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Welfare costs of the U.S. antidumping and countervailing duty laws

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Abstract

The antidumping (AD) and countervailing duty (CVD) laws in the United States have become the most pervasive form of import relief sought by domestic producers. This paper estimates the collective economic effect of the hundreds of active U.S. AD/CVD orders. Using a computable general equilibrium model, we estimate that the collective net economic welfare cost in 1993 of these orders to be $4 billion. This welfare estimate is sensitive to various modeling assumptions, which are explored in the paper. With the implementation of the Uruguay Round Agreements, the AD/CVD laws remain one of the costliest programs restraining U.S. trade.

Keywords: International Trade; Antidumping; Countervailing Duty; Computable General Equilibrium

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1. Introduction

The antidumping and countervailing duty (AD/CVD) laws in the United States have become the most popular and pervasive form of import relief sought by domestic producers. These statutes are intended to ''level the playing field'' for

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U.S. firms that face trade practices by foreign firms or governments that are considered ''unfair.'' In AD cases, a duty is levied when it is determined that a foreign firm (or more formally, the importer of record) is selling a product at ''less than fair value,'' i.e., dumping, a product in the U.S. market and is causing ''material injury'' to domestic producers.[1] Similarly, CVD law provides for a duty when an imported product is subsidized in some manner by a foreign government and is causing material injury.[2] Although AD/CVD cases are targeted at specific products and foreign firms or governments, the sheer number of cases in the last 15 years suggests that their collective economic effect may be quite substantial. Since 1980, there have been over a thousand AD/CVD cases brought before the U.S. Department of Commerce (USDOC) and U.S. International Trade Commission (USITC). Of those cases, hundreds were ruled in the affirmative and led to positive duties. In addition, although there is a formal review process for existing cases, these duties may be applied on the subject product indefinitely. In fact, there are duties being collected on cases that were decided as far back as the mid-1960s.

AD/CVD laws are not unique to the United States. Although the United States is arguably the most prodigious user of these laws, Messerlin and Reed (1995) show that during the 1980s the number of cases and average assessed dumping margins in the European Union have been similar in magnitude. In addition, Martin and Winters (1996) point out that a number of countries, which previously had no import relief program comparable to the U.S. AD/CVD laws, have been hard at work implementing these types of laws in the last decade. Moreover, despite the applauded success of the recent Uruguay Round trade negotiations, some have argued that the Round strengthened the legitimacy of these programs in the international arena by sanctioning them as another type of ''safeguard'' provision for countries to use in the face of increasing import competition (see Finger, 1996). Thus, as tariffs are reduced or eliminated, and quotas on agricultural products and textile and apparel products are phased out over the next decade, AD/CVD laws are poised to become the most significant trade barrier remaining in World Trade Organization (WTO) member countries.

Despite the popularity of relying on AD/CVD laws for import relief, little work has been done to estimate the collective economic effect of the hundreds of active AD/CVD orders currently in place in the United States (and elsewhere around the world). This paper presents an estimate of the collective net economic welfare effects of U.S. AD/CVD law using a computable general equilibrium (CGE)

[1]The U.S. AD/CVD law defines material injury as ''harm which is not inconsequential, immaterial, or unimportant.'' 19 U.S.C. 1677(7)(A).

[2]Numerous CVD cases involved countries that were not signatories to the General Agreement on Tariffs and Trade (GATT) Subsidies Agreement, and therefore, did not require an injury test by the U.S. International Trade Commission. Our estimates below include these so-called ''no-injury test'' cases.

model by overcoming a number of difficulties that have prevented analysis of this issue in the past.[3]

The lack of analysis on the collective economic effect of AD/CVD orders is not surprising for a number of reasons. First, AD/CVD orders are very targeted actions, often affecting only a few specific Harmonized Tariff Schedule (HTS) product categories. Most simulation models, particularly CGE models that account for all production sectors in an economy, specify industrial sectors at very aggregated levels. However, the CGE model used in this paper has the potential to model hundreds of separate production sectors. Thus, the model allows us to simultaneously focus on the economic effects of narrowly targeted AD/CVD orders in certain sectors (as with a partial equilibrium analysis), while at the same time estimating the combined economy-wide effects of all outstanding AD/CVD orders.

Second, a more significant obstacle to estimating the effects of outstanding AD/CVD orders with a CGE model is the extensive data requirements. These requirements entail gathering data on AD/CVD duties collected (in addition to other information) on active AD/CVD orders affecting hundreds of products from the time of each individual case to the year of analysis. We use data collected by the U.S. Customs Service (Customs) and the USDOC to resolve many of these data difficulties. These data provide information on AD/CVD duties collected and value of subject imports for 1993, the base year of our analysis. Through concordances we are able to match this data to USITC AD/CVD case numbers.

Finally, the nature of AD/CVD orders and the possibility that they may change over time presents an unusual modeling challenge. Although AD and CVD cases generate *ad valorem* duty rates, AD orders in particular are not accurately modeled as simple *ad valorem* tariffs. AD margins are determined by calculating the percentage difference between the foreign firm's U.S. price and its home market price. In addition, AD duties can be adjusted by USDOC ''administrative reviews'' as often as every year to recalculate the margin. Thus, foreign firms can affect future margin determinations through their own pricing decisions, and this may allow the foreign firm to extract rents by raising its U.S. price to obtain a lower duty through subsequent administrative reviews. We present evidence that this may be occurring quite extensively and show that it has a large impact on the estimated welfare costs of U.S. AD/CVD laws.

Although most AD/CVD orders have narrow individual economic effects, our

[3]This paper differs considerably from USITC (1995a), which also examines this issue. First, our base year is 1993, rather than 1991, which means addition of important cases, such as the 1992 steel cases. Second, the CGE model used has been extended to model subject and nonsubject imports separately, which allows direct treatment of subject imports and explicit analysis of trade diversion effects. Finally, unlike USITC (1995a), we provide a variety of sensitivity analysis which illuminate and qualify results in important ways.

analysis finds that the collective effect of U.S. AD/CVD law may rival the largest import restraint programs in the United States. The largest estimate we present suggests that the presence of outstanding AD/CVD orders represents a collective net economic welfare cost to the U.S. economy of $3.95 billion in 1993. With the exception of the Multifiber Arrangement (MFA) restrictions, this estimate of the welfare cost from the AD/CVD laws is larger than any other U.S. import restraint program in place in 1993, including the so-called Jones Act maritime restrictions, and the dairy and sugar import restraint programs.[4] These same estimates show that the three sectors with the largest individual welfare costs due to the presence of AD/CVD orders are telephones and pagers ($976 million), bearings and crankshafts ($848 million), and textiles and industrial belts ($577 million). Our welfare estimates show some sensitivity to modeling assumptions, but all plausible scenarios considered still place U.S. AD/CVD laws as one of the costliest U.S. import restraint programs. Finally, we find that disregarding the ability of foreign firms to avoid AD duties through their pricing decisions (i.e., treating the effect of observed 1993 AD duties as simple ad valorem tariffs) underestimates the welfare effects of U.S. AD/CVD laws by an order of magnitude.

The rest of this paper is organized as follows. First, because it is important in understanding our modeling concerns, we review the salient points connected with implementation and assessment of AD/CVD orders. Next, we briefly describe the CGE model used in this analysis, detail the methodology used to model AD and CVD orders, present the data on AD/CVD margins, and describe how these margins are concorded to our CGE model sectors. Following that, we present our results, explore additional considerations, and conclude the paper.

2. Implementation and assessment of AD/CVD orders

The U.S. AD/CVD laws are administered by the USDOC and USITC, each with distinct roles in the process. When a petition is filed, the USDOC determines whether the subject product is being sold at ''less than fair value'' in the United States (in AD cases) or if a subsidy is being provided for the subject product (in CVD cases). Selling at less than fair value (or dumping) is defined as selling a product in the United States at less than ''normal'' value, which is generally based on a foreign firm's own home market sale price.[5] The USDOC also calculates an

[4] USITC (1995b) estimates the 1993 welfare costs of the MFA (over $10 billion), the Jones Act ($2.8 billion), the dairy restraints ($1 billion), and the sugar restraints ($710 million).

[5] If home market sales are inadequate, then normal value is based on sale prices in third country markets. If third country sales are inadequate, then normal value is based on a constructed value for the foreign like product using manufacturing costs, selling, general and administrative costs, profits and packaging costs.

ad valorem dumping margin equal to the percentage difference between the U.S. price and normal value for AD cases, and subsidy margins equal to the estimated ad valorem equivalent of the foreign subsidy for CVD cases. The USITC determines whether the relevant U.S. domestic industry has been materially injured, or is threatened with material injury, by reason of the imports subject to its investigation.

If an affirmative preliminary determination is made by both the USDOC and the USITC, then the importer must post a cash deposit, a bond or other security for each entry equal to the preliminary margin determined by the USDOC.[6] This requirement stays in effect until either the USDOC or the USITC makes a negative final determination. If an affirmative final determination is made by both the USITC and USDOC, then USDOC issues an AD or CVD order to levy a duty equal to the estimated dumping or subsidy margin on the subject product. When a subject foreign product enters the United States, the importer must pay Customs a cash deposit equal to the margin times the value of the subject product. However, these cash deposits do not necessarily represent the final amount of duties to be assessed on the subject imports. Rather, the margin determined in USDOC's final investigation is only used as a basis for estimating the duty liability of the importer. The actual liability of the importer may be determined in subsequent years by the USDOC. Before 1984, this was accomplished by automatic yearly administrative reviews by the USDOC. However, since 1984, such reviews have become voluntary; that is, unless an interested party requests a review, the duties assessed are those found in USDOC's final determination (or most recent administrative review). The purpose of an administrative review is to adjust the margin on subject imports to reflect changes in the difference between the foreign firm's U.S. price and their normal value or in the subsidy rate. If a subsequent review determines that the margin during the review period is different from the previous margin used as a basis for the importer's cash deposit, a bill (or refund) in the amount of the difference plus interest is assessed (or rebated). From 1980 through 1991, Shin (1994) reports that over 80% of outstanding AD orders were subject to at least one administrative review. For modeling purposes, it is assumed that these reviews are accurate and consistent, so that when the foreign firm changes its U.S. price, it has some degree of certainty as to what the effective duty assessment will be.[7]

[6] In the period 1980 through 1993, the USITC made an affirmative preliminary determination in approximately 80% of the cases that it adjudicated, see USITC (1995a).

[7] Some observers contend that there is uncertainty involved with USDOC administrative reviews because USDOC can change its methodology for determining margins with each investigation or review. For example, see Boltuck et al. (1991); Congressional Budget Office (1994).

3. Methodology

3.1. The CGE model

There are a number of important reasons why a CGE model is appropriate for our analysis. First, although there has been extensive research on the economics of AD/CVD law, most previous empirical economic analysis of AD/CVD orders has focused on specific AD/CVD cases using partial equilibrium models.[8] Although this work has greatly increased our understanding of the actual impact of AD/CVD cases on particular sectors of the U.S. economy, one cannot credibly estimate the collective impact of all orders across so many sectors with these methods. This may be particularly true in this study since we are examining the collective impact of smaller multisector shocks. Kokoski and Smith (1987) find that partial equilibrium welfare estimates in these types of experiments (many multisector shocks) tend to exhibit large errors.

Second, the U.S. economy currently has hundreds of AD/CVD orders in place on a wide variety of imports, and these industries often have important upstream and downstream linkages with other production sectors in the economy. In order to accurately assess the collective impact of the AD/CVD laws on the U.S. economy, it is important to model the many AD/CVD orders together in a consistent framework that accounts for linkages between affected and non-affected industrial sectors. This is a specific advantage of CGE models over other alternatives and a principal reason why it is used for analysis in this paper.

Finally, CGE simulation models have been used to estimate the economic effects of most other significant trade barriers in the U.S. economy. General equilibrium analysis has been used to assess the welfare effects of U.S. restraints on textiles and apparel, steel, automobiles, agricultural products, and Jones Act restrictions on maritime shipping.[9] Thus, our analysis of U.S. AD/CVD laws with a similar CGE model will allow us to more directly compare the effects of U.S. AD/CVD laws in relation to other forms of U.S. import restraint programs. This is important since studies of general reductions or complete liberalization of U.S.

[8] Important theoretical papers on the economics of AD/CVD orders include Anderson (1992), (1993); Clarida (1993); Ethier (1982); Brander and Spencer (1985) among many others. Partial equilibrium analyses include the case study chapters in USITC (1995a); Morkre and Kelly (1994); Murray and Rousslang (1989). For another collection of case studies, see Finger (1993), and for an econometric study, see Staiger and Wolak (1994).

[9] General equilibrium analysis of these trade restraint programs can be found in USITC (1995b). See also, de Melo and Tarr (1990) for estimates of the welfare costs of U.S. quotas in textiles and apparel, steel and automobiles, and Francois et al. (1996) for an estimate of the effect of U.S. cabotage restrictions in ocean shipping. In addition, the more well-known partial equilibrium studies of U.S. import restraints include Feenstra (1984); Dinopoulos and Kreinin (1988) (automobiles), and Tarr and Morkre (1984) (automobiles, steel, sugar, and textiles).

import restraints often do not address reductions or elimination of AD/CVD orders.

We employ a CGE model that follows standard conventions and has been used to analyze a variety of commercial policies.[10] In brief, it is a Walrasian model in which a representative household maximizes utility subject to a budget constraint, constant marginal cost firms maximize profits, and government redistributes revenues from trade policies in lump sum fashion. Total capital and labor stocks are held fixed. Production technology is modeled using a constant elasticity of substitution value added function, whereas a Leontief (fixed coefficients) function is assumed between value added and intermediate products, and between different intermediate products. Domestic and imported goods are modeled as imperfect substitutes via an Armington specification. Thus, domestic and import industries have a degree of market power contingent on the substitutability of goods from the two sources. In addition, subject and nonsubject imports are disaggregated in the model so they compete with each other based on the relative prices from the two import sources. A CES technology is used to identify aggregate imports in sectors that have imports subject to AD/CVD orders. This modeling of separate import sources in a single-country CGE model is a significant new extension of standard models. Imperfect substitutablity is assumed on the export side, with a constant elasticity of transformation function between domestic and foreign sales for each sector. Aggregate government deficits and investment spending are held fixed, since substitution between present and future consumption would make static welfare comparisons difficult.

As in de Melo and Tarr (1990); Francois et al. (1996), and others, we use an equivalent variation (EV) measurement to indicate welfare changes in the economy from policy changes. With government and investment spending held constant in real terms, the EV measure can be calculated through the household sector. Thus, our EV measure calculates the income that would have to be given to households in the base period (with AD/CVD orders in place) to achieve the same level of overall economic welfare after removal of these orders.

The unique feature of the CGE model we employ is that it has the capability of modeling up to 491 separate production sectors.[11] The model's social accounting matrix (SAM), based on Bureau of Economic Analysis input–output tables and national income and product accounts, organizes data on interindustry flows, value added, trade flows, and final demand for 491 sectors in agriculture, manufacturing, and services. This relatively high level of disaggregation is important given the very targeted nature of AD/CVD orders. For example, the more significant AD/CVD orders can cover a substantial share of the products contained in a

[10]In particular, we build upon the CGE model of the United States economy developed at the USITC. Specification of this model can be found in Appendix A.

[11]These sectors are detailed at roughly the 4-digit Standard Industrial Classification level.

particular sector in the model. Thus, individual production sectors can be modeled specifically, and economic effects of liberalization for these specific sectors can be reported separately. In the modeling exercise, 20 sectors of interest are highlighted and the remaining sectors are aggregated into nine broad sectors that represent the remainder of the U.S. economy. The final significant input into the model are the parameters, which represent the behavior of economic agents in the U.S. economy. These parameters are in the form of elasticities and are described in more detail in Reinert and Roland-Holst (1991). Finally, we calibrate our model to 1993 data.

3.2. Modeling AD and CVD orders

Modeling the economic effects of outstanding AD/CVD orders must take into account a number of important issues concerning the differences between how AD/CVD duties are calculated, collected, and reviewed. CVD duties are intended to compensate for the effect of subsidization of the subject good by a foreign government. Thus, calculation of the CVD margin by USDOC is unrelated to any changes in behavior, such as pricing decisions, by the foreign firm. Therefore, in the case of a CVD order, modeling the margin as a simple ad valorem tariff is appropriate, and this is the method used to model CVD orders. More formally,

$$P_{\mathrm{D}} = e(1 + \mu)P_{\mathrm{W}} \tag{1}$$

where P_{D} is the domestic U.S. price of imported goods in the sector, P_{W} is the world price of the import good, e is the exchange rate, and μ is the ad valorem CVD margin.

Previous empirical studies of the effect of U.S. AD/CVD laws have assumed that Eq. (1) holds for AD duties, as well as for CVD duties.[12] While this may be appropriate for examining short-run effects of an AD duty, accurate modeling of AD order effects, especially those that have been in place for more than a year, may be more complicated. The rest of this section explains the complications and our modeling strategy to address them.

The AD margin determined by USDOC in its final investigation represents the duty amount that will ultimately be levied on the subject imports, unless the difference between the U.S. price and normal value changes. Since the foreign firm is responsible for setting both prices, it can raise its U.S. price, lower its home-market price or normal value, or some combination of both to close the margin and avoid AD duties (assuming it requests an administrative review). If the foreign firm decides not to react to an AD order by changing prices, then the duty collected each year should be equal to the final margin determination made at the

[12]For example, see Murray and Rousslang (1989); Morkre and Kelly (1994), and chapters 5–14 of USITC (1995a).

time of the initial investigation. In this case, modeling the AD margin as an ad valorem tariff is appropriate. More formally,

$$P_{\mathrm{D}} = e(1 + \pi)P_{\mathrm{W}} \tag{2}$$

where π is the ad valorem AD margin.

However, as reflected in International Trade Administration (1994), it is often the case that the actual AD duties assessed and collected are substantially smaller than the final margins determined by USDOC at the time of the initial investigation. This occurs because the foreign firm's pricing decisions have changed and the margin has been subsequently reduced through an administrative review. DeVault (1993) found that average antidumping duty rates fall by 40% after the first administrative review is conducted. In addition, case studies in USITC (1995a) find that administrative reviews for frozen concentrated orange juice, color picture tubes, brass sheet and strip, and bearings have resulted in substantially lower AD duties. Unfortunately, the data do not indicate whether the foreign firm has been assessed a reduced duty as a result of a reduction in the import's normal value, an increase in its U.S. price, or some combination of those changes.

However, there are compelling reasons and empirical evidence that the overwhelming part of the price change occurs with the U.S. price, not the foreign firm's home market price. First, the smaller the foreign firm's U.S. sales relative to its home market sales, the less willing the foreign firm will be to alter its home price. The assumption that the U.S. sales of a foreign firm are generally smaller than their home market sales is quite reasonable (e.g., see Venables, 1985). Second, and more compelling, procedures used by USDOC to determine margins in administrative reviews make it much less certain that a firm can alter its margin by adjusting its home market price rather than changing its U.S. price. To determine margins, the USDOC compares the U.S. price to ''normal'' value, which is generally, but not necessarily the foreign firm's own home-market price. However, as Palmeter (1991) explains, in calculating normal value the USDOC can and does exclude prices in the firm's home market which are deemed ''below cost sales'', i.e., sales prices below average total cost. Thus, a firm's strategy to reduce its margin by reducing its home market price may be completely ineffective if USDOC rules these sales are ''below cost''. No such provision stops a foreign firm from raising its U.S. price to obtain a lower margin. In addition, when USDOC rules that there are no comparable home market sales, it examines either sales by the firm to a third country (USDOC decides which country to consider) or it constructs the normal value from estimated cost and profitability data. In these cases, it is possible that there are home market sales, but they are ruled either as sales of a substantially different product or as below cost. Thus, because of wide discretion on the part of the USDOC, altering home market prices may have no effect on the determination of normal value, and hence, the margin levied on the foreign firm's product. Intuitively, the U.S. AD/CVD laws are intended to help

domestic firms, which benefit from higher U.S. prices, not necessarily lower prices in foreign markets. Thus, we should not be surprised that the administration of the U.S. AD/CVD laws give foreign firms incentives to raise U.S. prices, rather than lowering their home market prices. As expected, the empirical evidence demonstrates that foreign firms substantially alter their U.S. prices after they become subject to an affirmative AD ruling. In addition, this increase in the U.S. price of subject imports is also supported by many of the case studies found in USITC (1995a).[13]

Due to the structure and administration of U.S. AD/CVD laws, as well as the empirical evidence on foreign firms' U.S. pricing behavior after affirmative AD cases, we assume that lower margins from administrative reviews stem from increases in foreign firms' U.S. prices of subject imports, not from lower home-market prices.[14] This leaves two cases for consideration:

1) The foreign firm leaves its U.S. price unchanged; or
2) The foreign firm raises its U.S. price, to be assessed a lower AD duty.

Under both cases the price effect for U.S. consumers remains the same, i.e., as the foreign firm raises its price, administrative reviews should lower the margin by an equivalent amount. More formally,

$$P_{\mathrm{D}} = e(1 + (\pi_0 - \rho) + \rho)P_{\mathrm{W}} \tag{3}$$

where π_0 is the initial ad valorem AD margin determined at the time of the investigation, ρ is the ad valorem price increase by the foreign firm due to the incentives created by the administration of AD law, and $(\pi_0 - \rho)$ is the margin we observe in our base year, 1993. In effect, rather than allow the U.S. government to collect revenues from the AD order, the foreign firm can raise its U.S. price (up to the amount of the initial margin) in the United States without affecting the final price paid by consumers, and thus, without affecting the level of demand for its product.

Although the pricing decision of the foreign firm in the presence of an AD order may have no effect on the price ultimately paid by the U.S. consumer, whether the foreign firm decides to raise its price or not significantly affects the overall economic welfare consequences in the United States. Specifically, in the first case

[13]Specifically, chapter 3 in USITC (1995a) presents statistical evidence that import unit values (a proxy for the foreign firms' U.S. price) for products subject to affirmative decisions rise by 83% more after the case than for products that receive non-affirmative decisions (see table 3-11, p. 3-13). With regard to particular cases, after remedies were put in place, Brazil changed its export pricing formula for frozen concentrated orange juice, the price of subject imported color picture tubes and ball bearings rose considerably, and the import prices of brass sheet and strip rose above domestic prices.

[14]In Section 7.2, we explore the implications of allowing a discriminating monopolist to optimally set U.S and home market prices.

(the foreign firm does not change its U.S. price), duties are collected by Customs at a rate equal to the margin calculated by USDOC. In this case, the AD margin can be accurately modeled as a simple ad valorem tariff, which generates revenue for the U.S. Treasury. The tariff revenue is equal to $e\pi_0 P_W M$, where M is the level of imports.

In the second case, the foreign firm raises its U.S. price to divert U.S. tariff revenue for itself. This action has very different welfare consequences. In fact, the welfare effect in this case is similar to the analysis of a quantitative restriction, such as a quota or a voluntary restraint agreement, in which the foreign firm holds the quota rights. Tariff revenues and foreign-held quota rents have different welfare consequences precisely because quota rents represent a transfer of income out of the U.S. economy, whereas tariffs transfer income within the U.S. economy. In this case, when a foreign firm responds to an AD order by raising its U.S. price of the subject import, there is an income transfer (i.e., an economic welfare gain) from the U.S. economy to the foreign firm.[15] Thus, for AD orders where the foreign firm has partially raised its U.S. price, the remaining tariff revenues are $e(\pi_0 - \rho)P_W M$ and the quota rents are $e\rho P_W M$.

4. Data

4.1. AD/CVD orders

In 1993, there were 306 AD/CVD orders for which Customs collected duties. This number is significantly less than the universe of cases (over 1,100 since 1980) because many cases have resulted in negative determinations, have been terminated, suspended, revoked, or have had imports cease to enter the United States.[16] Modeling the economic effects of these active AD/CVD orders when we treat them both as ad valorem tariffs only requires data on μ_{93} (the 1993 CVD margin) and π_{93} (the 1993 AD margin). When modeling AD duties as in Eq. (3), we also require ρ, the amount by which a foreign firm has raised its U.S. price in response to the initial AD margin at the time of the case.

[15]Modeling case two in this way may be more precise than modeling a traditional quantitative restriction. When modeling a quantitative restriction, the equivalent price effect of the restriction must be estimated, but in this scenario, the price effect is analytically equal to the price effect represented by the initial AD margin minus the observed margin in 1993.

[16]There are a variety of reasons why subject imports have ceased entering the U.S. market. For example, importers may be facing prohibitively high AD margins or the administrative burden and open liability of future margins may deter subject imports. Because these prohibitive orders are not modeled, our estimated welfare impacts are necessarily underestimated with respect to this sort of bias. However, there were only a handful of prohibitive orders in place, and these were on products that had relatively small trade flows at the time of the case. See Section 7 below for a discussion of other considerations that may lead to an over- or underestimation of the welfare impacts.

1993 AD/CVD duty rates were determined using Customs and USDOC data, but the price response of foreign firms, ρ, is not available. However, from Eq. (3) the effective margin collected by Customs in 1993, π_{93}, is equal to $\pi_0 - \rho$, where π_0 is the initial AD margin. Initial AD margins are available from USITC reports related to each investigation and listed in the *Federal Register*. Therefore, since our data provides π_0 and π_{93}, we calculate $\rho = \pi_0 - \pi_{93}$, and implement Eq. (3) in the model.

The next issue is that the AD/CVD margins, determined by the USDOC in the first investigation and subsequent administrative reviews, and the 1993 AD/CVD margins collected by Customs for individual product entries, are categorized at detailed levels in the HTS. Thus, these margins must be aggregated to the level of the model sectors. Once aggregated into the model sectors, we find that close to 100 of the CGE model sectors are affected in some manner by an AD or CVD order. Most sectors covered by orders are manufacturing industries; however, several agricultural products are also covered. The next section describes the trade-weighted aggregation of the 1993 CVD duty rates (μ_{93}), initial AD margins (π_0), and the actual 1993 AD duty rates (π_{93}) to the level of our modeling sectors.

4.2. Initial and 1993 AD/CVD margins

During AD/CVD investigations and administrative reviews, USDOC determines individual margins for each investigated firm that exports from the foreign country subject to the investigation. In addition, USDOC also determines a margin that is applicable for all other firms that might also export the subject product from that same foreign country. Specifically, USDOC determines an ''all other'' margin for a country, which is a trade-weighted average margin determined from the firms identified in the initial investigation. Since firm level trade flows are not available, the ''all other'' margin is used for each affected country by HTS product category.

Disaggregation of subject and nonsubject imports in the model are determined by identifying the share of aggregate imports in each sector that are subject to AD/CVD orders. The amount of trade within a HTS product category that is covered by particular AD/CVD orders needs to be accounted for, since some orders do not affect all the products within a HTS category.[17] Specifically, the share of each HTS product category subject to an outstanding AD/CVD order in 1993 is used to adjust the level of subject imports from each named country. The share of 1993 subject imports in each sector is calculated by aggregating across all HTS lines for all named countries.

The margins applied to these subject imports are trade-weighted country-specific average margins. These country-specific margins are aggregated across countries

[17]Nearly 78% of the HTS categories identified are fully affected by AD/CVD orders. For the cases that were only partially affected, we were able to specify the proportion of the category affected to reasonably narrow levels.

using weights determined by each country's 1993 share of subject trade within the HTS product category to arrive at an effective margin for imports subject to AD/CVD orders.[18] The final step is to aggregate the margins from the detailed HTS level to the 491 industry sectors contained in the model. Once again, this aggregation uses 1993 trade volumes to assign weights that account for each HTS category's share of total subject imports across the relatively broad sectors.

5. CGE model sectoring scheme

Table 1 presents: 1) the CGE sectors substantially affected by outstanding AD/CVD orders in 1993; 2) the size of the sectors as represented by the value of their 1993 domestic output; 3) the import volume of the sector; 4) the share of aggregate imports subject to AD/CVD orders; 5) the trade-weighted 1993 AD/CVD ad valorem tariff rates applied to subject imports; and 6) the trade-weighted estimate of the amount that foreign firms's have raised prices on subject imports due to an AD order (ρ). Recall that ρ is calculated as the difference between the average initial AD margin and the average 1993 AD duty rate for each CGE sector. This difference represents the maximum extent to which foreign firms have raised their U.S. price to reduce the margin determined by the USDOC in subsequent administrative reviews.[19] Non-affected sectors in our model are aggregated into nine sectors representing the rest of the U.S. economy. The CGE model we employ has the capability to disaggregate the affected sectors to even finer detail; however, AD/CVD cases often cover products that span a variety of industrial sectors simultaneously. Consequently, we have constructed sectors to minimize the degree to which products from important individual AD or CVD cases were divided across different highlighted sectors. Table 2 presents the sectors constructed for this exercise as well as the principal AD/CVD cases that affect those sectors.

Finally, the estimated average 1993 duty rates and price effects are consistent with the timing of administrative reviews. Specifically, many cases from the early 1990s (e.g., steel products) have not had their margins changed by administrative reviews by 1993, so the sectors affected by these orders have higher average ad

[18]Since 1993 represents the final year of the sample, the trade weights used give less weight to high margin countries because if the AD/CVD orders were not in place, imports would have been higher and the trade weights would have been larger. We test the sensitivity of our estimates to this methodology below.

[19]From Table 1 it is clear that the ratio of the ad valorem duty rate to the additional price effect, ρ, varies considerably across sectors. There are a number of potential reasons for this, including 1) differences in market structure, 2) differences in time elapsed since the initial case determination as of our base year, 1993, and 3) idiosyncracies of the administrative review process. Explaining these differences goes beyond the scope of this paper, however, we explore the role of market structure to some extent below and the sensitivity of our results to these considerations.

Table 1
1993 summary data, by sector

Sector	U.S. domestic output ($ Billions)	U.S. import volume ($ Billions)	Share subject imports (Percent)	Subject 1993 AD/CVD duty (Percent)	Subject additional AD price effect (Percent)
Bearings and Crankshafts	274.1	42.3	3.6	4.07	40.73
Chemicals and Drugs	241.4	21.7	0.4	3.77	3.62
Computer Parts	137.6	67.5	11.1	1.03	3.99
Misc. Final Consumer Goods	67.0	11.1	4.1	2.13	11.94
Flowers	10.4	0.9	28.1	1.59	1.58
Fruits and Vegetables	45.5	5.0	3.2	0.01	2.29
Hand, Electric and Professional Tools	116.8	13.7	1.4	30.98	15.38
Industrial Machinery	59.4	6.4	4.4	0.64	38.99
Meat and Fish	177.4	8.4	5.5	1.57	0.11
Metal Products	75.7	5.8	4.2	9.38	10.06
Mining and Construction Materials	8.6	1.0	11.4	13.78	5.44
Nonferrous Metals	28.1	6.7	1.2	20.89	10.78
Rubber and Plastic Products	216.7	13.5	2.3	5.69	7.52
Steel Products	82.3	10.0	22.2	13.63	6.27
Telephones and Pagers	80.5	15.3	6.6	0.38	95.22
Textiles and Industrial Belts	220.1	66.7	5.3	0.93	13.04
Transformers and Electric Motors	17.1	3.7	1.9	0.16	22.48
TV Picture Tubes and Receivers	40.4	25.1	3.2	0.35	28.15
Typewriters and Wordprocessors	4.2	0.5	15.0	23.22	5.64
Wood and Lumber	50.9	7.2	69.2	5.82	n/a

Source: U.S. domestic output and import volume by sector from official statistics of USDOC. Average ad valorem tariff equivalents and additional price effects calculated from official statistics of USDOC, USITC, and Customs.

Table 2
Principal AD/CVD cases in each affected CGE model sector

Affected sectors	AD/CVD Investigation			
	Product	Type[a]	USITC Case Number	Year[b]
Bearings and Crankshafts	Roller Chain other than Bicycle	AD	1921-111	1972
	Tapered Roller Bearings	AD	731-341 to 731-346	1986
	Forged Steel Crankshafts	AD	731-350 to 731-353	1986
	Antifriction Bearings	AD	731-391 to 731-399	1988
	Antifriction Bearings	CVD	303-19 and 303-20	1988
Chemicals and Drugs	Cyanuric Acid	AD	731-136	1983
	Industrial Phosphoric Acid	AD	731-365 and 731-366	1986
	Industrial Phosphoric Acid	CVD	701-286	1986
	Electrolytic Manganese Dioxide	AD	731-406 and 731-408	1988
	Sodium Sulfur Chemical Compounds	AD	731-465 to 731-468	1990
	Sulfur Dyes	AD	731-548 to 731-551	1992
Computer Parts	Ferrite Cores	AD	1921-065	1970
	64k DRAMs	AD	731-270	1985
	3.5″ Microdisks	AD	731-389	1988
	Flat-Panel Displays	AD	731-469	1990
	DRAMs of 1MB and Above	AD	731-556	1992
Misc. Final Consumer Goods	Photo Albums and Filler Pages	AD	731-240 and 731-241	1985
	Porcelain-on-Steel Cookingware	AD	731-297 to 731-299	1986
	Stainless Steel Cookingware	AD	731-304 and 731-305	1986
	Sparklers	AD	731-464	1990
	Fans	AD	731-473	1990
Flowers	Fresh Cut Flowers	AD	731-327 to 731-334	1986
	Fresh Cut Flowers	CVD	701-276	1986
Fruits and Vegetables	Sugar	AD	1921-198 to 1921-200	1978
	Red Raspberries	AD	731-196	1984
	Rice	CVD	753-28	1985
	Kiwifruit	AD	731-516	1991

Table 2. Continued

Affected sectors	AD/CVD Investigation			
	Product	Type[a]	USITC Case Number	Year[b]
Hand, Electric and Professional Tools	Steel Jacks	AD	1921-49	1965
	Drafting Machines	AD	731-432	1989
	Multiangle Laser Light-Scattering Instrument	AD	731-455	1990
	Heavy Forged Hand tools	AD	731-457	1990
	Hand-Held Aspheric Opthalmoscopy Lenses	AD	731-518	1991
Industrial Machinery	Self-Propelled Paving Machines	AD	1921-166	1976
	Carton-Closing Staples and Machines	AD	731-116 and 731-117	1983
	Forklift Trucks	AD	731-377	1987
	Mechanical Transfer Presses	AD	731-429	1989
Meat and Fish	Live Swine and Pork	CVD	701-224	1984
	Atlantic Salmon	AD	731-454	1989
	Atlantic Salmon	CVD	701-302	1989
Metal Products	Iron Metal Castings	CVD	303-13	1980
	Iron Construction Castings	AD	731-264	1985
	Iron Construction Castings	CVD	701-249	1985
	Steel Wire Nails	CVD	549806[c]	1987
	Steel Wire Rope	CVD	614701[c]	1990
	Various Steel Pipe Cases	AD	731-131 to 731-132	1983
		AD	731-354	1987
		AD	731-532 to 731-537	1991
	Various Pipe Fittings Cases	AD	731-278 to 731-280	1985
		AD	731-308 to 731-310	1986
		AD	731-347 to 731-348	1986
Mining and Construction Materials	Ceramic Tile	CVD	201003[c]	1981
	Gray Portland Cement	AD	731-451 and 731-461	1990
Nonferrous Metals	Brass Sheet and Strip	AD	731-311 to 731-317	1986
	Brass Sheet and Strip	AD	731-379 to 731-380	1987
	Silicon Metal	AD	731-470 to 731-472	1990
	Pure and Alloy Magnesium	CVD	701-309	1991
	Ferrosilicon	AD	731-570 and 731-641	1992

Rubber and Plastic Products	Industrial Nitrocellulose	AD	731-96	1982
	Industrial Nitrocellulose	AD	731-440 to 731-444	1982
	Granular Polytetrafluoroethylene Resin	AD	731-385 and 731-386	1987
	PET Film	AD	731-458 and 731-459	1990
	Extruded Rubber Thread	AD	731-527	1991
	Extruded Rubber Thread	CVD	303-22	1991
Steel Products	Pig Iron	CVD	701-002	1979
	Various Carbon Steel Products	CVD	701-225 to 701-234	1984
	Various Carbon Steel Products	AD	731-573 to 731-618	1992
	Various Carbon Steel Products	CVD	701-319 to 701-354	1992
Telephones and Pagers	Cellular Mobile Phones	AD	731-207	1984
	Business Telephone Systems	AD	731-426 to 731-428	1989
Textiles and Industrial Belts	Fish Netting	AD	1921-85	1970
	Cotton Yarn	CVD	333002[c]	1976
	Spun Acrylic Yarn	AD	731-2	1978
	Cotton Shop Towels	AD	731-103	1982
	Cotton Shop Towels	CVD	701-202	1983
	Textile and Textile Products	CVD	753-1 to 753-21	1984
	Industrial Belts	AD	731-412 to 731-419	1988
	Sweaters	AD	731-448 to 731-450	1989
Transformers and Electric Motors	Large Power Transformers	AD	1921-86 to 1921-88	1970
	Large Electric Motors	AD	731-007	1979
TV Picture Tubes and Receivers	Electronic Tuners	AD	1921-64	1968
	Television Receivers	AD	1921-66	1968
	Color Television Receivers	AD	731-134 and 731-135	1983
	Color Picture Tubes	AD	731-367 to 731-370	1987
Typewriters and Wordprocessors	Portable Electric Typewriters	AD	731-12	1980
	Word Processors	AD	731-483	1991
Wood and Lumber	Softwood Lumber	CVD	701-312	1991

[a], Type of investigation: Antidumping (AD) or Countervailing Duty (CVD).
[b], Year the investigation was filed, not necessarily the year the duty was first assessed.
[c], Customs case number. These investigations did not undergo an injury determination at the USITC.
Source: U.S. International Trade Commission.

valorem duty rates and smaller price effects. Alternatively, for cases that have had administrative reviews completed, such as bearings and crankshafts, average 1993 AD duty rates are substantially lower than the average initial margin estimated for those sectors, and thus, generate a larger, positive estimated price effect.

6. Economic effects of AD/CVD order removal

Microeconomic trade theory suggests that removal of outstanding AD/CVD orders should result in a number of predictable economic consequences. First, removal of AD/CVD orders should translate into lower import prices of subject products, causing substitution from nonsubject to formerly subject imports. Aggregate import prices will generally decline in those sectors formerly subject to such orders, causing both gains and losses across the U.S. economy. Lower prices obviously mean economic welfare gains to downstream industrial sectors and U.S. consumers. Lower import prices also prompt consumers and downstream industries to substitute away from domestic products to the imports now free of the orders. Thus, domestic industries formerly subject to AD/CVD orders suffer output declines and employ fewer workers in the absence of these orders, while import volumes increase in those sectors. Consequently, upstream suppliers of those sectors formerly subject to orders will also experience a decline in demand for their output.

Table 3 details the changes in aggregate prices, imports, domestic output, and employment across the 1993 U.S. economy when we model AD duties as in Eq. (3) and all outstanding AD/CVD orders are removed. As expected, import volumes are greater and import prices lower for all sectors freed of the orders. In value terms, bearings and crankshafts, telephones and pagers, steel products, and textiles and industrial belts would face the largest import penetration. In percentage terms, typewriters and wordprocessors, steel products, telephones and pagers, and wood and lumber face the largest increase in import volumes. Our estimates indicate that domestic producers shielded by AD/CVD orders do benefit from the these orders, since the removal of these orders results in output and employment losses in sectors with subject imports. The largest domestic losses from order removal occur in bearings and crankshafts, followed by telephones and pagers, steel products, computer parts, and TV picture tubes and receivers. On the other hand, our estimates suggest that AD/CVD orders on flowers, meat and fish, and transformers and electric motors have relatively small impacts on the U.S. economy.

Highlighting the general equilibrium nature of our exercise, the sectors that did not include products subject to AD/CVD orders in 1993, which comprise the rest of the U.S. economy at the bottom of Table 3, are affected by the removal of AD/CVD orders as well. These sectors are impacted through their vertical relationships with the affected sectors, through their competition for factor inputs,

Table 3
Economic effects of AD/CVD order removal

Sector	Changes in 1993 U.S. Economy if All Existing AD/CVD Orders Are Removed						
	Prices		Imports		Domestic Output		Employment
	Import percent	Domestic[a] percent	Value[b]	Percent	Value[b]	Percent	FTEs[c]
Highlighted Sectors							
Bearings and Crankshafts	−1.6	−0.3	701	1.7	−702	−0.3	−2927
Chemicals and Drugs	− 0.1	([d])	9	([d])	−73	([d])	−230
Computer Parts	−0.6	−0.4	87	0.1	−225	−0.2	−1471
Misc. Final Consumer Goods	−0.6	−0.1	23	0.2	−30	−0.1	−165
Flowers	−0.9	([d])	4	0.5	−1	([d])	−10
Fruits and Vegetables	−0.1	([d])	6	0.1	2	([d])	6
Hand, Electric and Professional Tools	−0.6	−0.1	41	0.3	−68	−0.1	−457
Industrial Machinery	−1.6	−0.2	78	1.2	−101	−0.2	−466
Meat and Fish	−0.1	([d])	13	0.2	−9	([d])	−25
Metal Products	−0.8	−0.1	11	0.2	−80	−0.1	−432
Mining and Construction Materials	−1.9	−0.2	15	1.5	−19	−0.2	−82
Nonferrous Metals	−0.4	−0.1	([e])	([d])	−54	−0.2	−118
Rubber and Plastic Products	−0.3	([d])	36	0.3	−169	−0.1	−727
Steel Products	−4.0	−0.6	243	2.4	−387	−0.5	−1400
Telephones and Pagers	−4.5	−1.1	617	4.0	−510	−0.6	−2219
Textiles and Industrial Belts	−0.7	−0.2	286	0.4	−170	−0.1	−1278
Transformers and Electric Motors	−0.4	−0.2	7	0.2	−10	−0.1	−56
TV Picture Tubes and Receivers	−1.0	−0.6	261	1.0	−182	−0.5	−1091
Typewriters and Wordprocessors	−3.6	−0.5	12	2.4	−14	−0.4	−118
Wood and Lumber	−3.9	−0.7	118	1.6	−162	−0.3	−980
Sectors Comprising Rest of the U.S. Economy							
Agriculture, forestry and fisheries	([d])	0.1	2	([d])	−81	([d])	−442
Mining	([d])	([d])	−1	([d])	−48	([d])	−126
Construction	([f])	([d])	([f])	([f])	−4	([d])	−79
Nondurable manufacturing	([d])	([d])	37	0.1	160	([d])	453
Durable manufacturing	([d])	([d])	30	([d])	137	([d])	634
Transportation, communications and utilities	([d])	([d])	58	0.1	50	([d])	163
Wholesale and retail trade	([f])	0.1	([f])	([f])	288	([d])	3460
Finance, insurance and real estate	([d])	0.1	16	0.1	589	([d])	1952
Other services	([d])	([d])	43	0.1	858	([d])	8232

[a]The U.S. market price change is a weighted average of changes in the domestic industry's prices and of changes in its import prices. [b]In millions of 1993 U.S. dollars. [c]Full-time equivalent workers. [d]Percentage change less than 0.1%. [e]Less than 1 million 1993 U.S. dollars. [f]Non-tradeable sector.

and because of the income changes experienced by the household and government sectors. Most of these sectors gain in terms of output and employment (service and trade sectors gain the most), which is not surprising since households experience a relatively large real income effect from lower import prices. The agriculture, forestry and fisheries sector, the mining sector, and the construction sector suffer small losses. This is most likely due to the fact that these sectors are upstream to a sufficient number of sectors now free of orders, which experience output declines.

Table 4 provides detail on the relative changes in subject and nonsubject imports that result from the total elimination of AD/CVD orders. Table 4 shows that AD/CVD orders on subject imports influence imports from third parties. The effectiveness of the order for the domestic industry depends on the extent to which nonsubject imports can replace those subject to an order. The removal of AD/CVD orders causes a change in relative prices of imports from the two sources, increasing the demand of formally subject imports relative to nonsubject imports. Changes in import volumes from each source depend on the share of total

Table 4
Disaggregate trade effects of AD/CVD order removal

Sector	U.S. Import Changes in 1993 if All Existing AD/CVD Orders Are Removed					
	Prices		Imports			
	Subject	Nonsubject	Subject		Nonsubject	
	percent	percent	Value[a]	Percent	Value[a]	Percent
Highlighted Sectors						
Bearings and Crankshafts	−31.7	([b])	1411	98.3	−710	−1.7
Chemicals and Drugs	−6.9	([b])	10	9.7	−1	([b])
Computer Parts	−4.8	([b])	504	6.8	−417	−0.7
Misc. Final Consumer Goods	−12.5	([b])	52	11.7	−29	−0.3
Flowers	−3.1	([b])	7	2.8	−3	−0.4
Fruits and Vegetables	−2.0	([b])	5	3.2	1	([b])
Hand, Electric and Professional Tools	−33.2	([b])	106	83.6	−65	−0.5
Industrial Machinery	−28.5	([b])	154	55.3	−76	−1.2
Meat and Fish	−1.7	([b])	14	3.1	−1	([b])
Metal Products	−16.7	([b])	35	15.6	−24	−0.4
Mining and Construction Materials	−15.7	([b])	33	36.1	−18	−2.0
Nonferrous Metals	−25.3	([b])	25	36.7	−25	−0.4
Rubber and Plastic Products	−11.9	([b])	75	26.4	−39	−0.3
Steel Products	−16.8	([b])	526	27.5	−283	−3.5
Telephones and Pagers	−45.6	−0.3	1087	107.8	−470	−3.3
Textiles and Industrial Belts	−11.3	([b])	620	17.6	−334	−0.5
Transformers and Electric Motors	−18.5	([b])	18	25.9	−11	−0.3
TV Picture Tubes and Receivers	−22.3	([b])	756	96.5	−495	−2.0
Typewriters and Wordprocessors	−22.8	([b])	27	49.9	−15	−3.5
Wood and Lumber	−5.5	([b])	174	3.5	−56	−2.4

[a], In millions of 1993 U.S. dollars.
[b], Percentage change less than 0.1%.

imports subject to AD/CVD orders, the elasticity of substitution between the two sources, and the expansion or contraction of aggregate import demand in the sector. Price reductions of subject import prices are most pronounced in the telephone and pagers; hand, electric and professional tools; bearings and crankshafts; and industrial machinery sectors. Import volumes in the formally subject sectors increase most in the bearings and crankshafts; telephone and pagers; TV picture tubes and receivers; and textiles and industrial belts sectors. Nonsubject imports fall in all but the fruit and vegetables sector, with the largest decreases found in the bearings and crankshafts; TV picture tubes and receivers; telephone and pagers; and computer parts sectors.

Table 5 reports our estimates of the welfare costs of AD/CVD orders on the U.S. economy. We find that the presence of hundreds of AD/CVD orders in 1993 results in a net economic welfare cost to the U.S. economy of $3.95 billion. This figure represents the magnitude by which the costs of these orders in 1993 (from higher prices and accompanying inefficiencies such as the misallocation of labor and physical capital) outweigh the benefits derived by certain sectors from having the orders in place. Of the $3.95 billion welfare gain due to the liberalization of U.S. AD/CVD laws, changes in rent transfers account for roughly half of the

Table 5
Welfare effects of AD/CVD orders

Order Removal Experiment	Welfare Effect[a]
All AD/CVD Orders	3951
Individual sector	
Bearings and Crankshafts	848
Chemicals and Drugs	9
Computer Parts	411
Misc. Final Consumer Goods	79
Flowers	6
Fruits and Vegetables	4
Hand, Electric and Professional Tools	46
Industrial Machinery	143
Meat and Fish	4
Metal Products	41
Mining and Construction Materials	16
Nonferrous Metals	19
Rubber and Plastic Products	41
Steel Products	380
Telephones and Pagers	976
Textiles and Industrial Belts	577
Transformers and Electric Motors	22
TV Picture Tubes and Receivers	291
Typewriters and Wordprocessors	8
Wood and Lumber	38

[a], Estimated by an equivalent variation measure in millions of 1993 U.S. dollars.

impact ($1.97 billion), with the remaining portion attributable to efficiency gains and relative price effects. As mentioned earlier, relative to other U.S. import restraint programs, this estimate places the collective effect of U.S. AD/CVD laws as second only to the MFA in terms of welfare costs experienced by the U.S. economy. With the scheduled phase-out of the MFA under the Uruguay Round Agreements, the AD/CVD laws are poised to become the costliest program restraining trade in the United States. Thus, despite the targeted scope of each individual AD/CVD order, the sheer number of orders and products affected, coupled with their longevity, results in a substantial cost to the U.S. economy that is likely to increase over time.

The remainder of Table 5 reports estimates of the welfare effects from individually removing orders from each affected sector. Although it is not a precise decomposition of our welfare cost estimate of removing all orders simultaneously, it does suggest which orders have the largest impact, in terms of economic welfare. Whereas the orders covering products in the telephones and pagers sector have the highest impact ($976 million), most of the sectors with the large welfare costs are those that primarily provide inputs to important U.S. manufacturing sectors. These include bearings and crankshafts ($848 million), textiles and industrial belts ($577 million), computer parts ($411 million), and steel products ($380 million). The variation in magnitude of the welfare costs across these sectors is due to a number of factors, including the magnitude of the orders, the percentage of the sector that is affected by the orders, the volume of imports in relation to domestic output in the sector, and the extent to which the sector is upstream to other production sectors.

An analysis was conducted to examine the sensitivity of the EV measure to changes in elasticity of substitution between subject and nonsubject imports. A Monte Carlo experiment was run using 1000 vectors of randomly drawn substitution elasticities, each parameter in the vector being chosen from a normal distribution, with a mean equal to base parameter estimate and a standard deviation equal to 20% of the base value. In this exercise, EV varied between $3.68 to $4.24 billion, but had a relatively small $92 million standard deviation away from the estimate in the base simulation. Therefore, the 20% (of mean) standard deviation in the substitution elasticities used in the simulations produced only a 2.3% (of mean) standard deviation in EV. Similar Monte Carlo exercises modifying all the substitution and income elasticities yield qualitatively similar results.

7. Additional considerations

The magnitude of our estimates is affected by many of the underlying assumptions dictated by the modeling technique employed and the various data constraints. There are several assumptions and data constraints that may result in an underestimation or overestimation of the effects of AD/CVD orders on the U.S.

economy. In this section, we focus on several assumptions that may impact the results in our analysis, including: 1) aggregation bias from using 1993 trade shares; 2) the pricing decisions of foreign firms; 3) the effect of imperfect competition; and 4) the welfare effects associated with nonaffirmative AD/CVD investigations. Other concerns not addressed include: 1) accounting for the uncertainty generated in the market once an order is put in place, such as the open liability facing the importer of record; and 2) accounting for the legal, administrative, and other dollar costs associated with AD/CVD investigations.[20]

7.1. Trade-weighting

Of the limitations described above, one that can be addressed adequately in the context of our model is the issue of trade-weighting. The methodology in the previous sections is subject to the critique that it underestimates the effects of AD and CVD orders because it uses trade weights with a potential downward bias: 1993 trade volumes.[21] Since we considered only cases that have resulted in affirmative determinations that have not been revoked or suspended prior to 1993, trade flows associated with these cases will be reduced by the AD and CVD duties applied to these imports. We use a straight-forward methodology to estimate the possible underestimation effects on the entire sample: we quantify the degree to which this distortion in trade weights affects our estimates for the subset of AD/CVD cases initiated from 1990 to 1993.[22] We apply two sets of trade weights (those from 1989 and those from 1993) to assess and compare the impacts of these cases using estimated import shares that reflect relatively undistorted and relatively distorted trade weights. Trade weights from 1989 are expected to contain the least amount of distortion because the cases in the sample were initiated after that year.

Table 6 reports the results of this analysis.[23] The total welfare effects are reported in the first row and the results from liberalizing one sector at a time are reported in the rows that follow. The overall economic impact of 1990–93 AD/CVD orders differs considerably using prior versus end-of-period trade weights to calculate the applied margins: the estimated welfare costs for this subset of cases is over a third higher ($855 million versus $627 million) when nondistorted 1989 trade weights, rather than order-distorted 1993 weights, are

[20]USITC (1995a) reports that, in general, a simple case costs about $250 000 and a more involved case can cost upwards of $1 million.

[21]Anderson and Neary (1992); Bond (1995) are recent papers examining this issue.

[22]For this study, the impact of all cases cannot be assessed with the same technique since we evaluate cases initiated from the 1960's to 1993. Trade weights constructed from 1960's trade flows would be inappropriate, as would an average or any year within the period being evaluated. In addition, changes to the system of classifying U.S. imports makes gathering trade volumes for subject products before 1989 exceedingly difficult because of concordance issues.

[23]The model used for this analysis does not disaggregate subject and nonsubject imports. The qualitative impact of the alternative trade-weights is not altered by this simplification.

Table 6
Welfare effects under alternative import weights (1990–93 orders)

Sector	1989 Import Weights[a]	1993 Import Weights[a]
1990–93 AD/CVD Orders	855	627
Individual sector		
Chemicals and Drugs	1	1
Computer Parts	([b])	([b])
Misc. Final Consumer Goods	15	11
Hand, Electric and Professional Tools	10	12
Industrial Machinery	([b])	([b])
Metal Products	28	16
Mining and Construction Materials	25	1
Nonferrous Metals	16	6
Rubber and Plastic Products	7	4
Steel Products	605	328
Telephones and Pagers	([b])	([b])
Textiles and Industrial Belts	114	214
Typewriters and Wordprocessors	6	3
Wood and Lumber	29	32

Note: This trade-weighting exercise does not consider AD/CVD orders instituted prior to 1990.
[a], Estimated by an equivalent variation measure in millions of 1993 U.S. dollars.
[b], Less than one million dollars.

used. Running the trade-weighting analysis for 11 individual sectors over this same period tells a generally consistent story.

7.2. Foreign firm pricing decisions

There is also a modeling concern that could lead to an overestimation of the welfare costs: the observed lowering of AD duties may be from foreign firms lowering prices of the subject product in their own home market, rather than raising the subject product's U.S. price. We believe this unlikely to happen to a significant degree. First, case study evidence cited above reveals that subject import prices often rise significantly after an affirmative AD determination. Second, this is only a possible scenario if the USDOC constructs ''normal'' value as the foreign firms' home price. In many cases, the U.S. price is compared to a constructed cost or third-country sales price. In addition, USDOC has the ability to rule out what it deems as ''below cost'' home sales prices by the foreign firm.

Nevertheless, we also run the model assuming that only the ad valorem AD duties collected in 1993 represent the full effect of these orders; i.e., we assume that any reduction in AD duties results solely from home market price reductions by foreign firms. This should affect U.S. welfare considerably, since there are no rents captured by the foreign firm at the expense of U.S. consumers from U.S. price increases by the foreign firm in this case. We find that the estimated welfare

costs of all AD/CVD orders in 1993 is $209 million when we assume that reduction in AD duties over time resulted from the foreign firm lowering its home market price. This is more than an order of magnitude smaller than our earlier finding. However, as we have argued, this scenario is unrealistic. Ignoring the actual operation of U.S. AD/CVD laws over time and the incentives they give foreign firms to change pricing decisions, may result in severe underestimation of the welfare costs of these laws on the U.S. economy. In addition, this analysis suggests that the impact of CVD duties are relatively small compared to AD duties.

Alternatively, one can use theory of a firm's pricing decision when facing an AD order to provide intuition on how much a firm would raise its U.S. price, provided the USDOC uses home price as ''fair value'' and does not rule out any home transactions as ''below cost''. Following Boltuck (1987), one can specify a simple model of a discriminating monopolist in two markets, its home market and the U.S. market, facing an AD order in the U.S. market.[24] Using reasonable estimates for the parameters necessary for the analysis, this model suggests that the U.S. price rises by 60% of the duty, while the home price falls by 40% to eliminate the AD duty. Thus, for comparison we run a scenario assigning 40% of the reduction in AD duties over time to the foreign firm reducing its home market price and 60% to an increase in their U.S. price for all AD cases in the model. The estimated welfare cost of the U.S. AD/CVD laws using this scenario is $2.25 billion, which is significantly lower than our original estimates, but still places U.S. AD/CVD laws as one of the costliest U.S. import restraint programs. In addition, we note again that the theoretical model of foreign firm pricing used to generate these estimates does not consider the many USDOC procedures that make it uncertain that lowering home price will lead to a lower duty for the foreign firm. In this sense, the pricing model may underestimate the increase in U.S. price and lead our welfare estimate to be underestimated as well. Clearly, the actual pricing behavior of foreign firms in response to an AD order is important and our paper points towards the need for future research in this area.

7.3. Imperfect competition

Another concern may be the issue of how our estimated welfare consequences would change if imperfect competition were modeled more completely. There are imperfect competition aspects to the model we employ in that consumers differentiate between home and imports through an Armington assumption, and because we have allowed the subject foreign firms the ability to raise their U.S. price or lower their home price, implying some degree of market power in both markets. However, the domestic firms, and implicitly the rival foreign firms not

[24]See Appendix B for more detail on this model.

subject to duties, are treated as price takers. In addition, there are no increasing returns to scale, as is common in models of imperfect competition.

If domestic firms are not price-takers, then standard models of imperfect competition would suggest that they may raise their prices to some extent when duties are levied on rival foreign firms, or when those foreign firms raise U.S. prices in response to AD duties. This would certainly lead to welfare gains for domestic firms, though it would also mean higher domestic prices for consumers on the domestic ''like'' product as well. Thus, this consideration could increase or decrease the estimates we present. The same argument could be made with respect to rival foreign firms that do not receive AD duties – they may raise their U.S. price as well. To the extent that this has occurred we have underestimated the welfare costs of U.S. AD/CVD laws. Finally, other CGE studies (e.g., see Devarajan and Rodrik, 1989) find that modeling scale economies in production generally leads to larger estimates of the cost of trade restraints. Thus, if scale economies exist in some or all of the sectors, we may have underestimated the impact of U.S. AD/CVD laws.

7.4. Nonaffirmative AD/CVD investigations

A final concern is the issue of whether nonaffirmative AD/CVD investigations have welfare impacts on the U.S. economy. Staiger and Wolak (1994) find that AD investigation ''events'' besides affirmative decisions can have significant trade and domestic production effects, while Prusa (1992) shows that withdrawn AD petitions have as great an impact on trade as those petitions that result in AD orders. Because these nonaffirmative investigations do not result in orders, it is not possible to confidently model them within the framework of this paper, but these studies suggest that the overall welfare effect of U.S. AD/CVD laws is substantially greater than our estimates of the impact of affirmative AD/CVD cases.

8. Conclusion

This paper demonstrates that the U.S. AD/CVD laws are poised to become the costliest, in terms of net economic welfare, of U.S. import restraint programs. The magnitude of the impact is due not only to the sheer number of AD/CVD orders, but also to the structure and administration of these orders. First, AD/CVD orders are applied on the subject product indefinitely, and thus, there is an accumulation of orders over time. Second, and more importantly, these laws provide an incentive for foreign firms to raise their U.S. price resulting in lower AD duties. Our estimates show that this feature of the U.S. AD/CVD laws makes their welfare cost much higher because it allows foreign firms to capture rents at the expense of the U.S. economy. In other words, it allows foreign firms to convert a tariff into a

foreign-held quota at their discretion. Finally, a large number of AD/CVD investigations (and hence, AD/CVD affirmative determinations) involve manufacturing sectors that are upstream to many significant U.S. production sectors. As demonstrated by our general equilibrium model, these distortions result in larger welfare losses not only for U.S. consumers, but also for U.S. producers and exporters downstream to the sector subject to an order.

The recently completed Uruguay Round has insured the rising prominence of AD/CVD regimes relative to other forms of import relief in the United States and around the world. The results of this paper suggest that the achievements of the GATT in the post-war period may be hollow if more countries begin to implement AD/CVD regimes. In the United States alone, the collective effect of the AD/CVD laws rivals the largest import relief measures in place, and the current pace of AD/CVD investigations shows no sign of slowing. Thus, GATT's work may be done, but the WTO's work is just beginning.

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Appendix A

CGE model

The computable general equilibrium (CGE) model used in this paper has three components: a social accounting matrix (SAM), a behavioral parameter data set, and a system of equations that constitute the model specification. The SAM is the empirical data base for the model that specifies the transactions among the various economic agents in the U.S. economy for the base year of this paper, 1993. The majority of the SAM is composed of the estimated input–output accounts for 491 sectors in agriculture, mining, manufacturing, and services, which detail the transactions that occur between U.S. industrial sectors. The 491 sector classification is based upon U.S. Department of Commerce 6-digit Bureau of Economic Analysis sectors. In addition to these input–output accounts, other information such as international trade data, government transactions, and household transactions are incorporated into the SAM and are reconciled with the 1993 national income and product accounts. Through this process, a consistent set of transactions

between firms, households, government, and other domestic and foreign institutions are generated for 1993.

The model specification is divided into the following components: final demand behavior, production technology, factor supplies and demands, treatment of traded goods, domestic prices, domestic market equilibrium, the foreign sector, and income and government revenue. The model views each sector as consisting of three goods: imported goods, goods for export, and goods for domestic consumption. Imports and exports in each sector are imperfect substitutes for their domestic counterparts. Furthermore, AD/CVD subject and nonsubject imports are explicitly disaggregated in the model and are assumed to be imperfectly substitutable. Aggregate imports combine with the imperfect domestic substitute to form a composite good for the domestic market. Domestic output is allocated to the export and domestic markets based on relative price movements.

The model considers three separate components of domestic final demand: household consumption, government demand, and investment demand. The consumption behavior of households is given as:

$$c = \mathrm{LES}(p_{\mathrm{q}}, (1 - s^*)Y; \eta) \tag{A.1}$$

where c denotes real personal consumption, p_{q} denotes the domestic price of the composite good, s^* is the fixed savings rate, Y is domestic income, and η is the income elasticity of demand. The functional form is that of the linear expenditure system (LES).

Aggregate real government spending, g, and aggregate real investment, I, are fixed exogenously. By holding government spending and investment constant, the model specification avoids questions concerning the substitution between present and future consumption, which makes static welfare comparisons problematic.

Production technology is modeled using a constant elasticity of substitution (CES) value added function specified as:

$$x = \mathrm{CES}(i_{\mathrm{d}}, k_{\mathrm{d}}; \phi) \tag{A.2}$$

where x denotes gross domestic output, l_{d} is labor demand, k_{d} is capital demand, and ϕ is the elasticity of substitution between labor and capital. The parameter ϕ is exogenous and is estimated outside of the model. A Leontief (fixed coefficients) function is assumed between value added and intermediate products as well as between various intermediates. Intermediate use is given by:

$$\nu = ax \tag{A.3}$$

where v is total intermediate use and a is the fixed proportion intermediate-use coefficient. The coefficient a is determined by calibration to the social accounting matrix. As is generally the case in CGE models, the factors of production, labor and capital, are held in fixed supply. Factor demands in each sector are derived from the CES production function and specify labor–capital shares that depend on relative factor prices and the elasticity of substitution between capital and labor.

The treatment of traded goods is the most important component of the model specification. On the import side, the model treats foreign and domestic commodities as imperfect substitutes in domestic use. Therefore, the import composition of domestic demand is influenced by the ratio of domestic and import prices, as well as by any administrative quantity or tariff restrictions. The model aggregates imports and their domestic counterparts into an aggregate good q using a CES aggregation:

$$q = \mathrm{CES}(d_{\mathrm{d}}, m; \sigma) \tag{A.4}$$

Eq. (A.4) is the aggregation relation in which q denotes the composite good for domestic consumption, d_{d} denotes domestic demand for domestic goods, m denotes aggregate imports, and σ is the Armington elasticity of substitution between aggregate imports and domestic goods within the sector (Armington, 1969). Composite price indices follow from implicit exact aggregation in each sector.

The use of the CES functional form for aggregation implies that preferences with respect to aggregate imports and domestic goods within a sector are homothetic, while preferences between sectors are not. For a given level of demand in a product category, determined by the specification of the three components of final demand, the shares of imports and domestic goods are determined in response to relative prices.

Aggregate imports, m, are modeled as a composite of imports from AD/CVD subject, m_{s}, and nonsubject sources, m_{ns}. CES aggregation is employed to define an explicit competition between imports from the two possible sources, with σ_m identifying the constant elasticity of substitution between the imports from the two origins.

$$m = \mathrm{CES}(m_{\mathrm{s}}, m_{\mathrm{ns}}; \sigma_m) \tag{A.5}$$

The composite import price embodies exact aggregation of subject and nonsubject import prices. Eqs. (A.4) and (A.5) reflect competition within the model between three sources. Competition between domestic production and general imports is governed by Eq. (A.4), whereas competition between subject and nonsubject imports is governed by Eq. (A.5).

On the export side, the model assumes that domestic firms allocate their output between domestic and foreign markets according to a transformation function that depends on the ratio of domestic and foreign prices. Therefore, the export composition of domestic supply is influenced by the ratio of domestic and export prices. The functional form used is a constant elasticity of transformation (CET) as indicated in the following equation:

$$x = \mathrm{CET}(d_{\mathrm{s}}, e; \tau) \tag{A.6}$$

Eq. (A.6) is the allocation relation in which d_s is domestic supply, e is exports, and τ is the elasticity of transformation between domestic supply and exports.

We next turn to the equations for domestic prices, including those of import and export goods. These are given in the following six equations:

$$p_x x = p_a d_s + p_e e \tag{A.7}$$

$$p_q q = p_a d_s + p_m m \tag{A.8}$$

$$p_m m = p_{ms} m_s + p_{mns} m_{ns} \tag{A.9}$$

$$p_{ms} = (1 + t_s)(1 + \rho_s) n \pi_{ms} \tag{A.10}$$

$$p_{mns} = (1 + t_{ns})(1 + \rho_{ns}) n \pi_{mns} \tag{A.11}$$

$$p_e = n \pi_e \tag{A.12}$$

where t_s, and t_{ns} are the tariff rates for the subject and nonsubject imports, ρ_s and ρ_{ns} are the markups over world prices representing the quota premium rate in the case of a quantity restraint, and in this paper ρ_s represents importers' markup use to avoid AD duties. π_{ms} and π_{mns} are the world prices of the import good from the subject and nonsubject sources, π_e is the world price of the export good, and n is the composite exchange rate (U.S. dollars per unit of foreign currency).

Three equations are required for domestic market equilibrium, one for the commodity market and two others for the factor markets:

$$q = v + c + I + g \tag{A.13}$$

$$l_s = l_d \tag{A.14}$$

$$k_s = k_d \tag{A.15}$$

We characterize the foreign sector with the following three equations:

$$B^* = \pi_m m - \pi_e e \tag{A.16}$$

$$m = s_m(\pi_m; \sigma_f) \tag{A.17}$$

$$e = d_e(\pi_e; \tau_f) \tag{A.18}$$

where B^* is the exogenously-specified balance of payments or foreign saving, σ_f is the elasticity of import supply, and τ_f is the elasticity of export demand.

The national income identity is given as follows:

$$Y = w l_d + r k_d + n t_m \pi_m m + n B^* \tag{A.19}$$

in which the income of the representative consumer includes wages, rental income, government revenue, plus foreign savings.

In the model itself, private households, enterprises, and government are disaggregated into separate income and expenditure specifications, and a wider variety of fiscal instruments (e.g., income taxes and indirect business taxes) are included.

Appendix B

Foreign pricing model

Following Boltuck (1987), one can set up a simple model of a discriminating monopolist in two markets (its home market (H) and the U.S. market (US)) facing AD duties in the U.S. market. We assume that the firm faces demand of $Q_{\mathrm{H}}(P_{\mathrm{H}})$ in its home market and $Q_{\mathrm{US}}(P_{\mathrm{US}})$ in the U.S. market. Demand is downward sloping in price in both markets and, for simplicity, we assume the demand functions display constant price elasticity of demand over the relevant ranges. All production occurs in the firm's home market with constant marginal costs, c. In the absence of an AD order, the firm's problem is the following:

$$\underset{P_{\mathrm{H}}P_{\mathrm{US}}}{MAX}\ II = P_{\mathrm{H}}Q_{\mathrm{H}}(P_{\mathrm{H}}) + P_{\mathrm{US}}Q_{\mathrm{US}}(P_{\mathrm{US}}) - c[Q_{\mathrm{H}}(P_{\mathrm{H}}) + Q_{\mathrm{H}}(P_{\mathrm{H}}) + Q_{\mathrm{US}}(P_{\mathrm{US}})] \tag{B.1}$$

Taking first-order conditions, we can solve for optimal prices:

$$P_{\mathrm{H}} = c/(1 + 1/\eta_{\mathrm{H}}) \text{ and } P_{\mathrm{US}} = c/(1 + 1/\eta_{\mathrm{US}}) \tag{B.2}$$

where η_{H} and η_{US} are price elasticities of demand in the home and U.S. markets, respectively. In this setting, a firm's optimal U.S. price will be lower than the home price whenever $\eta_{\mathrm{H}} > \eta_{\mathrm{US}}$, and thus the firm will be evaluated as ''dumping'' under standard definitions.

Now assume that AD duties are possible and that the USDOC defines the firm's home price as ''fair value''. Under this definition of fair value, the USDOC levies a AD duty equal to $(P_{\mathrm{H}} - P_{\mathrm{US}})$ whenever $P_{\mathrm{H}} > P_{\mathrm{US}}$, and zero if $P_{\mathrm{H}} \leq P_{\mathrm{US}}$. With this AD duty possible, the firm's pricing decision problem becomes:

$$\begin{aligned}\underset{P_{\mathrm{H}}P_{\mathrm{US}}}{MAX}\ II = {} & P_{\mathrm{H}}Q_{\mathrm{H}}(P_{\mathrm{H}}) + P_{\mathrm{US}}Q_{\mathrm{US}}(P_{\mathrm{US}}) - cpQ_{\mathrm{H}}(P_{\mathrm{H}}) + Q_{\mathrm{US}}(P_{\mathrm{H}}) \\ & + Q_{\mathrm{US}}(P_{\mathrm{US}})] - (P_{\mathrm{H}} - P_{\mathrm{US}})Q_{\mathrm{US}}(P_{\mathrm{US}}) \text{ subject to } P_{\mathrm{H}} \geq P_{\mathrm{US}}\end{aligned} \tag{B.3}$$

The constraint $(P_{\mathrm{H}} \geq P_{\mathrm{US}})$ is necessary, since the AD duty does not become a subsidy when the home price is less than the U.S. price. If the constraint is binding, the firm charges a uniform price in both markets to avoid the duty, which can be shown to be $P_{\mathrm{I}} = c/(1+1/\eta_{\mathrm{I}})$ where:

$$\eta_{\mathrm{I}} = [Q_{\mathrm{US}}\eta_{\mathrm{US}} + Q_{\mathrm{h}}\eta_{\mathrm{H}}]/(Q_{\mathrm{US}} + Q_{\mathrm{H}}) \tag{B.4}$$

Of course, interior solutions, where the firm does not alter prices to fully eliminate the duty, are possible in this model as well. However, changes in the home and U.S. price in the face of an AD duty depend on the same parameters (the elasticities and market share) regardless of whether the constraint binds or not. See Boltuck (1987) for more details.

Comparison of Eqs. (B.4) and (B.2) indicates the changes in home and U.S. price that occur once an AD duty is in place, which depends not only on the elasticities of demand in both markets, but also on the relative size of sales in the two markets. The larger the elasticity of U.S. demand relative to home demand and/or the larger the relative share of U.S. sales for a foreign firm, the less the firm will raise the U.S. price to avoid the duty. Unfortunately, this framework is difficult to employ in the context of our model because it requires data on the elasticity of the foreign firm's U.S. and home demand and relative market shares, which we do not have. For sake of comparison, we assume the elasticity of demand for the U.S. market is -3, while the elasticity of demand in the foreign market is -2. If U.S. sales account for 25% of a foreign firm's total sales (home plus U.S. sales), then this model suggests that the U.S. price rises by 60% of the duty, while the home price falls by 40% to eliminate the duty. Based on authors' calculations of average export ratios for Japanese firms involved in affirmative AD cases in the 1980s, the assumption of U.S. sales as 25% of a foreign firm's total sales seems very reasonable. Thus, we use the estimates from this scenario for the results we report in the text. However, we note that approximately the same split occurs for other plausible parameter estimates and details are available from the authors upon request.

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