The Influence of Foreign Direct Investment, Intrafirm Trading, and Currency Undervaluation on US Firm Trade Disputes

J. Bradford Jensen, Dennis P. Quinn, and Stephen Weymouth

Abstract

We apply insights from “new, new” trade theory to explain a puzzling decline in US firm antidumping (AD) filings in an era of persistent foreign currency undervaluations and increasing import competition. Firms exhibit heterogeneity both within and across industries regarding foreign direct investment (FDI). We propose that firms making vertical, or resource-seeking, investments abroad are less likely to file AD petitions and that firms are likely to undertake vertical FDI in the context of currency undervaluation. Hence, we argue, the increasing vertical FDI of US firms makes trade disputes far less likely. We use firm-level data to examine the universe of US manufacturing firms and find that AD filers generally conduct no intrafirm trade with filed-against countries. We also find that persistent currency undervaluation is associated over time with increased vertical FDI and intrafirm trade by US multinational corporations (MNCs) in the undervaluing country. Among larger US MNCs, the likelihood of an AD filing is negatively associated with increases in intrafirm trade. In the context of currency undervaluation, we confirm the existing finding that undervaluation is associated with more AD filings. We also find, however, that high levels of intrafirm imports from countries with undervalued currencies significantly decrease the likelihood of AD filings. Our study also highlights the centrality of firm heterogeneity in international trade and investment in understanding political mobilization over international economic policy.

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As tariff rates have steadily declined around the world, business firms have responded to import competition from foreign trade partners by using temporary trade barriers (TTBs). US firms that suspect countries of selling goods at less than fair value—that is, of “dumping” the goods¹—can file antidumping (AD) petitions with the US Department of Commerce (DOC). If the petition is successful, AD duties are levied on the offending product from the originating country for a fixed period of time; these duties can bring significant economic advantage to filers (Bechtel and Sattler 2015). AD petitions are often triggered by import surges, especially from countries with undervalued currencies, as foreign exchange rate undervaluation makes imports from undervaluing countries relatively cheaper.

Although AD filings are by far the most commonly employed TTB worldwide (Irwin 2005, Bown 2011a), the number of petitions filed by US firms has declined markedly over the past 10 years, even though imports have increased, especially from countries with undervalued currencies (see figure 1).² We argue that firm-level variation in foreign direct investment (FDI) is critical to understanding this puzzling decline in AD filings. In the current era of increasing import competition, it is not a firm’s sectoral advantages, its industry, or even its international orientation per se that determines its response to the policies of foreign trade partners. Rather, a firm’s direct investments in, and trade relationships with, a specific country at a given point in time shape its economic and political activities: a salient political-economic cleavage divides firms with trade-related foreign affiliates from those without. Firms’ global sourcing activities drive their political and economic responses to the economic policies of US trade partners, particularly currency undervaluation.

We demonstrate that firm-level heterogeneity in international investment, trade, and global supply chains in US multinational corporations (MNCs) helps explain the decline in AD filings, notwithstanding increases in import competition, long-run trade deficits, and persistent foreign currency undervaluations. Simply put, firms that have investments in and intrafirm trade with a country are less likely to file against that country. And as more firms undertake FDI and intrafirm trade with a country, especially one with an undervalued currency, the likelihood of any AD filing against that country’s firms diminishes markedly. As a growing number of MNCs engage in FDI and intrafirm trade across many industry segments, it becomes more difficult to meet the 25 percent market share threshold requirement for a US antidumping filing mandate³ in more and more product categories.

Recent advances in international economics offer theory and empirical evidence to explain why some firms in an industry trade internationally and undertake FDI while others do not: Firm-level

1. “Dumping” is defined as a price below that at which goods are sold in the home market or below an estimate of average costs.

2. See Broz and Werfel (2014) and Ludema and Mayda (2011) on the impact of currency undervaluation and import competition, respectively, on AD filings.

3. The law requires the filing to be supported by producers of 25 percent of either the total volume or value of the production of the “domestic-like” product. For a detailed description, see <http://ia.ita.doc.gov/petitioncounseling/pcp-industry-support.html>.

characteristics within an industry, rather than industry or factor advantages per se, are the fundamental determinant of trade and international investment activity (Bernard and Jensen 1995, 1999; Bernard et al. 2003, 2007; Melitz 2003; and Helpman 2014 for a review). The literature explains how firms with different characteristics respond differently to changes in the economic environment; for example, some firms expand their exports in response to trade liberalization, while others shut down.

This intraindustry heterogeneity is likely to have important political implications, because many aspects of US trade, regulatory, competition, and tax policies have historically assumed that there is a high degree of economic and political homogeneity within industries.⁴ We propose that firm-level variation in global production strategies is likely associated with intraindustry heterogeneity in political preferences for economic policy. Changes in firms' composition and characteristics might therefore make it harder over time for firms in an industry to organize politically to achieve policy goals.

We use US firm AD filings as an empirical context to explore the effects of variation in FDI among firms in the same industry on firms' political activities. These intraindustry variations involve the location of foreign investment as well as diversity in trade relationships among firms with (and without) foreign affiliates.

Currency undervaluation is an important feature of the context of our study. Many studies have found that currency undervaluations in partner countries correlate robustly with AD filings (see, for example, Broz and Werfel 2014, Knetter and Prusa 2003). Real exchange rates are also likely to influence firms' choices of where to locate production, both for new FDI and potentially for shifting production (and possibly related-party (RP) imports for supply chain production) among existing plants. We explore the effects of foreign currency undervaluation on firms' market location decisions and nonmarket political strategies.

The first section of this working paper explores the political and economic relationships between and among international trade and investment, undervalued currencies, and trade disputes. We link increased firm participation in vertical (or resource-seeking) production networks to decreased AD filings. In the empirical analysis, we use firm-level data to examine our claims. First, we analyze the universe of US manufacturing firms covered by the US Economic Census to determine the attributes of firms that file AD petitions compared to their product market industry peers that do not. Filers are larger and more internationally engaged than their industry peers, but not in the countries against whose firms they file.

A key implication of our argument is that some firms will respond to sustained currency undervaluations by setting up affiliates for the purposes of production and intrafirm trade. We provide evidence that surviving AD filing firms, surviving manufacturing firms, and manufacturing firms in general became more engaged with countries with undervalued currencies during the period 1993–2009.

4. For example, corporate tax exemptions and investment tax credits are generally set at the industry level.

Further, we examine the universe of US MNCs using data collected by the Bureau of Economic Analysis (BEA) and provide evidence—to our knowledge for the first time—that currency undervaluations are associated with increased US vertical FDI in the target country.

We then explore how the forms and magnitudes of their international supply chains influence the likelihood that MNCs will file AD petitions. This analysis allows us to categorize a firm's supply chain as either intrafirm (or RP) or arm's-length ("unaffiliated party") trading. We find that intrafirm trading significantly reduces the likelihood of AD petition filings for large firms (those with at least \$1.3 billion in sales). In the absence of intrafirm trade, however, firm size is positively associated with AD filings.

Next, at the country level we examine the implications of our argument in light of recent research. We confirm the previous finding of a robust positive association between foreign currency undervaluation and AD filings. But we also show, consistent with our argument, that the composition of trade flows has a strong moderating influence on undervaluation's effects on trade disputes. In particular, high levels of RP trading in the context of currency undervaluation sharply *diminish* the likelihood of AD filings.

In the final empirical section, we examine filings against China because of its almost unique classification in US trade law as a "nonmarket" economy. We show that the number of filings predicted by our empirical model nearly matches the actual number of US firm AD filings. The key explanatory variable is changes in the composition of trade flows: RP trade is associated with fewer disputes.

GLOBAL SOURCING ACTIVITIES AND FIRM AD FILINGS

Three political-economic considerations motivate our analysis: the increasing prevalence of global supply chains in most US industries (Bernard, Jensen, and Schott 2009; Ramondo, Rappoport, and Ruhl 2013); persistent undervaluations in the home currencies of many US trade partners; and the ongoing opportunity for firms and industries facing competitive import pressures to use temporary trade barriers, including AD. We discuss how firms' global supply chains affect their use of TTBs, especially in the context of currency undervaluation.

Empirical Puzzle

We examine AD filings in the United States, where individual firms, groups of firms, and labor unions initiate AD investigations by filing a petition with the DOC. The International Trade Administration of the DOC then determines whether foreign goods have been dumped. Previous research finds that filings correlate strongly with policy changes by trade partners that are unfavorable to filers (Broz and Werfel 2014, Knetter and Prusa 2003). A couple of questions arise in light of the prior findings: Why, if they provide benefits for successful filers, have AD filings declined over time? Do firm investment and trade activities explain why some firms are less likely to file?

Variation in Firms' International Engagement

We propose that a firm's establishment of global supply chains (i.e., its FDI and associated RP trade) is a crucial explanatory variable in explaining its responses to import competition from foreign trade partners. Prior scholarship has stressed the centrality of firms' international engagement to their political engagement on trade issues.⁵ Here, we allow for the latter to vary by country and over time according to the nature of its investment and trade relationships.

Empirical research provides a rich picture of firm participation in international trade and investment. First, engaging in international trade is rare among US firms: Only about 3 percent of US firms trade internationally, and just 1 percent both import and export (Bernard, Jensen, and Schott 2009). And most firms that trade do so only at arm's length: that is, with unaffiliated parties.

However, a small number of firms (MNCs) establish affiliates in foreign countries, some for the purpose of exploiting differences in relative factor endowments to lower production costs (vertical FDI). According to an accounting definition, FDI precedes RP, or intrafirm, trade with foreign affiliates. While exporters are larger, more productive, and more capital intensive than nonexporters, multinationals are even larger and more productive than firms that strictly export (Tomiura 2007, Yeaple 2009). MNCs anchor global supply chains, mediating over 80 percent of US exports and imports (Bernard, Jensen, and Schott 2009)—which include, by definition, all RP trade and the vast majority of arm's-length imports and exports. While MNCs may choose to source from unaffiliated parties (i.e., to operate at arm's length), only intrafirm trade implies investment in, and thus greater economic integration with, foreign host countries. In addition to mediating a large share of international trade, MNCs account for a sizable share of economic activity in the United States, representing over 27 percent of employment in 2000 and accounting for more than one-third of net job creation in the private sector in 1993–2000 (see Bernard, Jensen, and Schott 2009).

The globalization of production through vertical foreign direct investment and intrafirm trade is common across US industries. Natalia Ramondo, Veronica Rappoport, and Kim J. Ruhl (2013) provide evidence that, although most affiliates do not export to their parent, in all industries there are affiliates that do, and the intrafirm trade intensities of these affiliates are quite similar across industries.⁶ Hence, there is significant heterogeneity in intrafirm trading intensity in all industries; the important dimension is firm-level heterogeneity, not industry or factor intensity.

The within-industry heterogeneity in firm internationalization and the greater size of MNCs relative to their domestic peers are relevant considerations for AD filings and trade protectionism more broadly for two reasons. First, AD filings must be supported by the producers of 25 percent of either the total

5. The seminal contribution is Milner (1988). See also Nollen and Quinn (1994).

6. Ramondo, Rappoport, and Ruhl (2013) create an index of intrafirm "intensity" and show that firms at the 75th percentile of intrafirm trading intensity have very similar levels of vertical integration across the entire range of manufacturing industries.

volume or value of the production of the “domestic-like” product. Large firms with vertical FDI are unlikely to seek protection from import competition from countries with undervalued currencies through AD petitions, even in the face of increased import competition from these countries, if they benefit from investments in or have trading relationships with the undervalued country. The greater the number of large firms with trade linkages to a particular country, the more difficult it becomes to organize the relevant filing coalition against that country.⁷ The largest producers in an industry, which tend to be MNCs, are likely to have greater legal standing in either filing or—more relevantly for this working paper—refusing to file petitions.

Second, as Kevin Greir, Michael Munger, and Brian Roberts (1994) noted, larger firms are more successful at overcoming collective action problems in politically organizing industry rivals compared to more atomistic industries composed of smaller firms.⁸ MNCs are therefore not only economically consequential; their size gives them greater capacity to organize politically for (or against) filings.

We therefore propose that variation in FDI positions, and subsequent RP trade flows, will affect a firm’s decision to initiate (or join with industry peers in) an AD filing.⁹ We develop the argument that MNCs with FDI abroad are less likely to file AD petitions against countries they invest in, and as the number of firms with international investment activities grows—especially in countries with undervalued currencies—the number of AD filings is likely to fall.

Our explanation departs from much of the prior literature on the political economy of trade that considers divisions over trade policies by industries or sectors of the economy. Trade models that assume firms are homogeneous within either industries or sectors imply that trade affects firms in a given industry or sector in the same way.¹⁰ By contrast, we examine the political implications of recent advances in the economics of international trade, which sees firms—not industries or sectors—as the central mediators of international commerce.¹¹

7. This argument is similar in spirit to that advanced by Bombardini (2008), who argues that industries with more large firms are more effective at lobbying.

8. See also Weymouth (2012), who finds that large firms are more likely to lobby and to report greater influence on government policy than are smaller firms.

9. See Gawande, Hoekman, and Cui (2015) for the development of a related argument in the context of seven large emerging market countries. At the industry level, Weder and Wyss (2013) show, using archival data, that inter-industry variation in vertical linkages deterred Swiss protectionist practices.

10. Models that adopt a two-factor Heckscher-Ohlin framework with Stolper-Samuelson distributional effects predict class cleavages over international economic policy (Rogowski 1987). Models that assume costly intraindustry factor mobility along the lines of Ricardo-Viner imply homogeneous trade policy preferences among firms and workers in the same sector (see Hiscox 2001, Magee 1980). Neither approach adequately explains the observed intraindustry variation in protectionist demands or the intertemporal changes in a given firm’s economic and political responses to undervaluation. Our argument is closer in spirit to Milner (1988), who shows that increases in a firm’s international economic orientation reduce demands for import protection.

11. The “heterogeneous firm” trade models emerged out of research by Bernard and Jensen (1995, 1999), who were some of the first authors to exploit micro datasets to study variation in exporting (and later importing) behavior at the plant and firm levels. Melitz’s (2003) model advanced a theoretical explanation by showing that only the largest and most productive firms can generate sufficient profits to cover positive fixed exporting costs; thus productivity helps explain why firms self-select into trade.

Undervaluation, Global Production Networks, and Firm AD Filings

Two ideal-type strategies for export promotion have been influential among emerging market economies in recent decades. The first is typified by the high-performing East Asian economies (most notably China), which have been characterized during their rapid growth by active exchange rate management policies that led to currency depreciation and export surges (World Bank 1993). The second strategy, of which Mexico has been an exemplar, is characterized by extensive participation in bilateral and international trade agreements, open capital markets, and a floating (market-determined) exchange rate.¹² The latter strategy limits the use of systematic governmental currency undervaluation to promote exports.¹³

Figure 2 illustrates currency undervaluation versus overvaluation, showing the evolution of currency valuations over time (since 1975) for China and Mexico, which—despite their differing policy stances—have very similar factor endowments.¹⁴ (Appendix A provides details on the construction of the undervaluation index.) Excluding the period of the Mexican peso crisis, the post-NAFTA Mexican peso ceased its long-run undervaluation and was *overvalued* for most of the 2000s relative to the US dollar.¹⁵ China, as part of its economic reforms in the 1980s, ended its long-standing currency overvaluation. Since 1994, China has sustained an undervalued exchange rate compared to the Mexican peso's overvaluation, which gave US producers an incentive to invest in (and source from) China rather than Mexico.

Currency undervaluation may be a particularly attractive growth strategy for governments¹⁶ because the international trading system under World Trade Organization (WTO) rules does not proscribe countries from engaging in currency undervaluation for the purposes of export promotion (Sanford 2011). Mark Copelovitch and Jon Pevehouse (2013), for example, find that governments that have signed preferential trade agreements (PTAs) are likely to move to an undervalued currency vis-à-vis their PTA partners' currency, possibly to enhance export competitiveness relative to these partners.

12. Mexico has signed free trade agreements with 44 countries, including the United States, Japan, Canada, and the member countries of the European Union (Villareal 2012).

13. Copelovitch and Pevehouse (2013), however, find that a preferential trade agreement with a primary economic partner (the country to which the currency is pegged or the most important trade partner) is associated with exchange rate flexibility and a depreciated real exchange rate.

14. See Chiquiar et al. (2008) for a detailed comparison of the factor endowments and the wide range of product market competition between the two economies.

15. Somewhat counterintuitively, the convention in the field is to denote undervaluation with positive numbers and overvaluation with negative numbers. Zero is a neutral valuation.

16. On the link between the exchange rate and growth, see Berg and Miao (2010), Easterly (2005), and Rodrik (2008). In an influential paper, Rodrik (2008, 366) finds that “an increase in undervaluation boosts economic growth just as powerfully as a decrease in overvaluation.”

While an undervalued currency may offer economic advantages to exporting nations and their firms, it risks backlash through other means by foreign trade partners. Some governments undertake policies to lessen the effects of the depreciation of trading partner currencies through competitive devaluations.¹⁷

Firms and industries can respond to undervaluation by trade partners by filing for TTBs such as AD petitions. Numerous studies have indeed found a strong correlation between domestic (home country) real exchange rate appreciation vis-à-vis trade partners and subsequent trade disputes (Broz and Werfel 2014, Copelovitch and Pevehouse 2011, Irwin 2005, Knetter and Prusa 2003, Oatley 2010). The central inference of this research is that AD filings represent the response of particular industries to undervaluation among their trade partners. In particular, Lawrence Broz and Stephen Werfel (2014) show that the pass-through of exchange rate movements to prices, which varies systematically by industry, correlates with industry AD responses to domestic real exchange rate fluctuations.

Our argument predicts within-industry variation in firm responses to undervaluation. Firms integrated into global supply chains, particularly those in countries with undervalued currencies, will be less likely to pursue AD because they benefit from producing in a country with an undervalued currency. The comparative advantage motive for vertical FDI suggests that firms tend to produce abroad where they can take advantage of cheaper inputs (Helpman 1984): A depreciated currency lowers the cost of labor and other host-country inputs relative to production costs at home. Firms that produce in such a country for sale in that country (i.e., horizontal, or market-seeking, FDI) do not benefit from the undervaluation because costs and revenues are both undervalued, but firms that produce in an undervalued country for export to the MNC's home market or to a third country (vertical FDI) benefit from the reduced costs from undervaluation (i.e., costs are undervalued, but revenues are not). For firms that use FDI as a platform for export, a depreciated currency increases the competitiveness of exports from that platform (Blonigen 1997).

A related way that firms integrated into global supply chains benefit from undervaluation (and thus are less likely to pursue AD) is that MNCs with a broad FDI portfolio can strategically respond to abrupt shifts in currency values in ways that firms without multiple production locations cannot. Bruce Kogut and Nalin Kulatilaka (1994) develop a model in which production in different countries allows MNCs to change the location of production in response to currency fluctuations: Firms that own production facilities in multiple currency zones can dynamically adjust their production to the lowest-cost location. FDI in countries that tend toward undervaluation serves as a real hedge against currency fluctuations: Andrew Bernard and colleagues (2009) present evidence, consistent with the Kogut and Kulatilaka model,

17. For example, Brazil, Israel, Japan, New Zealand, Poland, and Switzerland have recently undertaken monetary or exchange policies targeted at lessening the value of their currencies.

that US MNCs shifted production to their affiliates in the countries experiencing depreciations during the Asian financial crisis.

Additionally, firms find undervalued countries attractive for investment because a depreciated currency makes the value of assets relatively cheaper in foreign currency terms by lowering the costs of investment by foreign firms and increasing the net worth of foreign bidders relative to domestic investors (Blonigen 1997, Froot and Stein 1991). Thus undervaluation provides an additional incentive for investment.

In sum, large MNCs with production affiliates in multiple countries may choose to source from undervalued countries instead of pursuing trade remedies. In contrast, large firms (including MNCs) without trade or investment relationships with an undervalued country are likely to pursue trade remedies, especially if they compete with relatively cheaper imports from countries with undervalued currencies.¹⁸ Small firms are unlikely to file for AD protection (because it is difficult to organize a coalition) or source from undervalued countries (because this, too, is costly).¹⁹ As the share of MNCs with operations in undervalued countries is increasing, the natural constituency for AD protection is diminishing.

Empirical Implications of Our Argument

The diagram in figure 3 represents a summary of the argument and points to several of the empirical relationships examined in the following sections. We outline some empirical implications of our argument below.

We examine four implications at the firm level. The first is that, *ceteris paribus*, larger firms will be more likely to file AD petitions for two reasons: (1) filing incurs costs and (2) they are in a better position to organize a coalition to meet the 25 percent filing threshold.

Second, we expect differences in international investment positions and the composition of trade flows between firms that file AD petitions and those that do not. Compared to their nonfiling peers, filers will conduct less RP trade with filed-against countries, particularly in their product category.

Third, MNCs will find undervalued countries more attractive for vertical than for horizontal FDI. Profits tend to be higher for vertical FDI in undervalued countries because costs are incurred in an undervalued currency and revenue is realized in a different currency; horizontal FDI for local demand has both costs and revenues in the undervalued currency and thus does not benefit from the undervaluation.

18. Analyzing AD filings in Canada, Ludema and Mayda (2011) find that Canadian firms that compete against Chinese imports seek protection.

19. The literature on heterogeneous firms in trade (and investment) stresses firm-level productivity differences as an important determinant of firm participation in international trade and FDI. These differences are conceptualized and modeled as persistent; firms with low productivity are small and unable to overcome the additional costs of trade/FDI and will remain domestic-only producers (or might eventually go out of business). While productivity is clearly not immutable, it is influenced by a number of firm-level choices (e.g., firm strategy, production technology, intellectual property investments) that are likely to have long-lived implications.

The fourth and final firm-level implication that we examine is that RP trade will reduce the likelihood that a firm will file an AD petition. Firms that have vertical production networks in a country will be less likely to file an AD petition against that country.

At the country level, we follow recent literature examining the relationship between undervaluation and AD filings. Our argument extends the literature in that we expect that the impact of undervaluation on AD filings will depend on the composition of trade flows originating from countries pursuing undervaluation; that is, at the country level we expect related-party imports to moderate the relationship between undervaluation and disputes. If undervaluation attracts vertical FDI, and if firms with RP trade are unlikely to file against their host countries, undervaluation will be associated with fewer AD filings against countries from which higher levels of US intrafirm imports originate. If MNCs with operations in undervalued countries are less likely to file against that country, and if MNC activities in undervalued countries are increasing, AD filings should diminish.

While we expect this pattern to hold probabilistically across US trade partners, AD filings and trade disputes with China are likely to represent a special case, as China is almost uniquely classified as a “nonmarket economy” under both the terms of its accession to the WTO and its prior treatment under US trade legislation.²⁰ Over the past three decades, US AD petitions against China account for 13.8 percent of all filed disputes. The growing direct investments by US MNCs in China, and the resulting RP trading with China, will change the political calculus of these firms regarding AD duties. MNCs with resource-seeking operations in China benefit from low-cost intermediate goods produced and final goods assembled in China, while firms that do not have such operations (and that compete with Chinese exports) will be harmed by an undervalued yuan.

EMPIRICAL ANALYSES

In this section we explore the empirical implications of our argument using data from multiple sources at different levels of analysis. First, we use Census data matched to filing firms to determine whether AD petition filers differ from other firms in their industry. Next, we use both Census data for manufacturing firms and BEA data on US MNCs to examine whether firms have changed their engagement with undervalued countries. We then use BEA data on MNCs to examine whether MNCs with vertical affiliates are less likely to file AD petitions. Finally, at the country level, we analyze the relationship between foreign currency undervaluation, trade flows, and US AD dispute filings.

20. See Messerlin (2004) and Rumbaugh and Blancher (2004). As Rumbaugh and Blancher (2004, 8) note, under the WTO agreement, “other members can invoke ‘non-market economy’ provisions to determine dumping cases for 15 years following [China’s] accession.” See especially Prusa and Vermulst (2013, 219–23). Vietnam is the other country that the United States classifies as a nonmarket economy.

Characteristics of AD Petition Filers

Our hypothesis is that large firms that are engaged in trade with a country, particularly RP trade with their foreign affiliates, will be less likely to file AD petitions. We compare filers to nonfilers in the same product market for evidence that filers are different. We focus on the relative size of filers, their overall international engagement (imports and exports), and their engagement with the country against which they file (in terms of arm's-length trade and RP trade).

Our data source for AD petitions is the May 2012 update of the Global Antidumping Database (GAD-USA.xls) created by Chad Bown (2012). Our source of firm-level data is the Census Bureau Linked/Longitudinal Firm Trade Transaction Database (LFTTD), which covers the universe of firms in the scope of the economic census.²¹ A total of 559 organizations—including firms, trade associations, unions, and other organizations—filed AD petitions in 1993–2009. We are able to match 425 (76 percent) of these organizations to the Census Bureau's Business Register, which is excellent considering that not all filers are private sector firms.

The results are presented in table 1, which reports the share of firms exporting, importing, exporting to a related party, importing from a related party, and exporting/importing/RP exporting/RP importing the same HS4 product category with a country that is filed against. Consistent with our expectations regarding firm size, we find that firms that file AD petitions are comparatively large, with an average rank in the 88th percentile in terms of employment in their product market industry (line 1). At least 75 percent of the AD filers are engaged in international trade, and they are above the median in terms of the value of merchandise exports and imports: filing firms have an average rank in the 74th percentile in terms of overall exports (the sum of arm's-length and RP exports) and the 68th percentile in terms of overall imports (lines 2 and 3, respectively). Most of the filing firms are vertically integrated MNCs: nearly 60 percent engage in RP trading, and the percentile rank of value is high. Relatively few of the filers are purely exporters to, or importers from, unaffiliated parties.

In sum, we find that the average AD filing firm is very large and internationally engaged and—perhaps not surprisingly—that only about one-quarter of AD filers export or import in the product category with the filed-against countries; these firms are below the median in terms of the value of overall imports and exports.

A key finding, consistent with our argument, is that filers rarely engage in RP trade in the product category with the target country. Only 12 percent engage in RP trading in the same product category; of this number, the value traded is modest compared to industry peers. The vast majority of filers (88 percent) have zero RP imports and exports with the country against which they file. Consistent with our

21. This is, to our knowledge, the first use of these data in the political science literature. Our analysis begins in 1993 because this is the first year LFTTD data are available.

argument, AD filers, on average, have either no or much smaller investment and trade relationships with targeted countries in the product categories in which they file.

These results suggest that intraindustry differences in firm behavior in international trade and investment are associated with differences in firm AD filing behavior. AD-filing firms are less likely to be engaged with countries they file against. In the next two sections, we examine whether international trade and investment with filed-against countries—and, importantly, with undervalued countries—have increased.

Changes in Engagement with Undervalued Countries

To examine how firms' engagement in international trade and investment has evolved over time, we first examine the international trade characteristics from 1993 of the 89 firms that filed during 1993–97 (see figure 4).²²

In 1993 surviving firms were generally more engaged in exporting, importing, and RP exporting, relative to all firms and to nonsurviving filers. At least one-quarter of the 48 *survivors* were engaged in trade in the four-digit product with the set of countries filed against for the period 1993–97,²³ as opposed to a much smaller proportion of the 41 *failing firms* engaged in RP trading in the product with the set of countries filed against in 1993–97.

The general profile of the surviving filers had changed little 26 years later: in 2009 they remained larger and more internationally engaged than their product market peers (percentile ranks available upon request). The share of surviving filing firms exporting to a country that was filed against in 1993–97 increased by 13 percent by 2009, and the share of those engaged in RP importing from a filed-against country increased by 8 percent.

We also observe a large increase in firms' engagement with countries with undervalued currencies compared to those with overvalued currencies.²⁴ Figure 4 shows that the share of surviving filing firms that traded with *undervalued* countries increased significantly—particularly RP importing, which increased by 23 percent—while the share of firms engaged with *overvalued* countries marginally decreased. AD filing firms that survived increased their international trade with countries with undervalued currencies.

22. The 2009 data for the 48 surviving firms are also presented. Additional data for all 89 firms are also discussed and are available from the authors upon request.

23. We construct a list of Harmonized System (HS) four-digit product and country pairs that were filed against in 1993–97. We report that share of firms (or share employment at firms) engaged in trade with the filed-against product-country pair in figures 4 and 5.

24. We separate countries into two groups based on the average value of our undervaluation index from 1990 to 2009: countries with sustained undervalued currencies and those with sustained overvalued currencies. The derivation of the undervaluation index is detailed in data appendix A.

If, as we show below, firms with vertical affiliates are less likely to file AD petitions, then disputes against countries pursuing undervaluation should decline.

We explore whether similar changes in trading relationships are also evident in the sample of all surviving manufacturing firms. Figure 5 presents the same statistics as those reported in figure 4, but uses employment-weighted shares as a proxy for market share. While the overall engagement in international trade (exporting, importing, RP exporting, RP importing) changed little among surviving manufacturing firms during the study period, firms modestly increased their engagement with countries that were filed against in 1993–97, but significantly increased trade with undervalued countries.

The share of employment at firms with imports from undervalued countries increased by 11 percent. The share of employment at firms engaged in RP imports from undervalued countries increased by 17 percent, and by 2009 was nearly three times greater than the share of nonsurvivors with intrafirm imports from undervalued countries in 1993. If firms with vertical affiliates are less likely to file, as our results below indicate, then a pro-undervaluation constituency appears to be growing over time. We observe similar changes in the activities of firms when we examine the complete universe of manufacturing firms between 1993 and 2009.²⁵

Currency Undervaluation and Vertical FDI

The previous section demonstrated that AD filing firms that survived from 1993 to 2009 (as well as all surviving manufacturing firms) changed the location of their value chains and were especially likely to increase trade—both arm’s length and related party—with countries against which they and other firms had previously filed. We also find that surviving firms (and all manufacturing firms) similarly increased their engagement with undervalued countries.

A corollary to these findings, which to our knowledge has not been previously explored in the literature, is that currency undervaluation is likely to be associated with increased investment by US MNCs. In this section we further examine this claim, paying particular attention to affiliates that are vertical (the affiliate exports to the US parent or to other related parties), which we expect to be influenced by currency undervaluation, rather than horizontal (the affiliate does not export), which we do not expect to be influenced by undervaluation. Using detailed sales data from the US Bureau of Economic Analysis (BEA) at the foreign affiliate level, we capture the overall presence of MNC affiliates in foreign countries and the presence of vertical and horizontal affiliates specifically.²⁶

25. Appendix figure A.1 displays changes in employment-weighted means for all manufacturing firms in 1993 versus 2009. We observe modest declines in activity in countries with overvalued currencies, while the share of employment at firms that trade with undervalued countries increased, particularly at firms with RP imports from undervalued countries.

26. See appendix A for details on the method of categorizing the activities of foreign affiliates.

We link the total number of each affiliate type with our country-level measure of undervaluation to observe changes in investment patterns over the period. Table 2 reports the numbers of foreign affiliates of US MNCs present in countries with either undervalued or overvalued exchange rates. The data come from the quinquennial Benchmark Survey conducted by the BEA between 1994 and 2009.²⁷ For the groups of countries with undervalued and overvalued real exchange rates, we report total affiliates, along with counts of affiliates that export to related parties and those that do not export.

We compare growth rates of affiliates in countries with undervalued and overvalued real exchange rates. The key comparison concerns RP exporting affiliates versus nonexporting (“horizontal”) affiliates. In countries with sustained undervaluation, we observe a 243 percent increase in the number of vertical affiliates, far exceeding the 85 percent increase in the number of horizontal affiliates in such countries. Furthermore, we note that the share of affiliates conducting trade with related parties increases from 31 percent to 45 percent in undervalued countries. In overvalued countries, by contrast, the growth of horizontal affiliates (38 percent) far exceeds the minimal (4 percent) growth in RP exporters, and the share of affiliates conducting RP trade decreases over the period. Our findings indicate that the nature of firms’ global investment activities is shaped in part by real exchange rate valuations.

We further examine the relationship between undervaluation and investment and report the results in table A.1 in appendix A. In columns 1–3, we examine affiliate growth rates between 1994 and 2009 and find that undervaluation is statistically significantly associated with growth of RP affiliates, but not with horizontal affiliates. In columns 4–6, we report panel models of changes in the logged number of affiliates in each affiliate category regressed on undervaluation during the prior five-year period, and year dummies. In these models, undervaluation varies at the country-period level.²⁸ The results are consistent throughout: we find that undervaluation is strongly associated with increases in the number of affiliates that export to related parties, but not with increases in the numbers of horizontal affiliates.²⁹ The analysis suggests that MNCs respond to foreign exchange rate undervaluation by setting up vertical affiliates in these countries.

Intrafirm Trade and AD Petition Filings by US MNCs

We have provided evidence of intraindustry heterogeneity between and among AD filing firms and firms that do not file, and demonstrated that firms have increased their engagement with countries with undervalued currencies. A key empirical implication of our heterogeneous firm argument is that MNCs with

27. See appendix A for a discussion of the BEA data, and Jensen (2013) for political science applications of the BEA data. We begin with the 1994 Benchmark Survey to examine the current era of currency undervaluation, which is characterized most notably by the 50 percent depreciation of the Chinese yuan in December 1993. The undervaluation period is also chosen to coincide with the period we analyze using the Census LFTTD data, though we obtain consistent results if we include affiliate data from the 1989 Benchmark Survey.

28. The smaller sample in the growth models is explained by the exclusion of countries with zero affiliates in 1994.

29. We also estimated models of the logged number of affiliates (rather than the change in affiliates), including the lagged endogenous variable as a regressor. The results are consistent with the findings reported here and are available upon request.

extensive vertical FDI and large volumes of trade with their global affiliates will be less likely to file AD petitions. In this section we use a regression framework to examine how firms' vertical FDI affects their filings.

We link trade data from the universe of US multinationals included in the BEA Benchmark Surveys of 1989–2009 with the data on AD petition filers to examine the correlates of AD filings at the firm level.³⁰ The BEA data allow us to observe the value of trade (total imports and exports) conducted by the headquarters of all US MNCs. The import and export values are further disaggregated according to the headquarters firms' relationships with trade partners: unaffiliated trade is conducted with firms and organizations that are not foreign affiliates of the headquarters firm; RP trade is with foreign affiliates of the MNC.³¹

We examine the correlates of AD petition filings at the firm level by estimating variations of the following model of the number of dispute filings for firm i :

$$Disputes_i = \alpha + \beta Related\ party\ trade_{i,t} + \gamma Arm's\ length\ trade_{i,t} + \theta Sales_{i,t} + \varepsilon_i, \quad (1)$$

where t corresponds to each of the quinquennial BEA Benchmark Surveys of 1989–2009. Disputes are summed for each MNC over a five-year period beginning with benchmark year t , *i.e.*, $\sum_{j=t}^{t+4} Disputes_j$. Our specification includes year fixed effects to capture global trends³² and sector dummies to account for sectoral correlates of AD filings and trade flows. Firm fixed effects are inappropriate in this context as only firms with filings would enter the analysis, which would produce a biased sample. We relax the assumption of i.i.d. standard errors and report estimates that allow for firm-level clustering.

The dependent variable is highly overdispersed, with more than 99.8 percent of summed AD dispute observations equal to zero. To address overdispersion in the data, we follow the literature in assuming and testing that the data are best examined with a zero-inflated negative binomial (ZINB) model due to the very large number of zeroes.³³

We report the estimates of AD filings at the US MNC level in table 3. The estimates from the parsimonious specification reported in column 1 indicate that the volume of trade conducted with

30. The BEA did not conduct a Benchmark Survey in 1984, so we use 1989 as our starting point. The most proximate Benchmark survey to 1989 was conducted in 1982, but the data format and industry classifications used then are not consistent with those in subsequent quinquennial surveys. One hundred and seventy AD filers are US MNCs covered in at least one of the BEA Benchmark surveys.

31. The unaffiliated trade values are not broken down by the location of the trade partner, so we cannot examine the relationship between country-level characteristics, such as undervaluation, and MNC trade flows in this framework.

32. We also ran estimations with a time trend, and the results were little changed.

33. See Hilbe (2011) for a discussion. We use the logged value of total trade as the predictor of overdispersion, or “excess” zeroes. A Vuong test comparing the ZINB model to the standard negative binomial model indicates that the former is the more appropriate specification.

global affiliates (*Related-party trade*) is associated with fewer AD dispute filings, while *Arm's-length trade* is associated with greater numbers of filings. In model 2, we introduce the log of total MNC sales, as a proxy for firm size, and sector fixed effects. *Related-party trade* retains a negative and statistically significant coefficient, but the coefficient for *Arm's-length trade* is dramatically reduced and far from statistical significance. Also consistent with the results presented in a previous section, size (measured as the log of total sales) is statistically significantly associated with increased filings, all else equal.

Our theory suggests that the lower propensity of large firms with international investments to file AD petitions has contributed to the secular decline in filings over time. In columns 3–5 we examine whether large firms with high levels of RP trade file fewer disputes by including the interaction of *Related-party trade* and *Sales*. The results in model 3 indicate that *Related-party Trade* is associated with fewer disputes among large firms, and that large firms without RP trade file more disputes. The result holds for firms in the manufacturing sector (model 4).³⁴ For firms with zero intrafirm trade, a one-unit increase in the logged value of sales is associated with a roughly 200 percent increase in the predicted number of filings (based on results from model 3).

To facilitate interpretation of the results, we examine the interaction between a dummy variable indicating positive *Related-party trade* and *Sales* volume in model 5.³⁵ The results indicate that as sales increase, the predicted number of filings by firms with positive intrafirm trade decreases relative to the predicted number of filings by firms without vertical affiliates. The interactive effect becomes statistically significant at around \$1.3 billion in sales, where the coefficient estimates indicate that firms with vertically integrated affiliates are predicted to file 56 percent fewer disputes; and firms with vertically integrated affiliates and over \$100 billion in sales are predicted to file 97 percent fewer disputes.

The evidence is consistent with our argument that increases in vertical FDI lessen demands for temporary trade barriers during an era of currency undervaluation and increased import competition. By disaggregating MNC trade flows, we find that intrafirm trade, which indicates ownership of trading affiliates and serves as our main proxy for firm global production activities, is associated with fewer dispute filings. We find no evidence that trade with unaffiliated parties is associated with fewer disputes. The results are consistent with the view that vertical FDI by large firms explains the reduction in the number of US AD dispute filings.

34. The results are also consistent when we examine China-only filings and when we omit disputes involving Chinese firms. The details are available upon request.

35. The log-likelihood suggests that model 5 is marginally inferior in explanatory power compared to model 3. However, the dummy variable interaction in model 5 greatly eases the interpretation of the incidence rate ratio, as implied by the estimated coefficients of the ZINB model. The values of firm sales at which the interaction coefficient achieves statistical significance are similar for models 3 and 5. Details available upon request.

Currency Undervaluation, Trade Flows, and AD Filings at the Country Level

A robust finding in the literature is that currency undervaluation among trade partners is associated with increased AD filings. We suggest that this result may be incomplete, since responses to undervaluation vary depending on firms' vertical FDI in the undervalued country. We also argue that the effect of undervaluation on AD filings depends on the composition of trade flows from the undervalued country and that high levels of intrafirm trade may diminish trade disputes. We examine these country-level implications in this section.

We link AD petitions to country-specific variables to generate a unique cross-national time-series dataset that includes a number of theoretically informed country characteristics that vary annually. Our sample includes all countries for which currency undervaluation data are available. A major advantage of our approach is that our explanatory variables are specific to countries outside the United States. In contrast to the majority of studies—which model AD filings as a function of filing country and industry characteristics—we match exchange rate, investment, and other macroeconomic data to the countries named (and not named) in the AD disputes.

We estimate the country-level determinants of AD filings by US firms over either 1982–2011 or 1997–2011. In terms of the dependent variable, we count the number of AD petitions filed in the United States against each country for each year in our sample.

The yearly count of AD disputes, our main dependent variable, ranges from zero to a maximum of 12. The variable is strongly skewed: about 85 percent of the observations equal zero, and many countries have no filings against them. (Panel unit root tests, not reported to save space, strongly reject the null of a unit root.) To address overdispersion in the data, we follow the firm-level analysis and estimate a ZINB model.³⁶

One main independent variable in our analysis captures real currency undervaluation for all countries in our sample. Its derivation is described in appendix A. Another pair of key independent variables is the presence of US-based global production networks, which we gauge by incorporating measures of intrafirm (or RP) trade from each country into the United States as a share of US GDP, 1996–2010.³⁷

We include two indicators of a country's openness to FDI flows. The first is capital account openness (Quinn and Toyoda 2008). Countries with open capital accounts have a limited capacity to restrict US FDI and to manage exchange rate targets. Capital account openness is therefore likely to decrease the likelihood of AD filings for two reasons: (1) countries with open capital accounts, especially on resident

36. Copelovitch and Pevehouse (2011) and Sattler and Bernauer (2011) adopt either the same or related approaches to control for the “excess” zeroes found in bilateral trade disputes data. In this set of regressions, we use trade disputes lagged three years as the predictor for overdispersion, because it better predicts overdispersion at the country level than does trade.

37. The trade data are from the Census Bureau's Related Party Trade Database, available at <http://sasweb.ssd.census.gov/related-party/>. The data do not allow us to differentiate between imports by US-based parent firms from affiliates abroad and imports by US-based affiliates from foreign-based parent firms. The arm's-length data do not distinguish between imports mediated by US firms and imports by foreign firms. We thank Kristen Corwin for providing access to the aggregated data for RP trade prior to 2002.

outflows, have more difficulty maintaining a given currency undervaluation (owing to Mundell-Flemming effects) and (2) countries with fewer inward capital account restrictions tend to see increased investment and RP trading. Both effects are likely to be associated with fewer AD filings. The second indicator measures whether a country has a bilateral investment treaty (BIT) with the United States, which may enable or enhance vertical integration by US firms.

We also control for a host of variables identified in the literature as correlates of trade disputes and of our main explanatory variables. The Polity 2 index measures democracy, which has been found to be a positive correlate of trade disputes (Busch 2000, Rosendorff 2005, Sattler and Bernauer 2011). GDP per capita proxies for wealth and overall institutional quality, both of which are also positive correlates of trade disputes (Knetter and Prusa 2003, Sattler and Bernauer 2011). In the models in which US intrafirm trade data are not available, we include a measure of the bilateral trade balance with the United States as a share of US GDP, with positive numbers indicating a US trade surplus with the other country.

Because initiating an AD filing requires firms to evaluate the material injury they have suffered, we expect a nontrivial delay between real exchange rate movements and the dependent variable. We therefore introduce all of our regressors with a one-year lag, except for GDP per capita, which we lag three years in keeping with the estimation choice in Knetter and Prusa (2003, 9), and the trade balance, which we lag two years.³⁸

The full model estimated for the longest-available data is

$$\begin{aligned} Disputes_{i,t} = & \beta_0 + \beta_1(Disputes_{i,t-1}) + \beta_2(Undervaluation_{i,t-1}) + \beta_3(GDP/Per\ capita_{i,t-3}) \\ & + \beta_4(Polity_{i,t-1}) + \beta_5(Capital\ account\ openness_{i,t-1}) + \beta_6(Bilateral\ investment\ treaty_{i,t-1}) \\ & + \beta_7(Bilateral\ trade\ balance_{i,t-2}) + \gamma, t + \varepsilon_{i,t} \quad t=1982-2011, i=109-113 \end{aligned} \quad (2)$$

To test our argument with regard to firms and their investment and trade relations, we estimate a version of equation (2) substituting *Arm's-length* and *Related-party imports* data for the *Bilateral trade balance* and adding appropriate interaction terms with undervaluation:

$$\begin{aligned} Disputes_{i,t} = & \beta_0 + \beta_1(Disputes_{i,t-1}) + \beta_2(Undervaluation_{i,t-1}) + \beta_3(GDP/Per\ capita_{i,t-3}) \\ & + \beta_4(Polity_{i,t-1}) + \beta_5(Capital\ account\ openness_{i,t-1}) + \beta_6(Bilateral\ investment\ treaty_{i,t-1}) \\ & + \beta_7(Arm's-length\ imports/GDP_{i,t-1}) + \beta_8(Related-party\ imports/GDP_{i,t-1}) \\ & + \beta_9(Arm's-length*Undervaluation_{i,t-1}) + \beta_{10}(Related-party*Undervaluation_{i,t-1}) \\ & + \gamma, t + \varepsilon_{i,t} \quad t=1997-2011, i=109-113 \end{aligned} \quad (3)$$

38. The timing of the GDP and trade balance lags among 1, 2, and 3 lags is not consequential. The trade data are lagged two years owing to missing data for recent periods.

The models in table 4, columns 1–2, represent the longest-available sample of AD filings, 1980–2011. The models in columns 4–7 contain theoretically relevant variables, especially indicators of related-party and arm’s-length imports to the United States, but the sample is limited to 1997–2011.

The models estimate the relationship between bilateral real exchange rate undervaluation and AD disputes for nonbanking center countries, excluding China. As noted earlier, China is analyzed separately because it is categorized under US trade law as a “nonmarket economy,” which involves a different process of initiating and adjudicating disputes.³⁹ Moreover, the Vuong test suggests that a ZINB model is inappropriate for analyzing Chinese data.⁴⁰

The results shown in column 1 suggest that undervaluation is associated with increases in the number of trade disputes, which is similar to previously reported findings. In particular, a one-standard-deviation increase in undervaluation increases the predicted number of AD filings by about 125 percent.⁴¹ The results are robust to the omission of the lagged endogenous term (column 2).⁴² The model estimated in column 1 fits the data very well.⁴³ The estimated results of the other variables are broadly consistent with prior findings and are discussed below.

The results in columns 4–7 explore the core theory about the relationship between and among undervaluation, trade flows, and trade disputes. Specifically, we examine how RP (and arm’s-length) import shares relate to trade disputes in the context of undervalued currencies. The sample is necessarily shorter, owing to the unavailability of RP trade data from the US Census Bureau before 1996. To assess whether the parameter estimates differ due to changes in the length of the sample, the model in column 1 is reestimated using the shorter sample (1997–2011) in column 3; the signs, magnitudes, and levels of statistical significance of the parameter estimates are similar.

The estimates reported in column 4 indicate that the unconditional relationship between RP imports is positive: countries from which US intrafirm imports represent a higher share of US GDP are more

39. See the discussion in Tatelman (2007).

40. Empirically, we find the parameter estimates for China to be quite different from the rest of the sample, another reason to present analyses of China separately.

41. The exponentiation of the ZINB model coefficient gives the increase or decrease in the estimated incidence of AD filings. For example, the exponentiation of the estimate for undervaluation, 0.817, equals 2.26, or a 126 percent increase in the incidence.

42. Some scholars (e.g., Broz and Werfel 2014) have found that trade disputes are largely driven by the steel and metal industries. We explore this finding by restricting the sample to nonmetal and metal disputes, defined as HS codes 72–83. The relationship between undervaluation and disputes is similar across those subsamples.

43. We examine the predictions of column 1 in appendix A figure A.2, which shows actual trade disputes and the predicted number of trade disputes based on the ZINB estimates reported in column 1. Model 1 generates a very close approximation between predicted and observed trade disputes for 1982–2011. One concern, following Bechtel and Leuffen (2010), is that including the lagged endogenous variable provides most of the explanatory power. Figure A.2 also shows predictions from the results of column 2 in table 4 (omitting the lagged trade disputes term) and predictions from a model with only the lagged endogenous term included. The model with only the lagged term fares poorly in terms of predictions; conversely, the model without the lagged endogenous variable offers a close approximation of the observed filings, though the model including the lagged term is preferred.

likely to incur trade disputes. And higher (lower) levels of undervaluation are associated with increased (decreased) AD filings.

Our theory, however, proposes an interactive, moderating effect between intrafirm trade flows and undervaluation. We report interactions between the import trade shares and undervaluation in column 5. The results in column 5 (with trade shares and the interactions with undervaluation) are consistent with the hypothesis that firm vertical FDI and intrafirm trade moderate the relationship between undervaluation and AD dispute filings.⁴⁴ In particular, we find that undervaluation increases or decreases the predicted number of trade disputes depending on the composition of imports: It is associated with an increased likelihood of AD filings against countries from which more arm's-length US imports originate, and with fewer disputes against those from which US RP imports represent a greater share of US GDP. When the lagged dependent variable is omitted, the results change very little.

As a robustness test, in column 6 we substitute US inward FDI for RP trade under the assumption that FDI precedes US intrafirm imports. The intuition is that RP imports arise from either US FDI in the host country or FDI in the United States. We find that arm's-length trading is only modestly correlated with FDI and that FDI lessens trade disputes in the context of undervaluation, controlling for the effects of arm's-length imports into the United States. In sum, our results are consistent with the view that firm vertical FDI and intrafirm trade flows decrease AD filings in the context of undervaluation.⁴⁵

It is plausible that different types of imports could be endogenous to AD filing.⁴⁶ We test for the exogeneity of both arm's-length and RP imports using the control function approach outlined by Colin Cameron and Pravin Trivedi (2010, 607–10). Because it is difficult with this approach to estimate models with more than two plausibly endogenous variables, we focus on the sample of countries with sustained undervaluation and test for the exogeneity of arm's-length and RP imports to trade disputes in each subsample. The tests for exogeneity fail to reject the null hypothesis of exogeneity, which indicates that both types of imports are plausibly exogenous to filings. (Model 1 in appendix B provides details.)

44. We test for mediation between undervaluation and types of imports following the procedures detailed in Baron and Kenny (1986). Neither type of import nor FDI flows mediate the relationship between undervaluation and trade disputes (or vice versa). The variables do, as evidenced in models 5 and 6, moderate each other's influences.

45. As a further experiment, and in recognition that long-run undervaluation influences FDI, which influences RP trading, we estimate a first-stage model of the determinants of RP trading to assess whether increasing RP trading, above and beyond the influences of increasing FDI, has an estimated effect on AD filings. Research has shown that arm's-length and RP trade are highly correlated at the firm level (Bernard et al. 2009; Ramondo, Rappaport, and Ruhl 2013). We also know, as a near accounting identity, that RP trade follows from prior FDI in the country in question. We therefore estimate a model of a country's likely RP trade with the United States from a model including lagged arm's-length trading, prior FDI, and the country's per capita income, and extract the residuals, which become an estimate of unexplained RP trade. We then estimate model 1 in appendix B table B.1, which shows that the estimated effects of RP trade, extracting the influences of prior FDI especially, have results consistent with the main models.

46. We thank a reviewer and the editor for this suggestion.

We nonetheless estimate two types of instrumental variable models: an instrumental variable (IV) Poisson model and generalized method of moments (GMM) system two-step models. Both have valid instruments, although both IV estimators have undesirable properties. The GMM system estimate, in particular, gives rise to negative predictions of trade disputes for 40 percent of observations; negative disputes, are, of course, impossible. With the IV Poisson model, for identical models and samples the sum of squared errors (SSE) for the ZINB models is 20 percent the size of the SSEs for the IV Poisson models.

Despite the undesirable estimation properties, the results, available in appendix B, are very similar to those of the ZINB models. The main difference is that, in the GMM estimate model, the interaction effect between arm's-length imports and undervaluation is not statistically significant at conventional levels and is not reported. Related-party imports and undervaluation continue to have a negative and statistically significant effect. (See models 2 and 5 in appendix B.) We also estimate models constraining the samples to countries with long-run undervaluations of 20 percent and 10 percent (appendix B models 3 and 4), and the results are consistent with those in the main tables.

While the control variables are not the main focus, we find, consistent with other studies, that US firms are more likely to file AD disputes against firms in countries that are more democratic, wealthier, and with which the United States has a trade deficit. We find, to our knowledge uniquely, that greater openness to international capital flows is associated with *fewer* AD filings (see table 4, columns 1–6). As an empirical experiment, we distinguish between openness to nonresident (inward) and resident (outward) flows (column 7).⁴⁷ If the main effect of capital account openness is a nonresident inflow effect (from the liberalization of, for example, FDI), the inward restrictions (but not the outward restrictions) will contain the identifying variance. It is, indeed, the indicator of openness to nonresident inward investment, and not the indicator of openness to resident outflows, that contains the identifying variance in the capital account openness data. This is an area for further investigation.

We proposed above that a BIT with the United States might also increase US FDI, thereby reducing AD filings. The estimated coefficient estimate of the BIT variable is always negative. In some models, however, the estimates do not achieve conventional levels of statistical significance. This is another area for further research.

As we note above, China is likely to be an unusual case, because of both its special status under US trade law and the large effects of its economic activities on the US market.⁴⁸ We investigate China separately and report the results in table 5, which indicate that increased arm's-length imports from China are associated with increases in trade disputes, while RP imports are strongly negatively correlated with filings. Figure 6 shows that the predictions from our model very closely match the number and timing of actual AD petitions by US firms against China.

47. The data are described in Quinn, Schindler, and Toyoda (2011).

48. See Autor, Dorn, and Hanson (2013) for a discussion of the magnitude of effects on Chinese import competition of US labor markets.

CONCLUSION

Recent advances in scholarship on international economics demonstrate that firm-level heterogeneity in an industry is a main driver of trade and international investment activities. The political implications of “heterogeneous firm” (or “new, new”) trade theory are, however, largely unexplored thus far.

We propose that much can be learned about political and regulatory outcomes by shifting the investigator’s focus from factors and sectors to the level of individual firms. We use US firm AD filings as a prism through which to explore the utility of heterogeneous firm trade theory. We argue that the specific locations of firm vertical FDI and intrafirm trade at a point in time help explain the recent puzzling decline in firm AD filings, and we use both microlevel firm and macrolevel national data to examine our claims.

We demonstrate empirically that (a) intraindustry firm heterogeneity exists between AD filers and nonfilers and (b) the composition and characteristics of firms have important implications for this activity. Firms that file AD petitions are different from industry peers that do not file: they are larger and more internationally engaged in trade, though not with the countries that are filed against. Among firms that have investment or trade positions in foreign countries—especially once they set up vertical affiliates with which they trade—AD filings become much less likely, even in the context of currency undervaluation and rising import competition.

As documented in this working paper, the rising share of economic activity accounted for by firms with global production affiliates in countries with undervalued currencies makes organizing a coalition that represents 25 percent of the activity in a product market increasingly difficult. Given the rapid expansion of global supply chains, our findings offer a partial explanation for the decline in AD filings and the puzzling dearth of protectionism in the wake of the global financial crisis (see Kee, Neagu, and Nicita 2013).

Firm-based theories and empirical approaches are likely to prove effective in addressing a range of political questions in international political economy. Conflicts over international economic policies and outcomes are likely to divide firms within industries, separating firms with the capabilities to expand (and thus benefit from further integration) from those that cannot compete. By shifting the unit of analysis to individual firms, we expect that future scholarship will better explain the location and form of political activities as well as the distributional effects of changes in the global economy. Firm-level approaches are likely to illuminate individual and firm preferences and political behavior across a range of issues such as corporate taxation, international trade and investment, and financial regulation.

Figure 1 Imports, exports, and total antidumping filings by firms in the United States, 1982–2011

Sources: Bureau of Economic Analysis; Bown (2012).

Figure 2 Real exchange rates of Mexican peso and Chinese yuan relative to the US dollar, 1975–2010

Sources: Authors' calculations using methods from Rodrik (2008) and IMF (2012).

Figure 3 Relationships between and among currency undervaluation, foreign direct investment, and trade disputes

Table 1 Characteristics of antidumping (AD) filing firms at date of filing (pooled, 1993–2009)

Characteristic	Percent engaging in activity at time of filing (0,1)		Percentile rank within industry (of value)	
	Mean/ percent	Std. dev.	$\bar{x}$ Rank	Std. dev.
N = 425				
1. Employment	5,871	12,860	0.88	0.19
2. Export	75%		0.74	0.38
3. Import	68%		0.68	0.42
4. Related-party (RP) export	59%		0.61	0.45
5. Related-party (RP) import	52%		0.55	0.46
6. Export to contemporaneous AD country in same HS4 product	29%		0.36	0.45
7. Import from contemporaneous AD country in same HS4 product	25%		0.33	0.44
8. RP export to contemporaneous AD country in same HS4 product	12%		0.21	0.37
9. RP import from contemporaneous AD country in same HS4 product	12%		0.21	0.38

HS4 = Harmonized System four-digit category; Std. dev. = standard deviation

Note: This table presents statistics for firms that filed AD petitions in 1993–2009. The table shows filing firms mean employment, the firms' average rank in their six-digit NAICS industry, and the share of firms engaging in a particular form of international trade. The percentile rank column reports the average of the firms' rank in their industries for the value of these trade volumes.

Source: Authors' calculations.

Figure 4 Proportion of firms filing antidumping petitions 1993–97 engaging in international trade activities of various types: nonsurvivors (41) in 1993 and survivors (48) in 1993 and 2009

AD = antidumping; RP = related party; HS4 = Harmonized System four-digit category

Source: Authors' calculations with Census microdata.

Figure 5 Proportion of manufacturing firms engaging in international trade activities of various types: nonsurvivors (206,200) in 1993 and survivors (88,800) in 1993 and 2009 (weighted by employment as a proxy for market share)

AD = antidumping; RP = related party; HS4 = Harmonized System four-digit category

Source: Authors' calculations with Census microdata.

Table 2 Undervaluation and MNC investment (BEA data at the affiliate level)

Year	Total affiliates		RP exporting affiliates			Horizontal affiliates		
	Count	Growth	Count	Growth	Share	Count	Growth	Share
Undervalued countries								
1994	1,226	n.a.	379	n.a.	31%	737	n.a.	60%
1999	1,752	43%	356	−6%	20%	1,301	77%	74%
2004	2,066	18%	725	104%	35%	966	−26%	47%
2009	2,891	40%	1,300	79%	45%	1,363	41%	47%
1994–2009	1,665	136%	921	243%	14%	626	85%	−13%
Overvalued countries								
1994	11,273	n.a.	4,737	n.a.	42%	5,421	n.a.	48%
1999	11,621	3%	3,499	−26%	30%	7,388	36%	64%
2004	11,465	−1%	4,177	19%	36%	5,627	−24%	49%
2009	13,569	18%	4,923	18%	36%	7,472	33%	55%
1994–2009	2,296	20%	186	4%	−6%	2,051	38%	7%

BEA = Bureau of Economic Analysis; MNC = multinational corporation; RP = related party; n.a. = not available

Note: The sample is the population of US MNCs with majority-owned affiliates taken from the quinquennial BEA Benchmark Surveys over the period 1994–2009. Countries are grouped by sustained currency overvaluation (1994–2009 period average ≤ -1) and sustained currency undervaluation (1994–2009 period average ≥ 1). The numbers of RP exporting affiliates and horizontal affiliates do not necessarily sum to total affiliates. The unreported residual category is affiliates that export solely to unaffiliated parties. See appendix A for details.

Table 3 Related-party trade and MNC antidumping dispute filings, 1989–2009 (BEA data at the MNC headquarters level)

	(1)	(2)	(3)	(4)	(5)
	Sales, sector FE		Sales interaction	Manufacturing only	Intrafirm dummy
Related-party (“intrafirm”) trade	−0.105*** (0.031)	−0.111*** (0.032)	0.655** (0.268)	0.967*** (0.292)	
Arm’s-length (“unaffiliated”) trade	0.082** (0.042)	0.011 (0.049)	0.029 (0.051)	0.043 (0.062)	0.029 (0.046)
Sales		0.596*** (0.113)	1.056*** (0.203)	1.449*** (0.240)	1.020*** (0.187)
RP trade × sales			−0.054*** (0.019)	−0.080*** (0.021)	
RP trade dummy (1 if RP trade is positive)					6.878** (2.759)
RP trade dummy × sales					−0.545*** (0.198)
Constant	0.517 (0.749)	−9.670*** (2.334)	15.849*** (3.246)	19.589*** (3.591)	16.067*** (2.876)
<i>Model of excess zeroes</i>					
Total trade	−0.352*** (0.064)	−0.248*** (0.074)	−0.222*** (0.061)	−0.157* (0.082)	−0.229*** (0.068)
Year FE	Y	Y	Y	Y	Y
Sector FE	N	Y	Y	N	Y
Observations	12,656	12,656	12,656	6,835	12,656
Log-likelihood	−749.0	−730.9	−727.9	−618.7	−731.9

*p < .1; **p < .05; ***p < .01

FE = fixed effects; BEA = Bureau of Economic Analysis; MNC = multinational corporation; N = no; RP = related party; Y = yes

Note: The table reports the results of zero-inflated negative binomial models of the number of antidumping petitions filed by US multinational corporations, 1989–2009. The variables are all measured at the level of the MNC. The values of related-party trade, arm’s-length trade, sales, and total trade represent the natural log transformations of the reported value (plus one). The sector fixed effects correspond to the following categories: construction, agriculture and mining, manufacturing, telecommunications and utilities, wholesale and retail, and services.

Table 4 Bilateral real exchange rate undervaluation and trade disputes, 1980–2011 or 1997–2011

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	1997–2011 sample			Investment			
Disputes _{t-1}	0.269*** (0.074)		0.195** (0.098)	0.19** (0.085)	0.147** (0.071)	0.241*** (0.073)	0.157** (0.075)
Undervaluation _{t-1}	0.817*** (0.238)	0.875*** (0.263)	1.002*** (0.302)	0.992*** (0.315)	0.084 (0.385)	0.47 (0.348)	0.129 (0.393)
GDP/capita _{t-3}	0.566*** (0.158)	0.54*** (0.17)	0.455*** (0.161)	0.394** (0.167)	0.557*** (0.120)	0.439*** (0.132)	0.559*** (0.118)
Polity _{t-1}	0.053** (0.023)	0.056** (0.026)	0.096*** (0.034)	0.098*** (0.036)	0.071** (0.028)	0.075** (0.035)	0.071** (0.028)
Capital account openness _{t-1}	-0.009** (0.004)	-0.009** (0.004)	-0.019*** (0.006)	-0.02*** (0.006)	-0.019*** (0.005)	-0.020*** (0.006)	
Inward capital account openness _{t-1}							-0.03*** (0.011)
Outward capital account openness _{t-1}							-0.009 (0.012)
Bilateral investment treaty _{t-1}	-0.617** (0.314)	-0.722** (0.323)	-0.9*** (0.304)	-0.846*** (0.301)	-0.444 (0.299)	-0.708** (0.316)	-0.417 (0.294)
Bilateral trade balance _{t-2}	-1.173*** (0.274)	-2.198*** (0.35)	-1.92*** (0.489)				
US arm's-length imports _{t-1}				0.529 (0.58)	4.466*** (1.596)	3.526*** (1.195)	4.548*** (1.585)
US related-party imports _{t-1}				1.055*** (0.36)	-0.066 (0.596)		-0.209 (0.641)
Undervaluation _{t-1} × US related-party imports _{t-1}					-7.598*** (2.449)		-7.628*** (2.449)
Undervaluation _{t-1} × US arm's-length imports _{t-1}					24.485*** (7.106)	6.248* (3.211)	23.899*** (6.904)
US inward FDI _{t-1}						-137.936 (84.055)	
Undervaluation _{t-1} × US inward FDI _{t-1}						-408.022* (235.29)	
<i>Model of excess zeroes</i>							
Disputes _{t-3}	-14.264*** -2.792	-2.954*** -0.643	-17.0*** -0.558	-16.935*** -0.499	-16.5*** -0.486	-16.552*** -0.501	-16.16*** (0.472)
Log-likelihood	-1345.9	-1377.3	-549.13	-541.65	-528.131	-528.340	-527.47
Observations	2814	2814	1472	1473	1473	1337	1473
Countries	109	109	109	109	109	108	109
Vuong statistic	3.74	5.44	2.75	2.63	2.4	2.327	2.33

*p < .1; **p < .05; ***p < .01

Note: The table reports the results of panel zero-inflated negative binomial estimates of annual bilateral antidumping filings in the United States, with and without a lagged endogenous variable (models 1 and 2, respectively). Models 3–7 examine filings over the period 1997–2011. The variables are defined in the text.

Table 5 Undervaluation, imports, and antidumping filings against Chinese firms

	(1)	(2)	(3)
Disputes _{t-1}		0.072* (0.040)	0.008 (0.034)
Undervaluation _{t-1}	1.610** (0.639)	0.743 (0.687)	-6.607** (2.719)
US arm's-length imports _{t-1}			4.473*** (1.336)
US related-party imports _{t-1}			-6.914** (2.944)
Constant	1.578*** (0.147)	1.212*** (0.252)	-0.254 (0.609)
Log-likelihood	-85.097	-82.363	-31.347
Observations	33	32	15

*p < .1; **p < .05; ***p < .01

Note: The table reports the results of negative binomial estimates of annual antidumping filings against China by complainants in the United States. The independent variables are country-year values corresponding to China. The undervaluation index is defined in the text; higher values indicate greater real exchange rate undervaluation relative to the US dollar. Related-party and arm's-length imports measure US imports from China by affiliated and unaffiliated parties, respectively, as a share of US GDP.

Figure 6 US antidumping filings against China, observed and predicted from arm's-length and related-party imports, 1997–2011

predicted and observed number of antidumping filings against Chinese firms

Source: Derived from results in model 3, table 5.

APPENDIX A DATA

ANTIDUMPING PETITION DATA

Our data source for AD petitions is the May 2012 update of the Global Antidumping Database (GAD-USA.xls, Bown 2012), which includes all AD petitions filed in the United States since 1980.⁴⁹ It provides the name of the petitioner, a detailed product code corresponding to the product(s) under investigation, the country host of the firm against which the dispute is filed, and the date of the initiation of the investigation.

FIRM- AND INTRAINDUSTRY-LEVEL INTERNATIONAL ENGAGEMENT DATA

To examine the behavior of individual firms in an industry context, we use the Census Bureau Linked/Longitudinal Firm Trade Transaction Database (LFTTD), which links individual US trade transactions to US firms using a longitudinal database of US enterprises that tracks almost all private sector firms in the United States.⁵⁰ For each export and import transaction, we observe the ten-digit Harmonized System classification, the (nominal) value and quantity shipped, the shipment date, the destination or source country, the transport mode, and whether the transaction takes place at “arm’s length” or between “related parties.” Export partners are “related” if either party owns, directly or indirectly, 10 percent or more of the other party; for imports, the ownership cutoff is 6 percent.

We match the AD firm filing data compiled by Bown (2012) with the Census Bureau’s Business Register using the name of the filing organization. (Some of the filers are not firms; filing organizations include, for example, labor organizations, farm produce coops, and cities.) Once the AD filing firms are matched to the Business Register, we use a common identifier to match to the LFTTD and the Census Bureau’s Longitudinal Business Database (LBD), which contains information on industry and employment for almost all private sector establishments in the United States (see Jarmin and Miranda 2002). The combination of the LBD and the LFTTD allows us to construct a detailed and comprehensive picture of US firms’ domestic operations and international trade relationships.

We classify firms into product markets based on the six-digit NAICS industry in which the firm is active and in which it has the most employment (using information from the LBD) for each year.⁵¹ All firms are classified into a single six-digit industry, and we restrict the sample to the manufacturing sector.

49. The GAD lists data from 1980 onward, although US data for 1979 are available in the file.

50. For more information on the LFTTD, see Bernard, Jensen, and Schott (2009).

51. The North American Industrial Classification System (NAICS) is used to classify producers based on the production technology used in the establishment. The HS is used to classify products in international trade. Unfortunately, the two systems are distinct and have little structural similarity. We classify firms at the six-digit NAICS level to obtain fairly narrow company comparisons. We compare imports and exports of products at the four-digit HS level, the level at which AD filing data are most detailed and still reliable.

US MULTINATIONAL COMPANY DATA

We rely on confidential firm-level data from the BEA quinquennial Benchmark Surveys of US Direct Investment Abroad, which are the most comprehensive in scope and coverage of the BEA surveys. Any US person is considered to have a foreign affiliate if she has direct or indirect ownership of 10 percent or more of the voting securities of an incorporated, non-US business enterprise or an equivalent interest in an unincorporated, non-US business enterprise at any time during a benchmark year. A US MNC consists of a US parent (headquarters) company and each of its foreign affiliates. The International Investment and Trade in Services Survey Act requires owners of foreign affiliates to complete the BEA surveys detailing their financial and operating activities for each foreign affiliate and to provide information on the value of transactions between the affiliate and other parties, including the US parent.

Our analysis of firm responses to undervaluation uses affiliate-level data from the 1994, 1999, 2004, and 2009 benchmark surveys.⁵² The specific survey forms that the US MNC is required to complete vary by year, the size of the affiliate (measured as assets, sales, or the absolute value of net income),⁵³ and the US parent's percentage of ownership of the affiliate. The affiliate-level data allow us to disaggregate affiliate sales to a variety of buyers, including the US parent, the host country, and other foreign affiliates⁵⁴ to generate the following categorizations:

- Total affiliates
- RP exporting affiliates: the total number of affiliates that export to the US parent or to other foreign affiliates
- Horizontal affiliates: the total number of affiliates that do not report positive exports

Computing Undervaluation vis-à-vis the United States

The real exchange rate can be thought of as the price of tradable goods relative to nontradable goods. Our bilateral real exchange rate index captures the unique yearly value of a country's goods relative to those in

52. We rely on nonfinancial affiliate surveys accepted by the BEA; we exclude those that were not accepted due to reporting errors.

53. The foreign affiliate size thresholds by benchmark year are as follows: \$3 million (1994), \$7 million (1999), \$10 million (2004), and \$25 million (2009). The data coverage is considered nearly complete. In a typical benchmark year, the survey covers over 99 percent of affiliate activity by total sales, assets, and US FDI. For example, in 1994 participating affiliates accounted for 99.9 percent of total US FDI. In unreported analysis, we duplicated the analysis reported in tables 2 and A.1 using a common inflation-adjusted threshold of \$25 million. Our findings are not sensitive to this adjustment.

54. The data on foreign affiliate sales broken down by destination are collected for majority-owned affiliates only.

the United States at the prevailing nominal exchange rate. To generate our index, we rely on price-level data from the Penn World Table 7.1 (Heston, Summers, and Aten 2012). In particular, we compute

$$RER_{it} = \ln(XRAT_{it} / PPP_{it}). \quad (A.1)$$

We adjust for two well-known determinants of the real exchange rate. First, to account for the Balassa-Samuelson effect (i.e., that relative prices of nontradable goods tend to increase with country wealth), we adjust for GDP per capita: $GDPPC_{it}$. This procedure is standard and used, for example, by Copelovitch and Pevehouse (2013). Second, following IMF (2012), our index captures capital controls using data from Quinn and Toyoda (2008). Our undervaluation index is the residual ε_{it} of the following regression:

$$RER_{it} = \alpha + \beta \ln GDPPC_{it} + \delta CAOPEN_{it-1} + \gamma_t + \varepsilon_{it}, \quad (A.2)$$

where γ_t is a year fixed-effect term, and $CAOPEN_{it-1}$ is the Quinn-Toyoda capital control index for country i in year $t-1$.⁵⁵

Following Philip Lane and Gian-Maria Milesi-Ferretti (2007), we exclude banking center/tax haven countries from the analyses, because the exchange rate valuations and trade data for these countries are affected by the tax allocation strategies of multinational companies as much as (or more than) the countries' economic fundamentals.⁵⁶

55. The data for five countries that experienced hyperinflation during war or civil unrest are excluded owing to unreliable Penn World Table data. The estimation results are unaffected by the inclusion or exclusion of these cases.

56. In this study, the countries omitted because of their designation as a "tax haven" banking center include the Bahamas, Bahrain, Barbados, Hong Kong, Ireland, Luxembourg, Panama, Singapore, and Switzerland. See Gravelle (2013, 3). All of the results reported here are substantively unaffected by the exclusion or inclusion of the data for these countries.

Figure A.1 Change in proportion of all US manufacturing firms engaging in international trade activities of various types: all firms in 1993 (295,000) and 2009 (246,600); weighted by employment as a proxy for market share

AD = antidumping; RP = related party; HS4 = Harmonized System four-digit category

Source: Authors' calculations using Census microdata.

Figure A.2 Actual versus predicted trade disputes, 1982–2011

Source: Derived from results in models 1 (with Y_{t-1}) and 2 (without), table 4.

Table A.1 Undervaluation and multinational corporation investment, 1994–2009

	(1)	(2)	(3)	(4)	(5)	(6)
	1994–2009 growth in:			First difference of:		
	Affiliates	RP exporting affiliates	Horizontal affiliates	Affiliates	RP exporting affiliates	Horizontal affiliates
Undervalued dummy	1.223*** (0.426)	2.600*** (0.859)	0.401 (0.299)			
Neutral valuation dummy	1.531 (1.733)	1.329** (0.608)	2.341 (2.776)			
Undervaluation				0.08 (0.071)	0.231*** (0.070)	−0.023 (0.067)
2004				−0.047 (0.060)	0.496*** (0.064)	−0.492*** (0.074)
2009				0.012 (0.059)	0.482*** (0.056)	−0.124* (0.063)
Constant				0.108** (0.048)	−0.169*** (0.039)	0.263*** (0.052)
Observations				335	335	335
Countries	101	78	98	112	112	112
R-squared	0.023	0.135	0.020	0.007	0.235	0.169

*p < .1; **p < .05; ***p < .01

Note: The table reports growth in and first differences of US MNC affiliates in three separate categories: Total Affiliates, affiliates with positive sales to affiliated parties in the United States or in other countries (Related-party Exporters), and affiliates that do not export (Horizontal Affiliates). In columns 1–3, countries with zero affiliates in 1994 are excluded. The currency valuation dummies correspond to the 1990–2009 period averages of our undervaluation index: *Undervalued dummy* takes a value of 1 if *Undervaluation* is greater than or equal to .1; *Neutral valuation dummy* takes a value of 1 if undervaluation is between −.1 and .1. In columns 4–6, affiliate counts are logged (plus one) and undervaluation represents the average value of the undervaluation index for the 5-year period prior to and including the benchmark year. Robust standard errors are in parentheses, adjusted for country-level clustering in columns 4–6.

APPENDIX B

Endogeneity between imports and antidumping (AD) filings is a theoretical possibility and is potentially a difficult empirical problem. Instrumenting highly overdispersed data with zero-inflated negative binomial (ZINB) models is technically very challenging and somewhat beyond the current econometric frontier.

In our case, the AD filings data are very overdispersed count data (i.e., zeroes dominate the count). In overdispersed count data, we face a tradeoff between instrumenting for potentially endogenous variables and accounting for excess zeroes in the model. In ZINB models, which we show are most appropriate for our data, the first stage is used to account for the excess zeroes problem, and excess zeroes dominate these data. Currently, to our knowledge, there are no instrumental variable zero inflated negative binomial models.

Two alternative instrumental variables (IV) strategies are available. The control function IV Poisson procedure is outlined in Cameron and Trivedi (2013; 2010, 607–10), and was due originally to Windmeijer and Santos Silva (1997). The commands can be implemented in STATA 13 (the “ivpoisson” command).¹ The IV Poisson procedure contains a test for exogeneity of the regressors. The IV Poisson procedure, however, has difficulty in estimating models with more than two plausibly endogenous variables.

We truncate the sample for countries with sustained undervaluation,² and test for the exogeneity of arm’s length and related party imports to trade disputes. We find valid instruments for both types of imports (details available from the author). In table B.1 below (model 2), we report the results. The test for exogeneity fails to reject the null hypothesis of exogeneity, which indicates that trade is plausibly exogenous to filings. The results in model 2, moreover, shows that arm’s length and related party coefficient estimates have similar signs and levels of statistical significance as in the ZINB model, though the coefficient estimates are much larger.

The zero-inflated negative binomial models, however, have much better estimation properties than the identical IV Poisson models on identical samples. The sum of squared errors (SSEs) for the ZINB models are 20 percent the size of the SSEs for the IV Poisson models. For comparison purposes, the full ZINB models with all relevant regressors for the undervalued samples are reported below (table B.1, models 3 and 4). The signs and levels of statistical significance of the ZINB parameter estimates on the truncated undervaluation samples are close to those reported in the paper.

An alternative estimation strategy is to use GMM-system estimations, which allow for the instrumenting of multiple endogenous regressors. In table B.1 below, model 5 is a GMM-system

1. See www.stata.com/manuals13/rivpoisson.pdf for details.

2. Where undervaluation (overvaluation) for three consecutive years was under 20 percent. Similar results are obtained using a 10 percent threshold.

(two-step estimator). The estimates are “difference transformed.” The Sargan statistic suggests that we have valid instruments, and the AB1 and AB2 tests jointly reject the presence of serial correlation.

The GMM-system estimates, however, provide poor predicted values of these highly overdispersed count data, giving rise to negative predictions for trade disputes, which are of course impossible. Forty percent of the predicted trade disputes from the GMM-system estimator in the sample have a negative value. Neither the ZINB models nor the IV Poisson models, by contrast, ever predicts a negative trade dispute, which is reassuring. Moreover, the sum of squared errors for the ZINB predictions is half of that for the GMM-system estimators. The ZINB estimator has much better estimation properties and gives a much better approximation of the data.

We note that the signs, levels of statistical significance, and the size of the parameter estimates of the GMM-system model are relatively similar to the ZINB estimates reported in the paper. The one difference is that the *arms-length trade*undervaluation* interaction is not statistically significant and is not reported. The estimated BIT coefficient is also not statistically significant.

In summary, the possible endogeneity between imports and AD filings is a difficult problem. Instrumenting overdispersed data is technically very challenging and beyond the current econometric frontier.

Table B.1

	(1)	(2)	(3)	(4)	(5)
Sample & estimator:	RP imports Orthogonalized ZINB	Undervalued (>20%) IV Poisson	Undervalued (>20%) ZINB	Undervalued (>10%) ZINB	GMM–2 Step (difference– transformed)
Disputes _{t-1}	0.152** (0.072)		–0.099 (0.105)	–0.25 (0.13)	0.359*** (0.097)
Disputes _{t-3}					–0.435*** (0.115)
Undervaluation _{t-1}	0.002 (0.403)				0.07 (0.195)
Related-party imports _{t-1}	–0.74 (0.602)	–103.228* (54.032)	–45.392*** (7.66)	–13.123*** (2.835)	–3.53 (2.633)
Undervaluation _{t-1} x US related-party imports _{t-1}	–7.497*** (2.52)				–6.885* (3.532)
Arm's-length Imports _{t-1}	4.312*** (7.367)	84.018** (34.262)	55.312*** (9.662)	48.081*** (7.501)	6.214** (2.503)
Undervaluation _{t-1} x US arm's-length imports _{t-1}	16.42*** (4.877)				
Capital account openness _{t-1}	–0.019*** (0.005)		–0.035*** (0.013)	–0.02** (0.011)	–0.007** (0.003)
Polity _{t-1}	0.063** (0.03)		–0.018 (0.058)	–0.044* (0.023)	0.005 (0.012)
GDP/capita _{t-3}	0.523*** (0.12)		0.951*** (0.303)	0.521* (0.309)	0.069 (0.047)
Bilateral investment treaty _{t-1}	–0.468** (0.308)		0.852* (0.452)	1.087*** (0.404)	0.404 (0.416)
RP imports Exogeneity test [p-value for the null hypothesis of exogeneity]		[1.03]			
AL imports Exogeneity test [p-value for the null hypothesis of exogeneity]		[–1.03]			
Observations	1338	393	395	534	1375
Countries	108	52	50	57	109
Sargan test p-value					[0.58]
AB(1) p-value					[0.001***]
AB(2) p-value					[0.292]

*p < .1; **p < .05; ***p < .01

RP = related party; AL = arm's length; ZINB = zero-inflated negative binomial; GMM = generalized method of moments

Notes: Model 1 estimates a model with the residuals of a model of related party trade from using lagged values of US FDI into the host country plus all the regressors in table 4, model 5. The interpretation is that, controlling for the predicted effects of FDI and other covariates, the estimate of the related party trade coefficient is the unique identifying variance of related party imports, controlling for the imports' dependence on FDI, undervaluation, and other covariates. Sustained undervaluation is defined as three consecutive years (t–1, t–2, t–3) with a currency that is 20 percent (model 3) or 10 percent (model 4) or more undervalued using the indicators described in appendix B.

Source: Authors' calculations.

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