

Simultaneous Equations in Antidumping Investigations

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I. Introduction

Petitions filed by domestic producers alleging that they have been materially injured by reason of dumped imports are abundant and on the rise in the United States. Typically, the goal of each petition is to have antidumping import duties imposed on the relevant imported products. There is a two-step investigative procedure required in antidumping cases. First, the Department of Commerce determines whether or not the imported product has been sold at prices that are “less than fair value” (LTFV). Second, for cases in which the Department of Commerce votes affirmative on the LTFV issue, the International Trade Commission (USITC) investigates whether or not the domestic industry has indeed been materially injured by reason of these imports. Usually, in the second stage, analyses are not only conducted by USITC staff economists, but also by expert economists retained, respectively, by Petitioners (i.e., domestic producers) and Respondents (i.e., foreign producers). As with many cases that go to trial within the usual judicial system, expert economists from each side often testify to their analyses and findings at USITC hearings. Petitioners’ experts typically refer to evidence showing that the domestic producers have suffered from decreasing volumes, market share and market prices, and that these problems are attributable to LTFV imports. Respondents’ experts typically argue that not only are the alleged declines in domestic production and prices overstated but also that, to the extent that domestic volumes and market prices indeed declined, this outcome is attributable primarily to some market factor(s) other than subject imports.

Within the last year, expert analyses in USITC antidumping cases have become more formally econometric, with simultaneous equations estimates of supply and demand that incorporate various factors—in addition to import volumes or prices—that may influence the prices and/or shipments of the domestically produced product. When such models are correctly specified, one can determine the direction and degree of influence from each factor on the domestic product’s price (or volume). In short, this technique can determine what share of the blame for falling domestic market prices (or volumes) is actually attributable to imports, if any.

A more detailed description of the process involved with antidumping cases is provided in Section II of this paper. Section III describes generally the

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econometric approach, as compared to the traditional approach, to antidumping analyses. Section IV provides a brief and pragmatic demonstration of a formal econometric model that was used successfully in an antidumping investigation. Notably, it is the model generally credited for initiating the growth of formal econometric methods in the USITC forum. Finally, brief conclusions are presented in Section V.

II. U.S. Antidumping Background

Under U.S. trade law, when a domestic industry charges its foreign counterpart with dumping, two agencies investigate. The Department of Commerce—or, more technically, the Department of Commerce’s International Trade Administration (ITA)—determines whether or not the relevant imports are being dumped. The U.S. International Trade Commission (USITC) then determines whether imports are causing—or are likely to cause—material injury to the domestic industry.

Antidumping investigations proceed under strict statutory time deadlines. Unless the case is deemed to have “exceptional circumstances” the ITA must reach its final LTFV determination within 235 days after the date on which the petition was filed (Carpenter, 1999); the ITC must reach its final injury determination within 280 days.¹ These strict time deadlines are one key reason why antidumping protection is so often sought by domestic industries: unlike most domestic litigation, international trade disputes are resolved in a very timely manner.

The desirability of antidumping actions is reflected in their use. Antidumping law is easily the most widely used trade law. For perspective, more antidumping complaints are filed than all other trade laws put together! We summarize actual U.S. antidumping filings over the past decade in Figure 1. On average there were about 40 AD complaints filed per year, although there is substantial variation over years, with more than 90 cases filed in 1992 and about 15 in 1995-97.

The definition of “dumping” is far more general than commonly understood. The ITA (Commerce) actually looks for prices that are “less than fair value” (LTFV) when determining whether dumping occurred. There are essentially three criteria in which Commerce can determine whether imports were indeed sold at LTFV. The three alternative criteria for establishing LTFV are the following:

- if the foreign firm is selling at a lower price in the U.S. than it does in its home market,
- if the foreign firm is selling at a price lower in the U.S. than it does in some 3rd market, or
- if the foreign firm is selling in the U.S. at a price below the foreign firm’s production costs.

¹For cases with “exceptional circumstances” the ITA and ITC determination deadlines are 295 and 370 days, respectively.

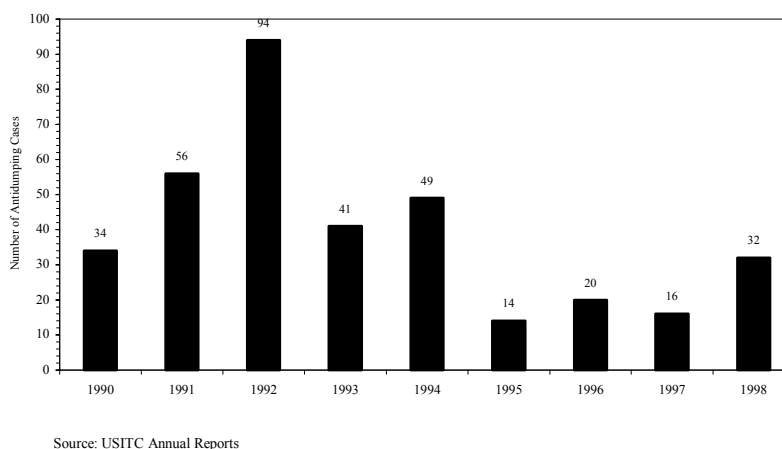
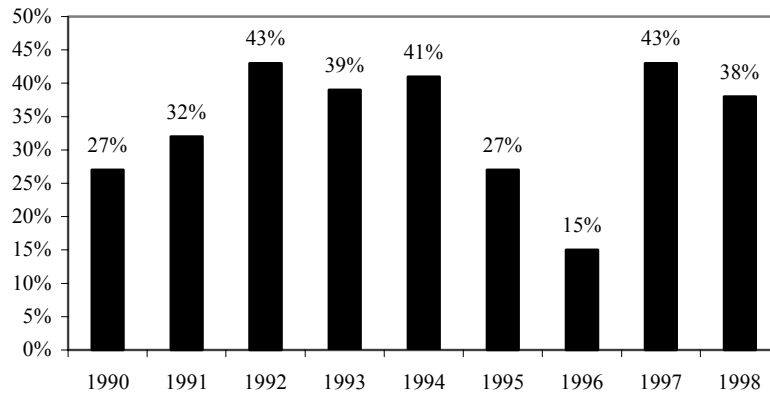


Figure 1. Total Number of U.S. Antidumping Cases Filed

Specifically, the ITA first attempts to compare import prices to prices of the product in the foreign firm's home market during the six months prior to the petition date. If the foreign firm's product is not significantly consumed in the foreign firm's home market, the ITA then attempts to compare import prices to prices that the foreign firm charged in some third market. If data are not available for either of these methods or when the prices are thought to be "below cost," the ITA constructs its own estimates of production costs, adds a markup for overhead, fixed costs, and profit, and then compares this "constructed price" with the import prices. If the actual transaction prices are below this constructed price then LTFV sales are said to have occurred.

Several comments are in order. First, the ITA often combines methods when determining the LTFV margin. For instance, the ITA may calculate the margin based on a price comparison for a fraction of the foreign firm's sales and use constructed prices for the rest. Second, if the foreign firm fails to comply with any of the ITA's often-onerous data and documentation requests, the ITA can disregard the foreign firm's information and instead use the "best information available" (BIA). BIA margins are typically calculated from information provided by the Petitioners (Sabry, 2000). Not surprisingly, the BIA margins are quite large. For instance, Lindsey (1999) finds that LTFV margins based under price BIA are two to ten times larger than standard price margins. Third, the rules for calculating the LTFV margin almost always lead to a finding of dumping (Boltuck and Litan, 1991). Consider that since 1990 more than 99% of the ITA's final determinations have been affirmative (i.e., in favor of Petitioners). Given the ITA's record, it is apparent that the only realistic chance of a Respondent winning lies with the USITC's injury determination.



Source: USITC Annual Reports

Figure 2: Percent Negative USITC Final Determinations

Once LTFV sales have been determined, a determination must be made whether a domestic industry has been materially injured or is threatened with material injury by reason of LTFV imports. The USITC defines “material injury” as “harm that is not inconsequential, or unimportant” (Carpenter, 1999, p. II-28). With this somewhat vague definition of material injury, the USITC has great latitude in making its decision, but it typically tries to assess the impact of imports and other economic and financial factors. Generally, the USITC relies on data for the three most recent complete calendar years plus the year-to-date period of the current year (Carpenter, 1999).

The procedures prior to the USITC’s final determination are quite involved. Technically, this final stage involves eight components, including (1) scheduling of the final phase, (2) questionnaires,² (3) prehearing staff report, (4) hearing and briefs, (5) final staff report and memoranda, (6) closing of the record and final comments by parties, (7) briefing and vote, and (8) determination and views of the USITC (Carpenter, 1999). However, the fourth component—hearing and briefs—is most relevant to this paper; during this period expert economists file their written reports and testify before the Commission.

In Figure 2 we plot the percentage of USITC’s final determinations that were negative (i.e., cases where the Petitioners lost). As one can see, Respondents face an uphill battle at the injury stage: on average only about one-third of USITC’s determinations have been negative. In fact, in no year were more than 45% of Respondents successful, and in one year only 15% of Respondents were successful. Given this track record, we now turn to explaining how the USITC makes its injury determination.

²The USITC staff drafts questionnaires to solicit from U.S. and foreign producers, U.S. importers, and U.S. purchasers, the information required by the Commission in order to make its final determination. For more information, see Carpenter (1999).

III. Economic Analyses of Injury: The Traditional and the Econometric

Within the last year, attorneys and economists have begun classifying expert economic analysis and testimony before the USITC as either “traditional” or “econometric” (although the two are probably not mutually exclusive). The two approaches to performing traditional analysis are “trends” analysis and the COMPAS model. Traditional “trends” analysis typically includes general, descriptive explanations about occurrences in the relevant domestic and foreign product markets. The presentation of traditional analysis varies from case to case, but the overall structure consists of (1) a review of time series data pertaining to the imports under investigation, (2) a discussion of data that the USITC staff has gathered on reported nominal transaction prices for sales of the relevant imports and their domestic counterparts (i.e., “nominal price analysis”), and (3) a review of individual transactions where domestic firms allege that they have lost sales or suffered revenue losses due to unfair imports, i.e., “lost sales analysis” (Morke & Kruth, 1989, p. 81-82).³

To many observers, however, trends analysis is fraught with subjective interpretation, embodying “more art than science.” Nevertheless, for many years trends analysis was the only type of analysis presented to the USITC. In an attempt to add some analytical rigor to the trends analysis of injury, in the late-1980s a simulation model called COMPAS was added.⁴ In simplest terms, COMPAS is a simulation model that quantifies the effects of dumping in a simple supply-demand framework. COMPAS is designed specifically to calculate the effect of dumping at a specified dumping margin on a domestic industry’s prices, domestic shipment volumes, and total sales revenues. Notably, however, COMPAS calculates price and volume effects of dumping based on three principal input data elements and six parameters (elasticities) that the analyst must “guesstimate.”⁵ Based upon these inputs, COMPAS calculates the effect of the subject imports on the price and volume of U.S. producers’ domestic shipments expressed as percent reductions from the levels that domestic producers would have achieved if the subject imports had not been dumped.

Although a significant improvement over simple trends analysis and easily implemented by the USITC staff, COMPAS still has serious shortcomings. First, just as with simple trends analysis, COMPAS results reflect the analyst’s judgments and assumptions concerning causal relationships between subject imports and the domestic counterpart. All key parameters are based on “educated guesses” rather than being grounded in actual industry data. Second, COMPAS ignores factors, other than subject imports, that may influence demand and supply. In other words, the COMPAS model does not explicitly

³Rather than the expert economist, other witnesses or counsel often address this third issue.

⁴COMPAS and its predecessor, CADIC, are from the family of so-called “Armington” models.

⁵Principal data elements for COMPAS are the percent dumping margin, the domestic producers’ percent market share (value basis), and the subject imports’ percent market share. Required parameter inputs are the aggregate U.S. market elasticity of demand for the relevant product, the domestic producers’ supply elasticity, the fair-traded import supply elasticity, and three elasticities of substitution (domestic product/subject imports, domestic product/fairly-traded imports, subject imports/fairly-traded imports).

allow for changes in factors other than dumped imports to affect the market price. A domestic industry alleging injury due to dumped imports may have also experienced negative shocks not related to imports that have decreased sales and profitability. For instance, a labor strike or a factory shutdown (say, due to a fire) would adversely affect the industry's ability to supply product to the market. Similarly, a decrease in the demand for its product (say, due to changing requirements of downstream buyers) would unfavorably affect sales. The COMPAS model would not capture any such changes in its calculations.

It has only been within the last year that formal econometric analysis was introduced to the USITC forum. Embodying "more science than art," formal econometric models—with simultaneous equations of supply and demand—provide a significant advancement in the analytical rigor over the usual traditional analysis, even when the traditional analysis incorporates use of the COMPAS model.

Econometric analysis for the USITC has evolved generally from limited use of simple, single equation methods to more sophisticated, simultaneous models of supply and demand. Rather than the judgmental estimates employed in traditional use of the COMPAS model, an econometric, simultaneous equations model incorporates empirically derived demand and supply parameters. Compared to COMPAS, such a model also allows for a more flexible form that accounts for influences other than subject imports on domestic supply and demand. As a result, such a simultaneous equations model provides the basis for directly inferring the nature and intensity of the economic relationships between subject imports and domestic products, as well as the relationships between other factors and the domestic products. In short, econometric analysis is more aptly suited (relative to judgments and assumptions) to disentangle each factor's contribution to the decreases in domestic prices (or volumes).

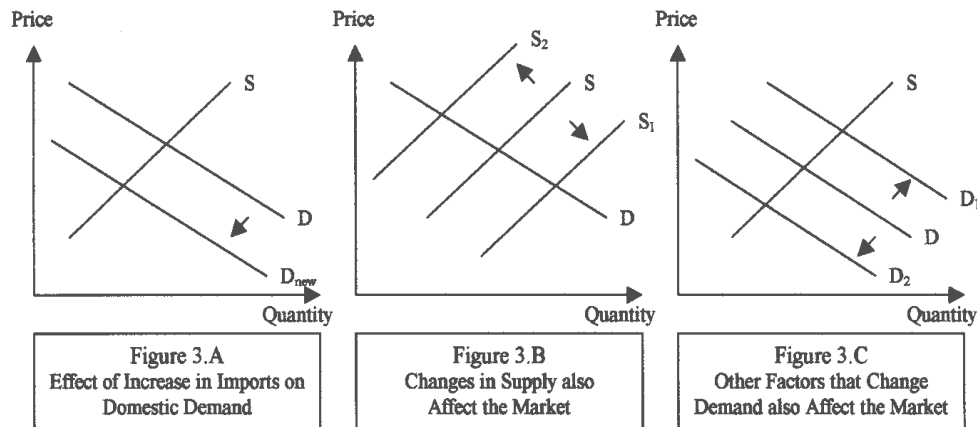


Figure 3

To clarify, in Figure 3 we graph typical supply and demand curves. An increase in imports (perhaps due to dumping) will lead to a decrease in the demand for the domestic product. We depict this in Figure 3.A as a shift from D to D_{new} . But, as argued above, there may also have been changes in the supply-side (depicted in Figure 3.B) or other factors affecting the demand-side (depicted in Figure 3.C).

Disentangling all of these causal forces is the statutorily mandated task of the USITC. Suppose, for instance, that over the period of investigation both the domestic price and domestic sales have fallen. This could simply be the result of changes as simple as that depicted in Figure 3.A where the entire change is due to dumped imports. Alternatively, the change could be the result of both the supply and demand curves shifting due to other factors. The USITC's traditional analyses (either simple trend analysis or the COMPAS model) will almost surely attribute changes caused by other factors to imports. By contrast, the econometric approach allows one to not only disentangle but also to quantify the size of the separate causal forces.

The following section presents a formal econometric model that has been used successfully in a previous antidumping investigation. In fact, the model presented below is generally credited for initiating the growth of formal econometric methods in antidumping analyses presented to the USITC

IV. An Econometric Model of Supply and Demand: The Case of Cold-Rolled Steel

In Certain Cold-Rolled Steel Products from Argentina, Brazil, China, Indonesia, Japan, Russia, Slovakia, South Africa, Taiwan, Thailand, Turkey, and Venezuela⁶, the domestic steel industry (Petitioners) pointed to the fact that the U.S. market price of cold-rolled sheet dropped from an average price of \$470/ton in 1996-1997 to \$400/ton in 1998-1999. This dramatic price change is plotted in Figure 4. Further, Petitioners alleged that subject imports (i.e., imports from the countries named in the case) were a significant cause of the \$70 price decline. Using the traditional approach, Petitioners pointed to two key trends; namely, over the same time period that domestic prices fell, (1) the price of imported steel from subject countries fell by \$50/ton and (2) the volume of imported steel from subject countries increased by approximately 30,000 tons/month. According to Petitioners, these two trends were clear enough evidence that subject imports were driving the domestic price down and thus causing injury.⁷

The traditional approach, however, ignores important changes in other crucial factors influencing the market for cold-rolled steel. In particular, Respondents argued that there were crucial changes in both the demand- and supply-side of the market. Using formal econometrics, the Respondents argued and showed that other factors significantly affected the market.

⁶USITC Investigations Nos. 701-TA-393-396 and 731-TA-829-840.

⁷This is an example of the primary problem with traditional analysis. That is, traditional analysis more easily lends itself to conjecture. For example, Petitioners' economist(s) may simply point to rising import volumes that slightly lead diminishing domestic prices and, from this, conclude that rising imports are the unambiguous culprit. This is, of course, committing the fallacy of *post hoc ergo propter hoc*. However, it is a simple, appealing, understandable argument to the commissioners and, for this very reason, such argument is frequently relied upon.

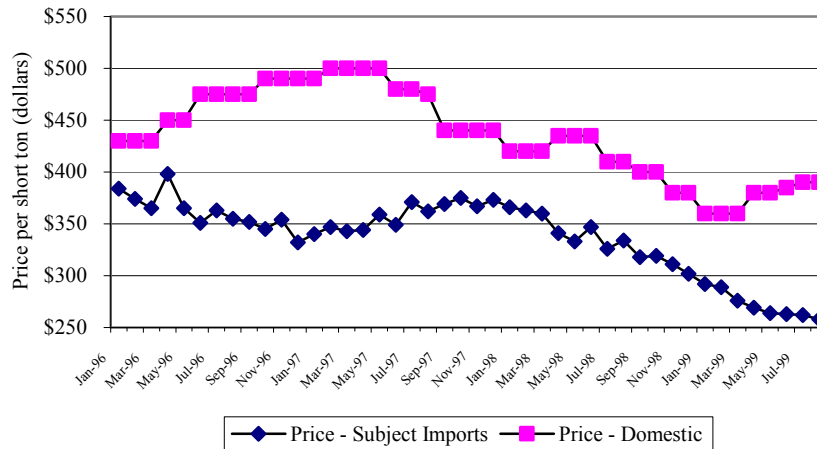


Figure 4. Import and Domestic Prices

The Respondents constructed a simultaneous equations model of supply and demand. The particular model in this case can be expressed generally as,

Demand	$Pcr_d = f(Qcr_d, Pcr_{si}, Pcr_{nsi}, Auto_d, IM_d, Pgalv_d, Galvcap_d)$
Supply	$Pcr_d = f(Qcr_d, Coal_d, Scrap_d, Iron_d, Slab, Phr_d, Phr_i, Crcap_d)$
where, Pcr_d	= Price of domestic cold-rolled sheet (per short ton),
Qcr_d	= Quantity of domestic cold-rolled sheet (in short tons),
Pcr_{si}	= Price of cold-rolled sheet from subject countries (per short ton),
Pcr_{nsi}	= Price of cold-rolled sheet from non-subject countries (per short ton),
$Auto_d$	= Auto assemblies in the U.S. (in millions),
IM_d	= Industrial machinery production in the U.S. (index),
$Pgalv_d$	= Price of domestic hot-dipped galvanized steel (per short ton),
$Galvcap_d$	= Domestic galvanized capacity (in thousands of short tons),
$Coal_d$	= Coal Producer Price Index,
$Scrap_d$	= Carbon steel scrap Producer Price Index,
$Iron_d$	= Iron ore Producer Price Index,
$Slab$	= Price of steel slab (per short ton),
Phr_d	= Price of domestic hot-rolled sheet (per short ton),
Phr_i	= Price of imported hot-rolled sheet (per short ton), and
$Crcap_d$	= Domestic cold-rolled capacity (in thousands of short tons).

The price of domestic cold-rolled sheet (Pcr_d) and its quantity (Qcr_d) are, of course, simultaneously determined by the supply and demand equations.⁸ However, the relationships between the other independent variables and the price of domestic cold-rolled sheet may warrant further explanation. The other demand-side and supply-side variables are discussed below. This is followed by a discussion regarding estimation of the model, as well as the model's results.

⁸Monthly cold-rolled domestic prices were gathered from *Purchasing* magazine's "Transaction Price Service." Monthly cold-rolled domestic shipments were obtained from American Iron and Steel Institute (AISI).

A. Demand-Side Factors

Assuming that the argument made by Petitioners was correct, one would expect to find a positive and statistically significant coefficient attached to the price of imported cold-rolled sheet. That is, imported cold-rolled sheet and domestic cold-rolled sheet are substitutes. By law, the USITC must distinguish the effect of imports from subject countries and nonsubject countries; thus, by law the analysis must differentiate between the two sources of imports.⁹ Thus, we expect a positive coefficient on the price of both subject imports ($P_{cr_{si}}$) and nonsubject imports ($P_{cr_{nsi}}$).

Cold-rolled steel is primarily an intermediate product used in the production of final products. Auto assemblies ($Autos_d$), industrial machinery production (IM_d), and the price of galvanized steel (P_{galv_d}) are intended to capture effects of demand for relevant final products on the demand (and hence price) for cold-rolled steel. Positive coefficients, therefore, would be expected for each. For example, a large amount of cold-rolled steel is ultimately used by the automobile industry. Auto assemblies ($Autos_d$) would capture decreases (increases) in the demand for automobiles that would decrease (increase) the demand for cold-rolled steel and cause the price of domestic cold-rolled steel to fall (rise). Auto assemblies would also capture any effects of the GM strike during the spring/summer of 1998 on the domestic price of cold-rolled steel.¹⁰

Cold-rolled sheet is also the primary input to galvanized sheet. So, in addition to the price effects of galvanized (P_{galv_d}) on domestic cold-rolled sheet, it was thought that measurement of galvanized capacity ($Galvcap_d$) would also be relevant. One would expect, for example, that increases in galvanized capacity would be an indicator of rising galvanized demand, which should increase the demand for cold-rolled sheet and put upward pressure on cold-rolled prices.¹¹

B. Supply-Side Factors

On the supply side, it should be noted that traditional steel mills produce cold-rolled steel using an integrated production process that starts with primary inputs (coal, iron ore, coke, etc.) or steel slab to produce hot-rolled steel. “Mini-mills,” on the other hand, tend to rely heavily upon steel scrap to produce hot-rolled steel. In either event, hot-rolled steel is then moved “down the line” and cold-rolled (thus becoming “cold-rolled steel”). Changes in the prices of these key, primary inputs, measured by $Coal_d$, $Scrap_d$, $Iron_d$, and $Slab$, can raise or lower the price of cold-rolled sheet on the supply side. In short, we would expect positive coefficients for each.¹²

⁹Subject and non-subject import prices (and volumes) were collected from the USITC’s “Dataweb” at www.usitc.gov. Initially measured in price per metric ton, they were converted to price per short ton for an “apples to apples” comparison with the domestic like-product.

¹⁰Industrial machinery production (index) and auto assemblies (millions of units at annual rate) were collected from the Federal Reserve and are available from www.federalreserve.gov. Domestic galvanized prices were obtained from *Purchasing* magazine’s “Transaction Price Service.”

¹¹Galvanized capacity data were obtained from Prusa & Durling (1999).

¹²Coal, carbon steel scrap, and iron ore are all Purchasers Price Indices (PPIs) gathered from the Bureau of Labor Statistics (www.bls.gov). Carbon steel slab prices were compiled from U.S. Bureau of the Census statistics.

While the above primary inputs may have some effect on the price of cold-rolled steel, hot-rolled steel is the raw input for cold-rolled steel.¹³ Thus, changes in either the domestic price of hot-rolled steel ($Phra$) or the imported price of hot-rolled steel ($Phri$) are expected to have significant, positive influences on the price of domestic cold-rolled steel.¹⁴

Finally, large investments in domestic cold-rolled capacity ($Crcapa$) are expected to drive down prices of domestic cold-rolled sheet. This new capacity allows steel producers to make larger volumes of cold-rolled steel at a lower price. Thus, for this final variable on the supply-side, we would expect a negative and statistically significant coefficient.¹⁵

C. Estimation

Of course, for unbiased and consistent estimations, simultaneous systems require a more complex procedure for estimation than single equation models, which can generally be estimated by regression with ordinary least squares (OLS). The most frequently used method of estimating simultaneous systems is the two-stage least squares (2SLS) method (Studenmund, 1997; Greene, 1993).¹⁶ Readers will recall that most standard econometric texts introduce the method of two-stage least squares with examples of supply and demand models.¹⁷ So, although the technique was a new (and controversial) introduction to USITC antidumping investigations, the approach is a “textbook” approach for estimating factors that determine the price of cold-rolled steel. The cold-rolled model, described above, was estimated with 2SLS and monthly data from January 1993 through May 1999.

The 2SLS estimation results are presented in Table 1.¹⁸ As shown in Table 1, estimation was on the logarithms of the dependent and independent variables. Notably, Table 1 also indicates the specific lag structures used for each independent variable in the base specification, as well as a brief interpretation of each estimated coefficient.

¹³Put simply, cold-rolled steel is essentially hot-rolled steel, re-rolled to a thinner gauge and a smoother finish.

¹⁴Domestic hot-rolled prices were obtained from *Purchasing* magazine’s “Transaction Price Service,” and imported hot-rolled prices were obtained from the USITC’s “Dataweb” at www.usitc.gov.

¹⁵Cold-rolled capacity data were obtained from Prusa & Durling (1999).

¹⁶Two-stage least squares (2SLS) estimation is available in most statistical software packages (SAS, SPSS, LIMDEP, etc.). The model discussed in this paper was estimated with SAS “proc syslin” (although “proc model” may also be used) and simulated with “proc simlin.”

¹⁷See, for example, Studenmund (1997, p. 551), Maddala (1992, p. 377), Pindyck & Rubinfeld (1991, p. 299) and *SAS/ETS User’s Guide* (1993, p. 821).

¹⁸Alternative lag structures and import volumes (instead of import prices) were used in alternative specifications not included in this paper. For example, prices of subject and non-subject imports were lagged four months in the base specification to address the commonly held belief that delivery of imports takes approximately four months. However, a total of nine alternative models were originally produced to the USITC (with different lag structures, etc.), and none of them provided significantly different results than the base specification provided here. For more details, see Prusa, Sharp and Reilly (1999). In addition, USITC staff economists ran additional specifications with different lags, and also tested for autocorrelation and unit roots.

Table 1
Base-Case Cold-Rolled Steel Model
Dependent variable = Pcr_d , domestic price of cold-rolled sheet (per short ton)
January 1993 – May 1999

All variables expressed in logarithms and standard errors in brackets; * = significant at 5% level; **=significant at 1% level

Variable Name	Variable Label	Demand Coefficient	Supply Coefficient	Interpretation/Notes
Qcr _d	Quantity of domestic cold-rolled sheet (short tons)	-0.431 [0.252]	0.055 [1.137]	The estimates imply that the demand curve slopes downward and the supply curve slopes upward. However, neither coefficient is statistically significant.
Pcr _{si}	Price of cold-rolled sheet from subject countries, lagged 4 months (per short ton)	0.022 [0.113]		A 100% change in the price of subject products from subject countries would change domestic prices for cold-rolled steel by just over 2%. Subject import prices are not a significant influence over domestic prices of cold-rolled steel. The coefficient is not statistically different from zero.
Pcr _{nsi}	Price of cold-rolled sheet from non-subject countries, lagged 4 months (per short ton)	0.158 [0.126]		A 100% change in the price of subject products from non-subject countries would change domestic prices for cold-rolled steel by almost 16%. Although the effect is greater than that from subject prices, non-subject prices are not a significant influence over domestic prices of cold-rolled steel. The coefficient is not statistically different from zero.
Auto _d	Auto assemblies, lagged 3 months	0.105 [0.101]		A 100% increase in auto assemblies would increase domestic prices of cold-rolled steel by almost 11%, however the effect is not statistically significant.
IM _d	Industrial machinery production, lagged 3 months	-0.519 [0.090]**		A 100% increase in industrial machinery production would decrease domestic prices of cold-rolled steel by about 52%. The coefficient has an unexpected sign and is statistically significant at the 99% level. It is likely that the negative sign reflects the trend of including more galvanized steel and less cold-rolled steel in industrial machinery.
Pgalv _d	Price of domestic galvanized steel, lagged 9 months (per short ton)	0.675 [0.089]**		A 100% increase in the price of domestic galvanized steel implies approximately a 68% increase in domestic prices of cold-rolled steel. The effect is statistically significant at the 99% level
Galvcap _d	Galvanized capacity, lagged 9 months	0.481 [0.171]**		Domestic galvanized capacity significantly affects domestic cold-rolled prices. This relationship is statistically significant at the 99% level. This coefficient indicates that a 100% increase in galvanized capacity would increase domestic cold-rolled prices by about 48%.
Coal _d	Coal PPI, lagged 1 month		0.193 [0.245]	Although it has the correct sign, the price of coal does not appear to significantly influence the domestic price of cold-rolled sheet.
Scrap _d	Carbon steel scrap PPI, lagged 1 month		0.001 [0.118]	Although it has the correct sign, the price of carbon scrap does not appear to significantly influence the price of domestic cold-rolled.
Iron _d	Iron ore PPI, lagged 1 month		0.086 [0.127]	Although it has the correct sign, the price of iron ore does not appear to significantly influence the price of domestic cold-rolled sheet.
Slab	Price of steel slab, lagged 1 month, (per short ton)		-0.123 [0.089]	Slab has a counter-intuitive sign and does not appear to significantly influence the price of domestic cold-rolled sheet.
Phr _d	Price of domestic hot-rolled sheet, lagged 1 month (per short ton)		0.918 [0.096]**	A 100% increase in the price of domestic hot-rolled sheet would increase the price of domestic cold-rolled sheet by about 92%. The effect is statistically significant at the 99% level.
Phr _i	Price of imported hot-rolled sheet, lagged 1 month (per short ton)		0.242 [0.113]*	A 100% increase in the price of imported hot-rolled sheet would increase the price of domestic cold-rolled sheet by about 24%. The effect is statistically significant at the 95% level.
Crcap _d	Cold-rolled capacity, lagged 9 months		-0.014 [0.179]	Although it has the predicted sign, cold-rolled capacity does not appear to significantly influence the price of domestic cold-rolled sheet.
Constant	Intercept	6.795 [2.896]*	-1.872 [3.723]	Indicate what the equations predict log domestic prices of cold-rolled steel to be when all independent variables take on a zero value.
R ²	R-squared	0.733	0.883	
F	F-Statistic	27.113	64.298	

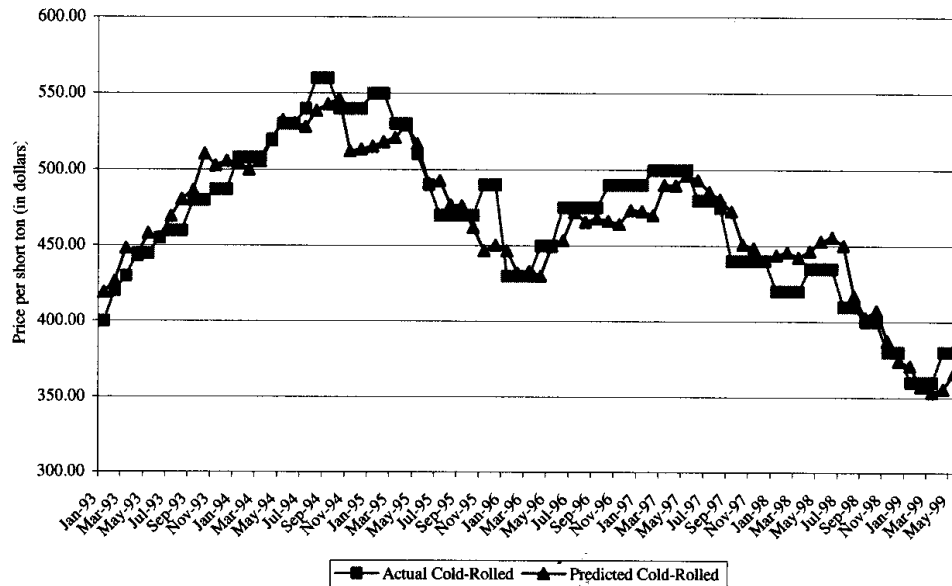


Figure 5. Predicted & Actual Domestic Cold-Rolled Prices

D. Results

Figure 5 graphically depicts the model's predicted domestic prices of cold-rolled sheet as well as actual domestic prices of cold-rolled sheet. From Figure 5, and by the statistical conventions provided in Table 1, it is clear that the econometric model fits well. The fact that the supply curve is upward sloping and the demand curve is downward sloping is not imposed on the model, but rather is determined by the data. Of course, the commonly used measures of "goodness of fit," R^2 and F-test, also indicate that the supply and demand equations have each captured most of the variability in the dependent variable (P_{crd}).

The coefficients on subject and non-subject imports have the expected, positive signs. That is, the coefficients on the "price of cold-rolled sheet from subject countries" (P_{crsi}) and the "price of cold-rolled sheet from non-subject countries" (P_{crnsi}) are both positive. Again, a positive sign means that a decrease in the price of subject imports will put downward pressure on the domestic price of cold-rolled steel. In other words, imported cold-rolled and domestic cold-rolled are substitutes. Crucially, the estimated effect of imports is quite small. In the specific case of cold-rolled sheet from subject countries, the coefficient implies a cross-price effect of only 2.2%.

What does the estimate of 2.2% mean? The estimate, of course, tells us how changes in the price of subject imports influence changes in the price of domestic cold-rolled steel. During the period of investigation (POI), the average price of subject imports fell by 14%. The model thus predicts that the price of subject imports explains approximately $2.2\% \times 14\% = 0.308\%$ of the change in the price of domestic cold-rolled steel. Given the 1996-97 price of cold-rolled steel was

about \$470, this means that about \$1.45 (i.e., $\$470 \times 0.308\% = \1.45) of the fall in the price of domestic cold-rolled steel is due to the price of subject imports. This small estimate indicates that imports had a very small effect—an economically insignificant effect—on domestic prices.

With the results from this model, we cannot reject the hypothesis that cold-rolled imports had no impact on domestic cold-rolled prices. That is, cold-rolled imports are statistically insignificant. This is an important finding. Given that the model finds that less than \$1.50 of the fall in the domestic price of steel is due to subject imports, we can conclude that subject imports are economically and statistically insignificant.

What were the primary culprits for diminishing domestic cold-rolled prices? Based upon the results from the econometric model and subsequent tests presented to the Commission, the price of domestic hot-rolled sheet (Phr_d) and the price of domestic galvanized ($Pgalv_d$) appeared, overwhelmingly, to be the primary reasons for the falling cold-rolled domestic prices of 1998-1999. The coefficient of 0.918 on the price of domestic hot-rolled sheet (Phr_d)—the “upstream” product from which cold-rolled sheet is produced—indicates that the two price series track together, nearly dollar-for-dollar. Likewise, the coefficient of 0.675 on the price of domestic galvanized sheet ($Pgalv_d$)—the “downstream” product for which cold-rolled steel is the primary input—indicates a uniquely strong relationship there as well. Moreover, as shown in Figure 6, the prices of domestic hot-rolled sheet and domestic galvanized sheet fell dramatically during the same time the prices of cold-rolled sheet fell. From this analysis, it is obvious that the ailments of the domestic cold-rolled industry had little to do with imports, and almost everything to do with other, domestic factors affecting the supply and demand of cold-rolled sheet.

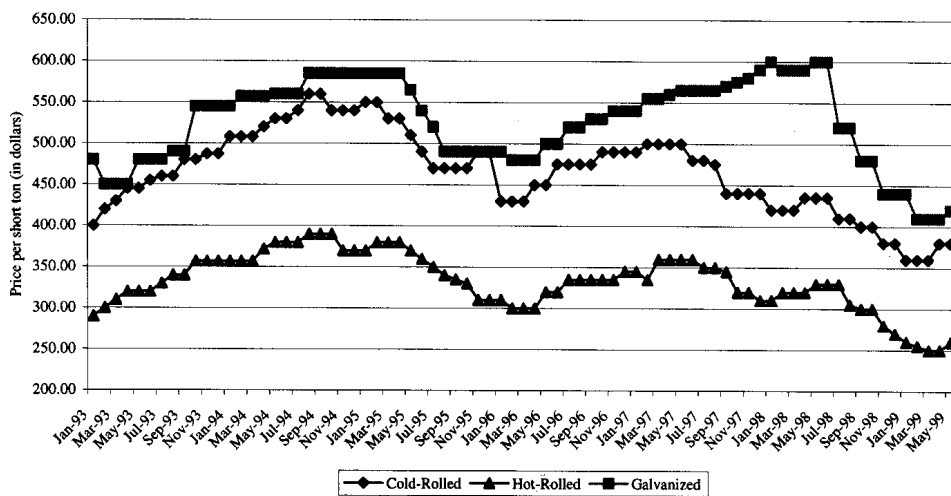


Figure 6. Actual Domestic Steel Prices

Based primarily upon the econometric model of Table 1, as well as the tests of robustness and final approval of the model by USITC staff, the USITC Commissioners determined that the domestic steel industry was not materially injured or threatened with material injury by reason of imports of Certain Cold-Rolled Steel Products from Argentina, Brazil, China, Indonesia, Japan, Russia, Slovakia, South Africa, Taiwan Thailand, Turkey, and Venezuela.¹⁹ Specifically, the vote was 5 to 1, with Vice Chairman Marcia E. Miller and Commissioners Jennifer A. Hillman, Stephen Koplan, Thelma J. Askey, and Deanna Tanner Okun voting negative, and Chairman Lynn M. Bragg dissenting (USITC #3283 and #3320, 2000).

V. Conclusion

The purpose of this paper has been twofold. The first purpose was to describe the process of antidumping investigations, particularly as it pertains to expert testimony to the USITC. The second purpose of this paper was to more closely examine the analyses in antidumping investigations, with emphasis on the relatively new introduction of econometric, simultaneous equation models to the USITC forum. Here the distinction was made between the traditional and econometric approaches, and the econometric model credited for breaking new analytical ground in antidumping investigations was presented.

By applying simultaneous equations to antidumping investigations we are in no way suggesting that this is the only application in forensic economics where this methodology might be applicable. The approach is technically appropriate whenever endogenous variables (e.g., P and Q) are jointly determined, as in a typical model of supply and demand. One can imagine a variety of contexts in which the forensic practitioner would encounter such conditions. In commercial litigation, one could model for the effects of a supplier or a rival with separate supply and demand equations facing the firm.²⁰ Even in wage disputes, simultaneous equations may be appropriate since hours and wages are jointly determined endogenous variables.²¹

In the specific antidumping case of Certain Cold-Rolled Steel Products from Argentina, Brazil, China, Indonesia, Japan, Russia, Slovakia, South Africa, Taiwan Thailand, Turkey, and Venezuela it may appear that the econometric approach was more useful and appropriate, but we should not make the general conclusion that the econometric approach is always preferred. In many ways, Petitioners and Respondents consider traditional analysis a requirement in expert testimony, primarily because USITC commissioners (who are usually non-economists) can better understand it. While the traditional approach speaks more directly to the commissioners, the econometric approach speaks to USITC staff economists who may or may not provide approval of the economet-

¹⁹See USITC publication No. 3282, p. 23 (especially footnote 185).

²⁰Although most textbooks offer macroeconomic models as examples of simultaneous equations and 2SLS estimation, one can find relevant examples of simultaneous supply and demand equations facing individual firms or industries (in a non-forensic context) in Maddala (1992, p. 370), SAS/ETS Software: Applications Guide 2 (1993, p. 142), and DeLurgio (1998, p. 472).

²¹For a classic example of a non-aggregate, simultaneous equations model of labor supply and demand (in a non-forensic context), see Mirer (1995, p. 366).

ric model and, in turn, may or may not recommend its results to the commissioners. Notably, after successful use of the cold-rolled model, many similar models followed.²² However, for the reasons mentioned above, these analyses typically included a traditional treatment of the issues as well. Thus, the traditional and econometric approaches have been treated as complements rather than substitutes.

Likewise, we should not make the general conclusion that econometrics is always a preferred substitute for the USITC's COMPAS model. For example, COMPAS has merits as an analytical tool when there is a dearth of data. In conducting injury investigations, USITC staff must frequently deal with narrowly specified subject products for which there are little or no published economic data. In such cases, the staff's ability to conduct quantitative economic analysis is limited. COMPAS provides a valuable tool for applying informed economic judgment in a disciplined manner to limited market data collected directly from concerned importers, exporters, domestic producers, and purchasers. For many investigations, COMPAS therefore provides a vehicle for doing the best that can be done with limited information.

Nevertheless, we must understand the limitations of both the traditional approach and the COMPAS model, and how these limitations can be overcome with an econometric analysis, such as the one presented here. Even with COMPAS, the traditional approach cannot establish causation, or even provide objective insights towards causation. However, it is possible for a correctly specified econometric model to disentangle the various effects on falling domestic prices and determine what share of the blame is actually attributable to imports, if any.

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²²Cases that have used simultaneous equation models similar to the cold-rolled model include Certain Crabmeat and Certain Seamless Carbon and Alloy Steel Standard, Line and Pressure Pipe from the Czech Republic, Japan, Mexico, the Republic of South Africa and Romania (731-TA-846-850); Certain Crabmeat from Swimming Crabs (TA-201-71); and Certain Carbon Steel Products from Australia, Belgium, Brazil, Canada, Finland, France, Germany, Japan, Korea, Mexico, Netherlands, Poland, Romania, Spain, Sweden, Taiwan, and United Kingdom (AA1921-197 Review).

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