct the variables of import shares, import prices, total expenditure, and aggregate price index for the AIDS model. The descriptive statistics of these variables are reported in Table 1. In aggregate, the monthly average imports by the U.S. are $83.915 million over the study period. The wooden beds from Italy are most expensive with a monthly import price of $244.321 per piece. The cheapest wooden beds are from Brazil with a price of $87.569 per piece. The prices for other countries range from $100 to $150 per piece. This price variation is consistent with the quality of furniture from these countries and their marketing targets (Gazo and Quesada, 2005).

Table 1. Descriptive Statistics for Wooden Beds from January 2001 to December 2008

Variable	Mean	Standard Deviation	Minimum	Maximum
w_{1t}	44.226	6.984	27.995	58.527
w_{2t}	11.731	10.728	0.087	34.251
w_{3t}	7.817	1.772	4.661	12.525
w_{4t}	6.309	2.358	2.340	10.012
w_{5t}	6.306	3.720	1.394	16.185
w_{6t}	4.435	1.319	1.813	8.807
w_{7t}	4.136	2.700	0.716	11.764
w_{8t}	15.040	4.106	9.249	26.271
p_{1t}	150.179	10.351	116.067	177.675
p_{2t}	117.344	11.580	90.712	150.721
p_{3t}	135.295	21.591	91.127	189.369
p_{4t}	104.600	11.536	78.988	142.184
p_{5t}	123.673	12.682	94.238	187.215
p_{6t}	87.569	11.683	38.021	120.905
p_{7t}	244.321	110.453	137.408	652.052
p_{8t}	112.263	13.618	84.258	145.088
m_t	83.915	23.362	33.728	121.153

Note: Variable units are percentage for import shares (w_{it}), $/piece for import prices (p_{jt}), and $ million for total expenditure (m_t). The subscripts of country i and j denote 1 – China; 2 – Vietnam; 3 – Indonesia; 4 – Malaysia; 5 – Canada; 6 – Brazil; 7 – Italy; and 8 – the rest of world.

The impacts of the antidumping action in this market are considered in the AIDS model by augmenting the model with several dummy variables. In this study, the antidumping investigation lasted from October 2003 to January 2005 and experienced several distinct stages (U.S. ITC, 2004). The major events were the announcement of petition in October 2003, the affirmative preliminary LTFV determination in July 2004, and the final implementation in January 2005. To consider both the investigation effect and duty effect, three corresponding dummy variables are added to the AIDS model to represent these events. For instance, the dummy variable for the petition announcement is equal to one for October 2003

and zero for other months. The other two dummy variables are similarly defined. At last, data for the instrumental variable of personal consumption expenditures for durable goods in the U.S. are collected from the Federal Reserve Bank of St. Louis (2010).

Empirical Results

Model Fit and Diagnostic Tests

Both the static and dynamic models are estimated using the seemingly unrelated regression procedure. Before estimating the dynamic models, the properties of the time-series variables are examined. The ADF unit root tests reveal that the null hypotheses of unit root cannot be rejected for all the variables of import shares, prices, and real total expenditure in the level form but are rejected for these variables in the first difference. In addition, the long-run equilibrium relationship among the variables is examined by applying the Engle-Granger cointegration tests on the residuals from the static AIDS model. The results indicate that the residual variables are cointegrated and there exists a long-run relationship for each country. Thus, the dynamic AIDS model can be further established to examine the short-run dynamics. (The results of unit root and cointegration tests are omitted as a result of space constraints.)

The theoretical properties of homogeneity and symmetry are examined for both the static and dynamic AIDS models by imposing linear restrictions on the system. The likelihood ratio tests are used to examine three hypotheses: homogeneity, symmetry, and the two combined. As a result, the dynamic model has smaller chi-square statistics and bigger p values so it shows significant improvement over the static AIDS model in meeting these theoretical properties. However, all three null hypotheses are rejected for both the static and dynamic models. Therefore, the restrictions of homogeneity and symmetry are imposed on the static and dynamic models during the estimation. This also reduces the number of parameters to be estimated and increases the degrees of freedom (Li, Song, and Witt, 2004).

The result of the Durbin-Wu-Hausman test reveals that the null hypothesis of no correlation between the error term and the expenditure variable is rejected at the 1% level. Thus, to correct for the endogeneity, the real total expenditure variable in the AIDS model is replaced by its predicted value from the auxiliary regression. Furthermore, after the models are estimated, several diagnostic tests are conducted and the results are reported in Table 2. For the seven equations in the static AIDS model, one of them passed the BG test of no serial correlation, six passed the BP test of no heteroscedasticity, two passed the RESET test of no functional misspecification, and five passed the JB test of normality. In contrast, the corresponding numbers for the dynamic AIDS model are improved significantly with seven for the BG test, seven for the BP test, five for the RESET test, and five for the JB test. Overall, the dynamic AIDS model has a better fit according to these diagnostic tests.

Results from the Estimated Coefficients

The results of the final model estimations are reported in Table 3 for the static AIDS model and Table 4 for the dynamic AIDS model. There are some similarities among the estimated parameter values. Among the seven coefficients for real total expenditure, six are significant in the static AIDS model and three in the dynamic model. For the price variables, there are 35 unique estimates given the symmetry restriction is imposed and the results for the rest-of-world equation are omitted; among them, 17 are significant for the static model and six are significant for the dynamic model. These estimates for expenditure and price variables will become more informative when they are used to calculate elasticities later on.

The other reported coefficients are revealing in several aspects. For the three dummy variables, the preliminary LTFV determination announced in July 2004 (i.e., the second dummy) in the static AIDS model has positive effects on Indonesia (0.023) and Brazil (0.025) and negative effect on Malaysia (-0.030). In the dynamic AIDS model, the second dummy variable has significant impacts on most countries except

Table 2. Results from the Diagnostic Tests on the Static and Dynamic Almost Ideal Demand System Models

	BG		BP		RESET		JB	
Equation	Statistic	*p* Value	Statistic	*p* Value	Statistic	*p* Value	Statistic	*p* Value
Static AIDS								
China	29.935	0.00	18.587	0.10	0.338	0.71	0.981	0.61
Vietnam	8.479	0.00	24.597	0.02	16.907	0.00	0.298	0.86
Indonesia	12.192	0.00	13.335	0.35	4.844	0.01	3.780	0.15
Malaysia	6.756	0.01	14.311	0.28	23.870	0.00	0.024	0.99
Canada	6.919	0.01	7.929	0.79	10.933	0.00	0.018	0.99
Brazil	7.424	0.01	9.661	0.65	0.671	0.51	12.506	0.00
Italy	0.000	0.99	15.535	0.21	8.009	0.00	16.460	0.00
Dynamic AIDS								
China	0.321	0.57	12.662	0.47	1.475	0.24	0.682	0.71
Vietnam	0.440	0.51	13.720	0.39	6.191	0.00	10.695	0.00
Indonesia	0.187	0.67	9.036	0.77	0.105	0.90	1.867	0.39
Malaysia	0.261	0.61	11.597	0.56	1.639	0.20	1.680	0.43
Canada	0.632	0.43	10.933	0.62	1.887	0.16	3.562	0.17
Brazil	0.461	0.50	12.893	0.46	0.215	0.81	0.845	0.66
Italy	0.937	0.33	8.790	0.79	10.122	0.00	155.792	0.00

Note: The null hypothesis is no serial correlation for the Breusch-Godfrey (BG) test, no heteroscedasticity for the Breusch-Pagan (BP) test, no functional misspecification for the Ramsey's Regression Specification Error Test (RESET) test, and normality of the error terms for the Jarque-Bera (JB) LM test.

Italy. It decreases imports from China with a magnitude of –0.199 and from Malaysia (–0.016), but it increases imports from Vietnam (0.033), Indonesia (0.038), Canada (0.021), and Brazil (0.032). However, the formal implementation of antidumping duties on China since 2005 has not generated any significant impact on the trade pattern. Overall, the trade impact of the antidumping action on trade mainly occurs in the short term. The temporary trade depression effect on China is negative, but positive trade diversion effect occurs to other countries, mainly to Vietnam, Indonesia, Canada, and Brazil. These empirical findings are consistent with the theoretical postulations about investigation effect and trade diversion effect (Dale, 1980; Staiger and Wolak, 1994). They are also compatible with the actual trade patterns over the time period covered by the antidumping action, as revealed in Figure 1.

The dynamic AIDS model has two estimates that merit more explanation. The coefficients of the lagged share variable in the dynamic AIDS model reveal the pattern of consumption habit. All the coefficients are negative and they are significant for four countries, i.e., China (–0.277), Indonesia (–0.203), Malaysia (–0.360), and Italy (–0.492). The negative signs indicate that the inventory adjustment effect exists in consumer behavior. Furthermore, the coefficients of the error correction terms reveal the short-run adjustments. All the estimates are consistent with theory and they are negative and significant at the 5% level or better. The speed of adjustment varies among countries. For China, it takes seven months ($1/0.143 \approx 7$) to get back to the equilibrium. Similarly, the corresponding time for equilibrium adjustment is 2 months for Brazil; 3 months for Indonesia, Malaysia, and Canada; 5 months for Italy; and 15 months for Vietnam. Overall, this suggests that the market is stable and the deviations from the long-run equilibrium can be adjusted back to the equilibrium status.

Results from the Calculated Elasticities

The long-run and short-run expenditure elasticities are reported in Table 5. All the long-run

Table 3. Estimated Parameters from the Static Almost Ideal Demand System Model for Imported Wooden Beds

Parameter	China	Vietnam	Indonesia	Malaysia	Canada	Brazil	Italy
α_i	–0.157	–3.080***	0.617***	–1.008***	1.610***	0.113	0.919***
	(–0.488)	(–11.084)	(5.625)	(–11.779)	(14.132)	(1.330)	(9.337)
β_i^s	0.042*	0.239***	–0.039***	0.081***	–0.115***	–0.005	–0.065***
	(1.703)	(11.214)	(–4.685)	(12.350)	(–13.216)	(–0.736)	(–8.629)
γ_{i1}^s	0.254***	–0.065	–0.029*	–0.025*	–0.005	–0.003	–0.037***
	(3.810)	(–1.463)	(–1.788)	(–1.787)	(–0.263)	(–0.223)	(–2.873)
γ_{i2}^s	–0.065	–0.148***	–0.001	0.023**	0.011	0.036***	0.075***
	(–1.463)	(–3.409)	(–0.064)	(2.083)	(0.721)	(3.255)	(6.862)
γ_{i3}^s	–0.029*	–0.001	0.000	0.007	0.014	–0.006	–0.011***
	(–1.788)	(–0.064)	(0.033)	(0.841)	(1.533)	(–0.814)	(–2.778)
γ_{i4}^s	–0.025*	0.023**	0.007	0.011	–0.009	0.010*	–0.004
	(–1.787)	(2.083)	(0.841)	(1.148)	(–1.091)	(1.689)	(–1.139)
γ_{i5}^s	–0.005	0.011	0.014	–0.009	–0.005	0.007	–0.015***
	(–0.263)	(0.721)	(1.533)	(–1.091)	(–0.338)	(0.858)	(–2.869)
γ_{i6}^s	–0.003	0.036***	–0.006	0.010*	0.007	–0.006	–0.008**
	(–0.223)	(3.255)	(–0.814)	(1.689)	(0.858)	(–0.750)	(–2.320)
γ_{i7}^s	–0.037***	0.075***	–0.011***	–0.004	–0.015***	–0.008**	–0.009*
	(–2.873)	(6.862)	(–2.778)	(–1.139)	(–2.869)	(–2.320)	(–1.887)
γ_{i8}^s	–0.090***	0.069***	0.025***	–0.013	0.001	–0.030***	0.008
	(–4.210)	(4.225)	(2.737)	(–1.610)	(0.109)	(–3.756)	(1.462)
φ_{i1}^s	0.046	–0.042	–0.019	0.002	–0.002	0.013	–0.001
	(0.778)	(–0.864)	(–1.452)	(0.128)	(–0.116)	(1.027)	(–0.060)
φ_{i2}^s	–0.076	–0.030	0.023*	–0.030**	0.020	0.025**	0.007
	(–1.285)	(–0.629)	(1.762)	(–2.476)	(1.137)	(2.051)	(0.425)
φ_{i3}^s	–0.020	–0.003	–0.006	–0.001	–0.003	0.008	0.007
	(–0.342)	(–0.053)	(–0.469)	(–0.059)	(–0.163)	(0.684)	(0.430)
R^2	0.285	0.806	0.534	0.811	0.883	0.444	0.723

Note: ***, **, * denote significance at the 1%, 5%, and 10% level, respectively. *t* ratios are in parentheses. See text for parameter definitions.

expenditure elasticities are significant at the 1% level and positive except Canada and Italy. The elasticity is positive and larger than one for three countries: 3.013 for Vietnam, 2.281 for Malaysia, and 1.095 for China; it is positive and smaller than one for two: 0.892 for Brazil and 0.494 for Indonesia; and it is negative for two countries: –0.845 for Canada and –0.583 for Italy. As for the short-run expenditure elasticities, all of them except Canada and Italy are positive and highly significant. The magnitude for most estimates in the short run is smaller than that in the long run. China and Vietnam have the largest expenditure elasticities in the short run (i.e., 1.285 and 1.091, respectively). Overall, these results indicate that the more consumers spend on the imported beds, the more will be imported from Vietnam, Malaysia, and China and the less from Canada and Italy. The large long-run expenditure elasticity for Vietnam is consistent with its rapid gain of market share in recent years.

The Marshallian own-price elasticities, as reported in Table 5, are negative and significant at the 1% level in both the long run and short run. With several exceptions, most values ranges from –0.9 to –1.1. For China, the Marshallian own-price elasticities are more inelastic in the long run (–0.467) than in the short run (–0.998). This result implies that consumption of imported beds is more flexible in response to price change in the short run than in the long run. In addition, the long-run elasticity of Vietnam (–2.491) is much higher than those for other countries. In contrast, China has inelastic price elasticities in both the long run and short run.

Table 4. Estimated Parameters from the Dynamic Almost Ideal Demand System Model for Imported Wooden Beds

Parameter	China	Vietnam	Indonesia	Malaysia	Canada	Brazil	Italy
ψ_i	–0.277***	–0.132	–0.203**	–0.360***	–0.051	–0.146	–0.492***
	(–3.855)	(–1.358)	(–2.230)	(–3.664)	(–0.537)	(–1.545)	(–5.144)
λ_i	–0.143***	–0.069**	–0.337***	–0.311***	–0.325***	–0.414***	–0.185**
	(–3.189)	(–2.051)	(–3.262)	(–3.940)	(–3.481)	(–4.714)	(–2.095)
β_i^d	0.126***	0.011	–0.035**	–0.003	–0.052***	–0.019	–0.020
	(2.676)	(0.503)	(–2.102)	(–0.300)	(–3.149)	(–1.601)	(–1.304)
γ_{i1}^d	0.057	0.005	0.004	0.011	–0.022*	–0.009	0.001
	(1.564)	(0.340)	(0.311)	(1.211)	(–1.817)	(–1.059)	(0.142)
γ_{i2}^d	0.005	–0.012	–0.008	–0.014**	0.004	0.005	0.013**
	(0.340)	(–0.756)	(–0.877)	(–2.107)	(0.487)	(0.741)	(1.990)
γ_{i3}^d	0.004	–0.008	–0.001	–0.005	0.015**	–0.007	–0.010**
	(0.311)	(–0.877)	(–0.106)	(–0.790)	(2.247)	(–1.378)	(–2.008)
γ_{i4}^d	0.011	–0.014**	–0.005	0.009	0.001	0.002	–0.001
	(1.211)	(–2.107)	(–0.790)	(1.344)	(0.242)	(0.509)	(–0.364)
γ_{i5}^d	–0.022*	0.004	0.015**	0.001	–0.005	0.006	–0.006
	(–1.817)	(0.487)	(2.247)	(0.242)	(–0.672)	(1.312)	(–1.353)
γ_{i6}^d	–0.009	0.005	–0.007	0.002	0.006	0.000	0.003
	(–1.059)	(0.741)	(–1.378)	(0.509)	(1.312)	(–0.051)	(0.718)
γ_{i7}^d	0.001	0.013**	–0.010**	–0.001	–0.006	0.003	0.005
	(0.142)	(1.990)	(–2.008)	(–0.364)	(–1.353)	(0.718)	(0.988)
γ_{i8}^d	–0.048**	0.006	0.011	–0.004	0.008	0.001	–0.005
	(–2.291)	(0.512)	(1.274)	(–0.583)	(0.927)	(0.214)	(–0.634)
φ_{i1}^d	–0.008	0.010	–0.001	–0.003	–0.009	0.008	–0.009
	(–0.251)	(0.629)	(–0.082)	(–0.375)	(–0.779)	(1.022)	(–0.868)
φ_{i2}^d	–0.199***	0.033**	0.038***	–0.016*	0.021*	0.032***	0.009
	(–6.165)	(2.183)	(3.233)	(–1.934)	(1.943)	(3.825)	(0.849)
φ_{i3}^d	–0.002	0.002	–0.004	0.003	–0.011	0.007	0.006
	(–0.050)	(0.109)	(–0.348)	(0.454)	(–1.038)	(0.820)	(0.557)
R^2	0.385	0.097	0.386	0.331	0.288	0.405	0.435

Note: ***, **, * denote significance at the 1%, 5%, and 10% level, respectively. *t* ratios are in parentheses. See text for parameter definitions.

This is consistent with the stable import pattern for China regardless of the trade intervention policy.

To better understand the competition relationship among suppliers, the Hicksian cross-price elasticities are calculated and reported in Table 6. A positive price elasticity between imported beds from two countries denotes substitutes and a negative value denotes complements. In total, there are 21 pairs of cross-price elasticities among the seven countries. For each pair, the sign and significance are the same but the magnitude may differ. For example, when the price of beds from Vietnam increases by 10%, the imports from Malaysia decrease by 4.74%; when the price of beds from Malaysia increases by 10%, the imports from Vietnam decrease by 2.54%.

In the long run, eight of the 21 pairs of Hicksian cross-price elasticities at the lower triangle of the panel are significant. Five of them are positive and indicate substitutes: Vietnam vs. Malaysia/Brazil/Italy, Indonesia vs. Canada, and Malaysia vs. Brazil. The largest substitute elasticity is 1.964 between Vietnam and Italy. Three of them are negative and indicate complements: Indonesia/Canada/Brazil vs. Italy. The largest complement elasticity is –0.293 between Canada and Italy. Overall, in the long run, the prices of imported beds from Vietnam and Italy have larger impacts on the imports from other countries.

Table 5. Estimates of the Expenditure Elasticity (η_i) and Marshallian Own-Price Elasticity (ε_{ii})

	Long-Run		Short-Run	
Country	η_i	ε_{ii}	η_i	ε_{ii}
China	1.095***	–0.467***	1.285***	–0.998***
	(19.723)	(–2.992)	(12.079)	(–10.311)
Vietnam	3.013***	–2.491***	1.091***	–1.109***
	(16.783)	(–6.967)	(6.013)	(–8.663)
Indonesia	0.494***	–0.955***	0.546**	–0.978***
	(4.573)	(–5.665)	(2.525)	(–7.301)
Malaysia	2.281***	–0.909***	0.946***	–0.848***
	(21.988)	(–6.107)	(5.286)	(–7.786)
Canada	–0.845***	–0.968***	0.172	–1.035***
	(–6.055)	(–3.912)	(0.656)	(–8.062)
Brazil	0.892***	–1.137***	0.577**	–0.987***
	(6.068)	(–6.091)	(2.179)	(–9.031)
Italy	–0.583***	–1.162***	0.511	–0.849***
	(–3.179)	(–9.407)	(1.363)	(–6.119)

Note: ***, **, * denote significance at the 1%, 5%, and 10% level, respectively. *t* ratios are in parentheses. See text for parameter definitions.

In the short run, seven of the 21 pairs of Hicksian cross-price elasticities are significant. All of them are positive and indicate substitutes: China vs. Vietnam/Indonesia/Malaysia/Italy; Vietnam vs. Italy; Indonesia vs. Canada; and Canada vs. Brazil. The largest substitute elasticity is 0.611 between China and Malaysia. Overall, in the short run, the prices of imported beds from China, Vietnam, and Indonesia have larger impacts on the imports from other countries. The overall degree of substitution is also smaller in the short run than in the long run.

Discussion and Summary

In recent years, annual imports of wooden beds by the U.S. have exceeded $1 billion. This fast growth has been mainly driven by the large imports from the newly industrialized countries. In fact, the trade has grown so rapidly that an antidumping investigation against wooden bedroom furniture from China was conducted in 2003, and consequently, various antidumping duties have been imposed on individual Chinese firms since January 2005. To evaluate this market dynamics, static and dynamic AIDS models are used to analyze the consumer behavior and evaluate the effectiveness of this antidumping investigation. Monthly disaggregate data for the top seven suppliers from 2001 to 2008 are used in the evaluation.

Several conclusions can be reached from the analyses about consumer behavior, antidumping effectiveness in this import market of wooden beds, and market competition. First of all, the existence of a long-run equilibrium status in this market is supported by the Engle-Granger two-step cointegration test. This equilibrium status is regained by short-run adjustments of individual supplying countries. In the long run, expenditure elasticities disclose that when U.S. consumers increase their expenditure on wooden beds, they buy more from Vietnam, Malaysia, and China but less from Canada and Italy. Among these countries, Vietnam has demonstrated a great potential to lead the import market of wooden beds in the near future. As indicated by the own-price elasticities, the imported quantities from most countries are sensitive to its own price in both the short run and long run. However, for China as an exception, both its long-run and short-run own-price elasticities are inelastic, which indicates its less sensitive response to price change.

As a trade remedy instrument, the antidumping investigation against China has limited effects in reducing the import growth of wooden beds. At the stage of petition announcement, the investigation does not generate significant

Table 6. Estimates of Long-Run and Short-Run Hicksian Cross-Price Elasticity (ρ_{ij})

Quantity of a Country	Price of a Country						
	China	Vietnam	Indonesia	Malaysia	Canada	Brazil	Italy
Long-run							
China	—	–0.029	0.012	0.008	0.051	0.038	–0.042
	—	(–0.289)	(0.318)	(0.256)	(1.154)	(1.236)	(–1.454)
Vietnam	–0.109	—	0.071	0.254***	0.157	0.352***	0.677***
	(–0.289)	—	(0.683)	(2.777)	(1.196)	(3.725)	(7.303)
Indonesia	0.067	0.108	—	0.150	0.249**	–0.031	–0.100**
	(0.318)	(0.683)	—	(1.462)	(2.047)	(–0.333)	(–1.973)
Malaysia	0.056	0.474***	0.183	—	–0.079	0.207**	–0.021
	(0.256)	(2.777)	(1.462)	—	(–0.608)	(2.150)	(–0.385)
Canada	0.361	0.298	0.310**	–0.080	—	0.156	–0.192**
	(1.154)	(1.196)	(2.047)	(–0.608)	—	(1.199)	(–2.365)
Brazil	0.375	0.940***	–0.054	0.296**	0.219	—	–0.146*
	(1.236)	(3.725)	(–0.333)	(2.150)	(1.199)	—	(–1.812)
Italy	–0.453	1.964***	–0.191**	–0.032	–0.293**	–0.158*	—
	(–1.454)	(7.303)	(–1.973)	(–0.385)	(–2.365)	(–1.812)	—
Short-run							
China	—	0.131***	0.087***	0.088***	0.014	0.024	0.044**
	—	(3.640)	(2.869)	(4.388)	(0.504)	(1.209)	(1.982)
Vietnam	0.488***	—	0.013	–0.051	0.095	0.083	0.148***
	(3.640)	—	(0.172)	(–0.934)	(1.428)	(1.587)	(2.749)
Indonesia	0.496***	0.019	—	0.003	0.249***	–0.045	–0.085
	(2.869)	(0.172)	—	(0.040)	(2.999)	(–0.690)	(–1.354)
Malaysia	0.611***	–0.094	0.004	—	0.082	0.075	0.020
	(4.388)	(–0.934)	(0.040)	—	(1.025)	(1.247)	(0.356)
Canada	0.096	0.180	0.310***	0.083	—	0.139*	–0.059
	(0.504)	(1.428)	(2.999)	(1.025)	—	(1.927)	(–0.799)
Brazil	0.236	0.222	–0.078	0.107	0.196*	—	0.097
	(1.209)	(1.587)	(–0.690)	(1.247)	(1.927)	—	(1.237)
Italy	0.477**	0.429***	–0.161	0.031	–0.090	0.106	—
	(1.982)	(2.749)	(–1.354)	(0.356)	(–0.799)	(1.237)	—

Note: ***, **, * denote significance at the 1%, 5%, and 10% level, respectively. *t* ratios are in parentheses. See text for parameter definitions.

impacts on the import of beds. The affirmative preliminary LTFV determination leads to a big drop on the import value of China after July 2004. However, the trade diversion takes place from China to Vietnam, Indonesia, and Brazil at the same time. Furthermore, the final duty implementation has no significant impacts on the import from China. Collectively, the effectiveness of this antidumping investigation is only temporary. This is consistent with the continuous growth of total import value of wooden beds by the U.S. in recent years.

The degree of competition among these countries is well revealed by the cross-price elasticities. The imports among most countries can be substituted by each other, except the wooden beds from Italy. Most cross-price elasticities are inelastic with moderate magnitudes, implying that wooden beds from these countries are far from perfect substitutes. They reveal that these supplying countries have been able to successfully meet the diversified preferences on wooden beds by U.S. consumers. For instance, the Brazilian Export Promotion Agency spent $8.5 million in 2006 to promote Brazilian furniture in U.S. and European markets (Silva, 2007). These results have critical implications for the domestic furniture industry.

To improve the competitiveness and market share in an increasingly globalized furniture market, U.S. furniture manufacturers can learn greatly from these successful strategies adopted by the competing countries (Gazo and Quesada, 2005). Vital strategies include enhanced mass customization, more innovations, clearer customer targets and pricing, more intensive promotion by furniture associations, and better government supports. In the future, when comparable domestic data for wooden beds are available, competition among domestic and imported beds can be further assessed.

Finally, it is worthy of note that the increasing imports of furniture and consequential trade intervention policy may have far-reaching implications on relevant industries and consumers in the U.S. Theoretically, demand or supply shifts in one market can be passed through marketing channels (Gardner, 1975). Timber is one of the major raw materials for forest-related products (e.g., paper and furniture). Thus, a change in product markets can have impacts on related stakeholders through the supply chain. For example, Kinnucan and Zhang (2004) analyze the impact of the 1996 Canada–U.S. lumber trade agreement and the related export tax on consumers and producers in both countries. Li and Zhang (2006) examine the welfare incidence of the same agreement on stakeholders in the southern U.S. and conclude that timberland owners are the largest beneficiary of the lumber trade agreement and loggers the least. Similarly, the increasing imports of furniture products in the U.S. will reduce the demand on domestic timber and lumber production and affect landowners and lumber producers. In the future, a separate welfare examination of the changing settings in the furniture market can be conducted to improve our understanding of the impacts on domestic retailers, producers, and consumers.

In conclusion, this study analyzes the consumer behavior in purchasing imported beds and the competition among the top seven suppliers in the wooden beds market within a demand system. It makes an important contribution to analyzing the market of furniture products trade with a differentiation of short-run and long-run consumer behavior. It also generates empirical evidences of trade diversion in the furniture industry when the antidumping investigation is taken.

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