Temporary Trade Barriers and Trade Growth

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Abstract

Temporary trade barriers (TTBs) like antidumping (AD) have been shown to have large and persistent effects on trade flows between countries, but there is mixed evidence on the direction of the effect on trade to unrelated markets in part driven by unique institutional features that complicate identification. In this paper, we revisit classical TTB questions with a focus on AD policy through the lens of export growth using publicly available product-level trade data. We find *qualitatively different* trade effects when accounting for growth effects that suggest AD investigations are associated with *global* reductions in within-product trade, across all destinations. We provide evidence that these reductions are not primarily driven by policy-related chilling effects, and argue a supply-side investment/innovation channel is a larger contributor. Our findings suggest the aggregate impact of AD policy on global trade flows of exporters is potentially large due to complementarity across export markets and long run effects.

Keywords: Temporary trade barriers, antidumping, dynamic treatment effects

JEL classification: F10; F13; F14

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1 Introduction

Temporary trade barriers (TTBs) like antidumping (AD) duties and countervailing duties are the last remaining source of trade barriers that exist between member nations of the World Trade Organization (WTO). These barriers have proliferated over the course of the past several decades, with over 7,500 TTB investigations reported to the WTO between 1995 and 2022.[1] The resulting tariff rates can often be large – in the case of China, the average AD ad valorem tariff rate imposed by the United States over the period 2000-2009 was 153% (Felbermayr & Sandkamp, 2020).[2] An extensive literature has investigated the effects of these policies on trade flows into both the investigating destinations, as well as unrelated, non-investigating destinations.[3] However, despite high tariff rates and widespread use of these policies, clear evidence on the direction of trade effects to unrelated destinations is mixed – whether TTBs *deflect* or *dampen* trade in sanctioned products is still an open question.[4] In part, this ambiguity is due to the complex institutional nature of TTB policy and how it hinders identification. In particular, it has been shown that there is a clear bias in which products are selected by importing countries to target with duties – either in the form of targeting products with downward price trends, or surges in the volume and share of imports.[5] This selection may result in strong pre-treatment trends in the level of trade flows that complicate the identification of policy effects (Steinbach & Khederlarian, 2022).

In this paper we revisit the effect of TTB investigation on trade, focusing on AD policy, using a dynamic difference-in-differences (DiD) event study framework to answer two main questions. First, what are the effects of AD investigation on the level and growth of trade

[1] These data were retrieved from the WTO website, accessed August 25, 2023. AD cases are reported here, countervailing cases are reported here, and safeguard cases are reported here.

[2] Tariff rates against non-market economies are often higher. Additionally, AD duties can come in many other forms such as price undertakings and specific tariffs.

[3] For example, Prusa (2001) and Bown and Crowley (2007, 2010, 2013a). For a broader discussion of this literature see Bown and Crowley (2016) and Blonigen and Prusa (2016).

[4] Trade deflection occurs when a TTB leads exporters to reallocate excess capacity to unrelated, or third markets. Trade dampening is when a TTB results in a reduction of trade to these third markets.

[5] The former follows from the stated goal of AD policy (USITC, 2015). Bown and Crowley (2013b), Hillberry and McCalman (2016) document the latter.

within the investigation destination? Second, what are the effects of AD investigation on the level and growth of trade to non-investigating destinations? In particular, we are interested in whether viewing classical AD questions through the lens of export growth addresses identification concerns and delivers qualitatively different results. We use UN Comtrade product-level data over the period 2000-2016 to study the effect of AD investigations on trade, first focusing on China and then extending to other frequently-targeted economies.[6] We leverage both export data and import data of the 10 destinations responsible for filing the most AD petitions against the target exporters. Our focus on China is spurred primarily by the fact that China is the largest target of TTB actions across the spectrum of petitioning destinations, with four times the number of petitions as the second-largest target destination (Bown, 2011). This trend was exacerbated by China's accession to the WTO in 2001 that rendered other forms of trade barriers a violation of the "most-favored nation" status enshrined in WTO membership.[7]

The presence of pre-treatment trends has significant implications for the approach to estimating the trade effects of AD policy. If there are indeed strong trends in the level of trade flows prior to initiation, it is likely that the parallel trends assumption is violated and DiD estimation will be biased. AD tariffs are levied disproportionately on developing countries that presumably have time-varying trade flows that exhibit strong positive growth trends. This is especially salient for China due to the explosion of exports following its 2001 accession to the WTO (Bown, 2011). Therefore, it is natural to conduct the DiD estimation in growth rates. If the growth rates of trade flows evolve over time in a similar fashion for treated and control products prior to investigation (despite treated products exhibiting higher growth rates), the parallel trends assumption will hold and the DiD estimation will produce more valid estimates. This matters both quantitatively and qualitatively, as the

[6]Beyond China, we examine the effect of AD investigation on exports from other export-oriented developing economies (India, Indonesia, Thailand, and Malaysia), and developed economies (the United States, the European Union, Japan, and South Korea).

[7]Our focus on China is also in part due to our ability to access both firm-level data and transaction-level trade data for Chinese exporters, which we intend to leverage.

size and *sign* of the estimated effects may be influenced by accounting for differential growth trends.

We contribute to the literature by highlighting the existence of strong pre-trends in trade flows prior to an AD investigation across all exporting destinations, not just within focal markets. There exists an upward growing trend in the difference in the levels of log trade volume and the import share but a relatively stable difference in the growth rates of trade volume and the import share between target products and non-target products within the same sector or industry in the investigating destination over time. We find a persistent negative effect on the *growth rate* of targeted products up to 9 years after investigation (even after controlling for unobserved industry-destination heterogeneity), which leads to a negative effect on the levels of those Chinese exports to the focal markets in the long run, as compared to similar non-target products. The growth effects are quantitatively significant, with treated products exhibiting growth rates up to 36 percentage points lower than control products in post-treatment periods. These findings are important and likely non-specific to the setting that we are studying (i.e., AD tariffs), as almost all TTBs (AD tariffs, quantity restrictions, SG tariffs, CVDs etc.) target high-growth exports prior to the sanctions, which calls for further investigation into the long-run effects of all types of TTBs (Bown & Crowley, 2013b; Steinbach & Khederlarian, 2022).[8]

Concerning the third market, we find a strong trade *dampening* effect instead of a trade deflection effect following an AD investigation. This finding is established *only when* we carefully take into account the difference in the growth rates between target products and non-target products within the same industry prior to the AD tariff shock.[9] Specifically, we find a persistent negative effect on the *growth rate* of the AD products in the third

[8]Caveat: the identified growth effect is the average treatment effect on the treated (ATT), not the average treatment effect (ATE). Target and non-target products are not randomly selected by the authorities (e.g., the difference in the export growth rate prior to the AD action). In particular, the ATE should be smaller (bigger) than the ATT if the AD tariff has a bigger (smaller) negative impact on products that feature higher export growth.

[9]A simple DID regression (without controlling for the difference in the pre-trends) would lead to the opposite finding.

market up to 9 years post-investigation, which leads to a *substantial downward deviation* of the export level from its pre-treatment trend after the AD tariff. These growth effects are also quantitatively significant, though smaller in magnitude than the focal market effects – growth rates of export volumes to third markets are consistently 4 to 6 percentage points lower among treated products than control products following AD investigation, and are larger for products with a larger share of exports in the sanctioned market. This finding shows that target products displayed a *global* pattern of high export growth before the AD tariff and substantially reduced export growth afterwards. Robustness exercises suggest this finding is not China-specific and likely applies broadly to exports subject to TTB activity.[10]

To arrive at the above results, we consider a number of specifications. Beyond our concern about the validity of the parallel trends assumption, AD imposition is a staggered event where treatment timing varies by product and a number of recent papers in the DiD literature discuss how differential timing introduces bias into a standard two-way fixed effects (TWFE) DiD estimation.[11] We start with the simple static model and extend to a dynamic event study setting to investigate long-run effects. Both the static and the dynamic DiD models are estimated via ordinary least squares (OLS) and weighted least squares (WLS). We then consider the alternative dynamic estimator proposed by Sun and Abraham (2021) to address the econometric issues discussed in Goodman-Bacon (2021). Under each of these specifications, we also consider a variety of fixed effects to control for varying degrees of unobserved heterogeneity. Our results are robust to these alternatives as we discuss in Section 5; we focus on the static and dynamic DiD results estimated via OLS in the main text and relegate additional estimations to the appendix.

We now turn to theoretical channels that can explain the documented empirical findings on co-movement of sanctioned export growth to multiple countries as outlined above. We conjecture that the AD tariff shock in the focal market is likely to generate a negative effect on *supply-side* factors of exporting that are *not* market specific (e.g., firm-level R&D, produc-

[10]The same caveat mentioned in footnote 8 applies: we identify an ATT, not ATE.
[11]See Goodman-Bacon (2021), Callaway and Sant'Anna (2021), and Sun and Abraham (2021) for more.

tivity improvements, or investment into exporting) instead of triggering a global reallocation of exports. We provide evidence that suggests we can exclude the chilling effect as a primary driver – we are unable to find price increases of the target products in the third market after AD investigation in the focal market, and find no effect of correlation in AD filing behavior on prices or growth in exports to third markets.[12] Some recent papers (Albornoz et al., 2021; Breinlich et al., 2022; Fajgelbaum et al., 2023) highlight the importance of the scale effect in determining exports to multiple markets.[13] We cannot exclude this channel. We plan to use a merged firm-level data set from China that contains both production and export transaction information to validate (or exclude) the conjectured channels.

This paper contributes to several strands of literature. First, it complements the considerable discussion on the effects of TTBs on trade flows, specifically AD tariffs. Prusa (2001), Lu et al. (2013), Besedeš and Prusa (2017), Sandkamp (2020), and Steinbach and Khederlarian (2022) examine the effects of TTBs within the investigating market, documenting sharp reductions and even total elimination in trade of targeted products. Egger and Nelson (2011) find negative effects of much smaller magnitudes, while Staiger et al. (1994) show that investigation alone can induce trade destruction. Other papers discuss outcomes such as exchange rates and prices (Blonigen & Haynes, 2002; Blonigen & Park, 2004), productivity (Pierce, 2011; Jabbour et al., 2019), and aggregate bilateral trade (Vandenbussche & Zanardi, 2010). Like Steinbach and Khederlarian (2022), we document strong trends in trade flows prior to investigation, but we differ in that we also provide novel evidence of growth rate effects that both support previous findings of the size and duration of the trade effects of AD policy, as well as suggest a (potentially) *permanent* impact of AD policy on exports.

With respect to third market effects of TTBs, Bown and Crowley (2007) and Baylis and Perloff (2010) find trade deflection effects for US AD actions, and Hoai et al. (2017) find

[12]The chilling effect hypothesizes that AD initiation from some destination i raises the probability of AD initiation from some other destination $j \notin i$. This induces a price (or growth) response of exports in the target product to non-affected destinations to reduce probability of AD investigation.

[13]The scale effect suggests that exporter exit from the focal market may induce reductions in exporting activity to non-investigating third markets due to complementarities across destinations within a product.

deflection for EU actions. For Chinese exports specifically, Chandra (2016), Felbermayr and Sandkamp (2020), and Bao et al. (2021) find evidence of trade deflection, while Bown and Crowley (2010) and Lu et al. (2013) do *not* find evidence of trade deflection. Prusa (1997), Lasagni (2000), and Durling and Prusa (2006) discuss trade diversion effects, or whether other trading partners "fill the void" left by target importers. Our findings challenge the existence of broad trade deflection effects by identifying reductions in the growth rate of exports to non-investigating destinations, which we document over a longer time horizon and across a variety of AD targets and AD petitioners. Importantly, our results show that AD tariffs' growth effect and level effect can be *qualitatively* different for some classical questions studied in the AD literature, like trade deflection, and suggest the importance of accounting for growth trends in the analysis of third market trade effects.

A second strand of literature our paper connects to concerns the endogeneity of TTB policy. A number of papers document links between likelihood of TTB petition and macroeconomic conditions, industry-specific factors, political motivations, strategic retaliation, and the presence of preferential trade agreements.[14] We contribute to a subsection of this literature focused on the role of sudden surges in import growth. Bown and Crowley (2013b) and Hillberry and McCalman (2016) find AD tariffs and safeguard actions are precipitated by rapid growth in imports from the target economies, in line with terms-of-trade motives (Bagwell & Staiger, 1990; Broda et al., 2008; Bagwell & Staiger, 2011). Our paper is closely related, echoing the link between import growth and TTB investigation and illustrating the significant implications this has for the identification of the effects of TTB policy.

Finally, the findings we present have implications for how firms respond to trade policy, which is the subject of a growing literature. Morales et al. (2019) and Alfaro-Urena et al. (2023) provide firm-level evidence that suggests exporting to one destination lowers the cost of exporting to similar destinations. Albornoz et al. (2021) examine both focal market

[14]For work on these topics, see Feinberg (1989), Feinberg and Hirsch (1989), Prusa and Skeath (2002), Blonigen and Bown (2003), Knetter and Prusa (2003), Aggarwal (2004), Reynolds (2006), Bown and Tovar (2011), Crowley (2011), Bown and Crowley (2013a), Furceri et al. (2021), Prusa et al. (2022), and Bown et al. (2023).

and third market effects following a tariff shock to Argentine exporters and Fajgelbaum et al. (2023) examine exports from non-target countries in response to the U.S.-China trade war, both of which suggest the existence of within-product interdependence between export destinations. Breinlich et al. (2022) offer scale economies as a possible explanation for export destruction and link this channel to the discussion on industrial policy. Our third market results suggest that the loss of exports to one market due to AD duties induces further reductions in exports of the same product to unaffected destinations, which is consistent with the argument of *complementarity* across export markets and scale economies in exporting. We intend to bring in firm-level data to further investigate the validity of this scale effect and construct a dynamic trade model to quantify the growth effects of AD tariffs on trade flows in an interdependent world.

In the next section, we briefly discuss some institutional features of TTB and AD policy, before moving into data construction in Section 3 and empirical methodology in Section 4. We then present the results and conclude, further discussing the possible theoretical channels consistent with our findings.

2 Institutional background

Over 7,500 TTB investigations were reported to the WTO between the years 1995 and 2022, of which over 6,500 are AD cases.[15] Increasingly used by lower-income developing countries, these tariffs are discriminatory in nature and specifically target products and firms accused of engaging in unfair trade practices such as dumping or export subsidization. Among TTBs, AD duties are by far the most commonly used policy instrument, comprising a majority of total TTB investigation and imposition across petitioning countries – particularly for newer users of TTBs (Bown & Crowley, 2016). Due to the overwhelming popularity of AD policy as a vehicle for obtaining temporary tariff protection, we focus on AD imposition in this

[15] These data were retrieved from the WTO website, accessed August 25, 2023. AD cases are reported here, countervailing cases are reported here, and safeguard cases are reported here.

paper.

In order to obtain temporary tariff protection via AD law, domestic firms, industry associations, or labor unions organize and file petitions with key government agencies. In the United States, these agencies are the Department of Commerce and the United States International Trade Commission. In the European Union, this is the European Commission. Agencies review the petitions and make affirmative or negative decisions on two major questions: (1) were the target exporters dumping, and (2) did this activity cause or threaten to cause material injury to domestic competitors?[16] Proving dumping or material injury is likely easier for products that exhibit declining relative prices and rapidly growing import shares, thus it is natural to think strong trends are likely to precede investigation.

If the respective agencies make affirmative determinations to both questions, then duties are imposed. AD proceedings typically last around one year, from investigation initiation to the levying of final duties.Duties remain in place until revoked by the imposing country, though per WTO rules are subject to sunset review every 5 years by the presiding agencies. Sunset review requires re-evaluation of the AD case, and result in duty revocation unless it is found that termination would result in the "continuation or recurrence of dumping [...] and of material injury" (USITC, 2015). The size of AD duties are determined by the difference between the observable export price and the calculated "normal value," a differential that is referred to as the dumping margin. All firms in the target destination engaged in the export of the target product are subject to the duties. In market economies, dumping margin is calculated on a firm-specific basis using firm-specific prices. However, for exporting countries with non-market economy status like China, the final dumping margin is the difference between the average export price of all firms and the "normal value" of the product.[17] While there is a possibility for exporting firms to obtain individual or market economy treatment, and thus receive firm-specific tariffs, for many exporting firms the tariff size is invariant to

[16]Dumping is defined as selling an exported product below "normal value," which typically is calculated as the price that firm charges in a home market, a 3rd market, or an estimated production cost.

[17]Non-market economy domestic prices are assumed to be distorted, e.g. due to state subsidies.

that firm's individual export price. For the purposes of this paper, we choose not to focus on the tariff rates as treatment and instead on whether the product was investigated in a binary sense. The delayed nature of AD proceedings (and thus likelihood of anticipatory behavior), the vast heterogeneity in tariff rates, and the continuous nature of the tariff rate as a treatment all present additional challenges for identification (particularly within a staggered adoption setting) and would require even stronger parallel trends assumptions (Callaway et al., 2021).

3 Data

To examine the effects of AD activity on growth, we use annual product-level trade data retrieved from UN Comtrade. These data document import and export flows at the Harmonized System (HS) 6-digit product level for all countries over the period 2000-2016. Data on AD activity comes from the Global Antidumping Database (GAD), which is part of the Temporary Trade Barrier Database maintained by the World Bank (Bown et al., 2020). The GAD contains information on the universe of AD activity across all filing countries. These data contain detailed records on the timing of various stages of AD investigations, targeted countries and HS product codes, as well as tariff rates for cases that advance to either preliminary or final tariffs.

One drawback of these AD data is that products can be targeted at the HS6, HS8, or HS10 level as determined by the importing destination's agencies and customs office. However, HS codes are only comparable across countries at the 6-digit level: 8-digit and 10-digit codes are destination-specific, so a given product may be assigned a different code when it leaves as an export than from what it is assigned as it arrives as an import in the destination. As such, we aggregate target product data from the GAD to the HS6 level. While this aggregation removes some detail, it is not too problematic for two reasons: first, many 6-digit categories do not have a large number of component 8-digit and 10-digit codes, and second, many

AD petitioners recognize the possibility of relabeling as a loophole and intentionally include related 6-, 8-, and 10-digit codes in the AD petition (that may even have zero trade flows prior to treatment) to anticipate this relabeling behavior.

Before merging the GAD into relevant trade data, we collapse the AD data to the product-petitioning destination-initiation year level. This involves several steps. First, we extract all AD activity from the 10 destinations responsible for the most petitions against China over the period 2000-2016, with target products aggregated to the HS6 level.[18] This provides us with a data set of all target HS6 products by the top 10 filers against China. Then, we eliminate duplicates – for the focal market analysis, we eliminate duplicates within petitioning destination-product such that a given HS6 product is only treated at the date of the first case filed against the product by the given destination chronologically. For the third market analysis, we eliminate duplicates within product (but across destination), such that a given HS6 product is only treated at the date of the first case filed against the product by any of the petitioning destinations chronologically.

We include both unsuccessful and successful cases, as previous work has suggested that investigation by itself can have an effect on trade flows, and repeat filing against products following an unsuccessful case is a common practice (Staiger et al., 1994).[19] Finally, we consider an alternative to the baseline third market sample and include only treated HS6-destination pairs in which the linked focal market has a share of Chinese HS6 exports at or above 1% in the 3 years preceding treatment.[20] In summation, the focal sample consists of 656 cases and 1,516 targeted HS6 products. For the third market analysis, the baseline sample consists of 453 cases and 931 targeted HS6 products and the alternative sample consists of 412 cases and 796 targeted HS6 products.

Table 1 documents summary statistics on the distribution of cases and target products

[18] The top 10 petitioners against China are the U.S., the E.U., India, Argentina, Australia, Brazil, Colombia, Canada, Turkey, and Mexico.

[19] We also estimate just using successful cases; these results are reported in Tables A8 and A18 the appendix.

[20] Export share $s_{ijt} = x_{ijt} / \sum_j x_{ijt}$ is the share of a given HS6 i's total exports sent to a given destination j in a given year t. We consider this threshold to focus in on cases where the AD action occurs in a "core" destination rather than a "periphery" one.

across petitioning destination for the full sample prior to removing duplicates, the focal market sample, and the baseline third market sample. Table 2 displays the share of total AD cases that advance to final duties, as well as the mean and standard deviation of case duration in years for each of the three samples.[21] On average the success rate of AD cases is high, and on average the duration exceeds the 5 year period when cases must be reviewed per WTO rules – suggesting that most of these temporary barriers are extended at least once. The United States and Turkey have the longest average duration in the sample, India and Turkey have the highest success rate in the sample, and India, the United States, and the European Union file the largest number of cases against the largest number of products in the sample.

We construct two data sets to explore our two major questions of interest. For the analysis within the focal markets, we extract data from UN Comtrade documenting all HS6 imports into the 10 destinations responsible for the most AD petitions against China. We aggregate trade volume across origin countries to calculate import shares by destination-product category in each year of our sample. Then, we calculate year-to-year growth rates for trade volume and the import share. A common issue impeding the consistent computation of volume and share growth rates is the presence of zero trade flows – trade is lumpy and can sometimes exhibit intermittent zero flows within a product-destination pair over time. To account for these zeroes over the sample period, we rely on a modified growth calculation from Davis et al. (1998), which is formally

$$\Delta Y_{ijt} = \frac{x_{ijt} - x_{ijt-1}}{(x_{ijt} + x_{ijt-1})/2} \tag{1}$$

where i indexes product, j indexes destination, t indexes period, and the denominator is the average of variables in periods t and $t-1$. In this sense, when a trade flow x_{ijt} switches from zero to a positive number between years, the growth rate will equal 200%. Likewise,

[21] Many AD actions are still "in force" as of 2019, the last year of the GAD sample used. As such, duration is censored at 19 years.

when a trade flow x_{ijt} switches from a positive number to a zero, the growth rate will equal -200%. These rates can be thought of as capturing entry and exit, and allow us to account for frequent zeroes in the data without dropping too many observations.[22] Computed growth rates are winsorized to avoid entry/exit acting as outliers and driving results – we choose a trim value of 3% for the main results, but include a sensitivity analysis across various trim values in the appendix.[23]

To examine third market effects, we extract export data from UN Comtrade that documents all Chinese exports by product and destination. As we are focused on the response of trade flows to non-investigating destinations, we omit exports of the investigated products to any of the top 10 petitioning destinations that ever file against the product and retain all other product-destination pairs. We merge the AD data in at the product level, applying the same treatment date to all exports of the target product to non-investigating destinations, determined by the initiation year in the first filing destination chronologically. One drawback of using Chinese export data is an inability to compute import shares. Otherwise, we proceed as outlined above using the growth calculation in (1) to compute the per-period growth in trade volume as well as trade value.

As a final step, we compute unit values for both the focal market and third market to decompose both level and growth effects into price-driven and quantity-driven. This sheds more insight on the possible underlying mechanism, and allows us to test for the existence of a chilling effect in prices as hypothesized in previous work (Bao et al., 2021). Unit value is calculated by dividing the trade value by the trade volume, which gives a rough approximation of the average price of the product. To compute the growth rate of unit value, we log difference in all specifications.

Table 3 contains summary statistics on the quantity variables and their growth rates, with the first panel displaying statistics within the focal destinations and the second panel

[22]We also calculate growth using a more standard approach by log-differencing trade volume and import share levels. This robustness exercise is included in the appendix, Tables A10 and A20.

[23]Winsorization trim sensitivity displayed in Tables A9 and A19 of the appendix.

displaying statistics across all export destinations. Average export growth is 15% within both focal markets as well as across third markets, though growth to third markets exhibits a larger variance, and log export volume is on average higher within the focal destinations. The third panel documents average HS6-year export shares across various categories of destinations.[24] Here we can see on average exports to linked third markets have smaller shares than exports to the related focal markets, highlighting on average that third markets tend to be peripheral. However, the insight these summary statistics offer is limited so we report more detailed shares over time in Table 4.

Table 4 further breaks down product export shares across destinations over time. In panel (a), we calculate the number of new products investigated in that year, the average share of those HS6 exports to the investigating, or focal, destination in that year, and the average share of those HS6 exports to all third markets, or linked destinations in that year. We can see that the share of newly-investigated products exported to the investigating destination fluctuates between 8 and 16%, while the share of said products exported to all other destinations is between 82 and 94%. Because the third market sample eliminates duplicate filing against the same HS6 product across destinations, the focal and linked shares do not always sum to 100%.

Panel (b) of Table 4 looks at export shares over a longer horizon. Here, we calculate the share of total exports in each year by whether or not the product was ever investigated over the sample period. This panel illustrates that over the course of 2000-2016, products investigated by at least one of our 10 focal destinations account for 30% to 35% of total Chinese exports. Products that never see an investigation account for 65 to 70% of total Chinese exports. Over time, the share of Chinese trade in products that ever see investigations is stable, despite underlying heterogeneity in the shares of products that see AD cases in different years over the sample period. Now, we proceed to outline the empirical

[24]Focal markets are HS6-ISOs where AD investigations were initiated. Linked markets are HS6-ISOs where the HS6 is investigated, but by another destination. Unlinked markets are HS6-ISOs where the HS6 was not investigated.

methodology, first discussing ex-ante trends before outlining the identification strategy for estimating the effect of AD investigation.

4 Empirical Methodology

4.1 Ex-ante growth rates and probability of investigation

Before examining the trade effects of AD activity, it is worth verifying previous findings in the AD and TTB literature documenting the relationship between pre-treatment import growth and AD initiation within the context of our sample. Table 5 presents summary statistics comparing the average export growth in pre-treatment periods for initiated products to average import growth over the full sample for two definitions of control products: first, for all non-target HS6 products, and second, for non-target HS6 products within the same HS4 subcategory as target products. Averages are calculated as winsorized means, where top and bottom 3% extreme values are replaced by values at the top and bottom 3% quantiles. Table A1 in the appendix displays the same, but breaks up comparisons by petitioning destination. Simple comparisons of means consistently suggest that import growth is higher among target products in pre-treatment periods than non-target products, with some significant heterogeneity in the size of these growth differentials by importing destination.

We also consider a simple regression framework to further validate this relationship. Similar to Bown and Crowley (2013b), we estimate

$$AD_{ijt} = \beta_0 + \beta_1 g_{ijt} + \alpha_{st} + \gamma_j + \varepsilon_{ijt} \tag{2}$$

where AD_{ijt} is a binary variable equal to 1 if there was a trade policy change (i.e. a new AD investigation) for product i by destination j in period t and g_{ijt} is the mean growth rate of product i imports into destination j from $t-1$ to $t-3$.[25] We include sector-time and

[25] We choose the average of the 3 preceding years due to common institutional features of AD policy. For example, the USITC uses data from the past 3 full calendar years plus up to 3 additional quarters in the

destination fixed effects to attempt to capture unobserved sector- and destination-specific heterogeneity in the probability of AD petition. We estimate (2) via OLS, probit, and logit; the results are reported in Table 6 where g_{ijt} is standardized with mean zero and standard deviation one. Estimated coefficient of the linear probability model and the marginal effects of the probit and logit models are in line with reported results of Bown and Crowley (2013b). Our estimates imply a one standard deviation increase in the growth of import volume increases the likelihood of an AD investigation by approximately 20 percent relative to the mean likelihood.

Finally, as an additional step, we model the process as a survival problem and estimate a proportional hazard model, where the hazard rate is the probability of investigation. Formally, we estimate

$$\lambda_{ij}(t) = \lambda_0(t) \times \exp(\beta_1 g_{ij}(t)) \tag{3}$$

where $\lambda_{ij}(t)$ is the hazard rate at time t, or the probability of investigation of product i by destination j, $\lambda_0(t)$ is the baseline hazard rate (unobserved heterogeneity in probability of investigation), and $g_{ij}(t)$ is the mean growth rate over the past 3 years. The results of the proportional hazard model are displayed in Table A2 in the appendix. The statistically significant positive coefficient implies the hazard ratio $\exp(\beta_1)$ is greater than 1, meaning an increase in the mean growth rate in the past 3 years contributes to an increase in the hazard rate, or the probability of investigation. This further confirms our above findings that there is a positive relationship between ex-ante import growth and probability of AD investigation. We now turn toward the main question of interest, estimating the effect of AD on post-treatment import growth.

4.2 Effect of AD investigation on growth

AD imposition varies by product and importing destination, and units (product-destination pairs) are treated for varying degrees of length depending on case timing and the outcome

material injury determination. See USITC (2015) for more information.

of regular sunset reviews. In this sense, we want to estimate a dynamic DiD specification that allows us to capture the effect of the treatment at different lengths of exposure, while accounting for the staggered adoption of the treatment across units. Identification of trade effects relies on variation in AD imposition across products, both within and across destinations – the first difference compares trade flows before and after initiation, and the second difference compares these differences between target and non-target varieties (within the same broader sector). We consider estimating

$$Y_{ijt} = \alpha_{ij} + \lambda_{jt} + \gamma_{st} + \sum_{k=-10}^{-2} \delta_k D_{ij,t-k} + \sum_{k=0}^{10} \beta_k D_{ij,t-k} + \varepsilon_{ijt} \tag{4}$$

where Y_{ijt} is log import volume, the import share, or log unit value of product i shipped from China into destination j in year t, α_{ij} represent product-destination fixed effects, λ_{jt} represent destination-year fixed effects, γ_{st} represent sector-year fixed effects (defined at either the HS2 or HS4 level) and ε_{ijt} is an error term. $D_{ij,t-k} = \mathbb{1}\{D_{ij} = 1\}\mathbb{1}\{t - k = t^*_{ij}\}$ is relative time indicator equal to 1 if (1) product i is ever treated by destination j, and (2) product i receives treatment by destination j in period $t - k$, where t^*_{ij} denotes the treatment year. This term indicates the treatment year for $k = 0$, it indicates treatment beginning k periods ago for $k > 0$, and it indicates start of treatment $|k|$ periods in the future for $k < 0$. Thus, δ_k and β_k represent leads and lags of the treatment, so estimates of β_k capture the average treatment effect on the treated (ATT) for varying lengths of exposure, while estimates of δ_k will capture pre-treatment trends and can be used for pre-testing. We define the control group to be HS6 products within the same HS4 category as treated HS6 products in an attempt to reduce some concern regarding selection based on broader industry category.[26] We use product-destination fixed effects as this is the level of treatment, and destination-year and sector-year fixed effects (where sector is denoted by HS2 or HS4 category) to control for sector- and destination-specific trends and macroeconomic conditions.

[26]Previous work has highlighted trends in AD imposition that suggest certain industries, like metals and chemicals, are more likely to be investigated.

However, as suggested by the discussion in section 4.1, it is likely that the log level of trade volume and the import share exhibit strong trends in the pre-treatment period – higher growth rates among treated products suggest that the level of trade of treated and control products will not evolve in a parallel fashion. Further, if AD cases truly target the phenomenon of dumping, we should also observe pre-treatment trends in average prices. In both cases, estimates of $\delta_k, k \leq -2$ will likely not equal zero, and the parallel trends assumption will be violated. While this concern compromises the previous estimation and implies treatment is not randomly assigned, we still believe from the perspective of the exporting firms, AD investigation is plausibly exogenous as it originates from foreign firms and governments and can arrive unexpectedly. We propose an alternative estimation strategy by first-differencing (4). In this manner, we are estimating the effect of AD investigation on the growth rate differential between target products and non-target products within the same industry or sector. This can be thought of as a triple difference, with the first difference comparing differences in growth rates before and after initiation. Our estimation equation becomes

$$\Delta Y_{ijt} = \lambda_{jt} + \gamma_{st} + \sum_{k=-10}^{-2} \delta_k \Delta D_{ij,t-k} + \sum_{k=0}^{10} \beta_k \Delta D_{ij,t-k} + \Delta\varepsilon_{ijt} \tag{5}$$

where ΔY_{ijt} is the growth rate of import volume or import share as defined in (1), or unit value of product i from China into destination j from $t-1$ to t, λ_{jt} is a destination-year fixed effect, γ_{st} is a sector-year fixed effect, and $\Delta\varepsilon_{ijt}$ an error term. $\Delta D_{ij,t-k} = D_{ij,t-k} - D_{ij,t-1-k} = \mathbb{1}\{D_{ij} = 1\}(\mathbb{1}\{t-k = t^*_{ij}\} - \mathbb{1}\{(t-1)-k = t^*_{ij}\})$ will remain a relative time indicator for product i being k periods away from initial treatment within destination j at year t, as the last indicator function will always evaluate to zero. As before, β_e capture the ATT for varying lengths of exposure to the treatment, using products within the same industry (HS4 category) as treated HS6 products as the control. By differencing, the time-invariant unit fixed effects drop out. The destination-time fixed effects control for destination-specific macroeconomic conditions like exchange rates that have been shown to influence growth in trade, and the sector-time fixed effects control for unobserved sectoral level growth trends (where as before, we define sector as either HS2 or HS4 category). Given our level specification, sector-destination or sector-destination-year fixed effects are also reasonable if we think that there are sector-destination specific growth trends. We consider these for robustness.

Our first question centers around the effect of AD investigation and imposition on the growth of trade flows within the focal destination. We estimate (4) and (5) using OLS, WLS, and an estimator proposed by Sun and Abraham (2021) designed to address issues that arise in dynamic DiD settings with staggered adoption when treatment effects evolve over time.[27] In this context, t^*_{ij} corresponds to the year an investigation was initiated by the destination j against Chinese imports of product i, and the dependent variable is the level or growth of Chinese import volume, the import share, and the unit value within destination j.

The second question concerns the response of investigated exports to non-investigating destinations. The general estimation strategy is the same as above, with a few important modifications. We now estimate

$$Y_{ijt} = \alpha_{ij} + \lambda_{jt} + \gamma_{st} + \sum_{k=-10}^{-2} \delta_k D_{i,t-k} + \sum_{k=0}^{10} \beta_k D_{i,t-k} + \varepsilon_{ijt} \tag{6}$$

$$\Delta Y_{ijt} = \lambda_{jt} + \gamma_{st} + \sum_{e=-10}^{-2} \delta_k \Delta D_{i,t-k} + \sum_{k=0}^{10} \beta_k \Delta D_{i,t-k} + \eta s_i^{AD} + \Delta\varepsilon_{ijt} \tag{7}$$

where the first major difference is our treatment variables $D_{i,t-k}$ and $\Delta D_{i,t-k}$ are now indicators for product i being k periods away from initial treatment by *any* of the petitioning destinations, using the earliest chronological case as the treatment date for each product i. Treated product-destination pairs are dropped from the sample, so we estimate the effect of an AD investigation initiated by one of the top 10 petitioning countries against China on export growth to all other destinations (including other petitioners, if they did not ever investigate product i). Note that we drop treated product-destinations even if they were not the first chronological case against a product i – while we want to eliminate these within-product duplicate cases for the purposes of defining the treatment date, we still want to

[27]Related issues discussed in Goodman-Bacon (2021), Callaway and Sant'Anna (2021).

consider these product-destination pairs as focal markets and exclude them. Including these markets would bias results downward as they are eventually subject to investigation at later dates.

The second major modification is the inclusion of the variable $s_i^{AD} = x_{if}^{AD} / \sum_k x_{il}^{AD}$ where x_{il} is export volume of product i shipped to destination l in the year that product i was treated via AD investigation, and f indexes the focal destination. This variable represents the share of product i exports sent to the focal destination f in the year that focal destination enacts an AD investigation against the product, and can be thought of as a measure of within-product exposure to the focal destination. We believe it is important to control for significant heterogeneity across products in the growth rate beyond sector-level trends. A higher export share within the focal market implies a lower export share in third markets, which is often associated with faster growth and more entry in the third markets. Further, we *do not* control for product-specific linear growth trends via (HS6) product or product-destination fixed effects in the growth regressions for two reasons. First, we are worried that linear growth trends probably do not hold at such a disaggregated product level. Second, controlling for product-specific linear growth trends would sweep up most of the variation in the growth effect we attempt to identify, which is across HS6 products. Since we still want to control for product-level heterogeneity, we include the focal export share s_i^{AD} as a "weaker" control variable that leaves us room for identification. Note that we do not include this variable in the level specification (6), as it is absorbed by the product-destination fixed effects α_{ij}.

A final difference to note is we do not estimate this model for import share as a response variable since we use Chinese export data, using log level and growth in import volume and unit value as the main dependents of interest. As before, our baseline specifications incorporate product-destination (or market), destination-year, and sector-year fixed effects in the level regression and sector-year and destination-year fixed effects in the growth regression. As in the focal analysis, we consider both HS2 and HS4 levels for the sector-year fixed effects.

We also consider including sector-destination-year fixed effects instead of sector-year and destination-year separately. We cluster the standard errors of coefficients at the level of the treatment assignment. Specifically, we cluster the standard error at the HS6 product-destination (ISO) level in the focal market regressions and at the HS6 product level in the third market regressions.[28] In the following section we discuss the results from the estimation strategy outlined above.

5 Results

We now present the results of our empirical strategy. We first discuss the effect of AD investigation within the investigating destination on both volume and share of imports, as well as prices by estimating (4) and (5) via OLS. We focus on the average treatment effect on the treated (ATT), aggregated across cohorts and lengths of exposure, and then break down the effect dynamics using event study plots aggregated across cohorts and plotted over length of exposure to AD orders. We also estimate the model using WLS and the Sun and Abraham (2021) estimator for robustness, and consider a wider sample of target exporters – both developing and developed – which suggests our finding is not China-specific.

After summarizing our findings within the investigating destination, we turn to a discussion of the effect of AD investigation on export volume and average export prices of target products to unaffected, non-investigating destinations. As with the previous set of results, we present OLS estimates of (6) and (7), focusing on both aggregate ATTs and dynamic coefficient plots across lengths of exposure to the treatment. We also consider alternative estimators and a wider range of target exporters for robustness. Finally, we consider some extensions to our model to investigate the role of market share, correlation across AD imposition, and regional proximity to the investigating destination as they relate to the trade effects of AD actions.[29]

[28] Note that all third markets of the same product are treated at the same time, when the product is investigated in the focal market.

[29] For variables such as the export shares and the growth rates, we use their numerical values without the

5.1 The effect of investigation in investigating destination

5.1.1 Main results

We first present OLS estimation results of (4) and (5), which focus on the effect of AD investigation within the investigating destination, or focal market, for the three main dependent variables of interest. Table 7 documents these results, with three panels for our three dependent variables. In all three panels, columns 1–3 contain estimates of the model run in levels as outlined in (4), and columns 4–6 contain estimates of the model run in differences as outlined in (5). In both cases, we include alternative fixed effects specifications in addition to the "baseline" model outlined in the previous section – the baseline specifications are in columns 1 and 4, respectively. Table 7 presents ATTs of AD investigation aggregated over both cohort and length of exposure.

Focusing first on panel (a), we see that AD investigation is associated with statistically and quantitatively significant reductions in both level and growth in import volume. The first three columns suggest that, following an AD investigation, import quantity falls by 30 to 50 percent. Columns 4–6 suggest that the growth rate of targeted imports into the focal destination falls by 11 to 12 percentage points. However this aggregate ATT fails to capture some of the interesting dynamics in both the level and growth effects, so we plot the coefficients for each length of exposure, aggregated across cohorts (i.e., product-destination pairs with different investigation dates), in Figure 1 for quantity level (panel (a)) and quantity growth (panel (b)).

There are several things to note about Figure 1. First, in panel (a) there is a persistent and clear trend in the difference between log quantity in the treated products and non-treated products within the same industry during the pre-investigation periods. This difference narrows over time, as the treated products exhibit higher growth rates. This is suggestive of a violation of the parallel trends assumption that compromises our DiD estimates. After

percent sign in the regressions (i.e., 10 means a 10% share or growth rate). Import shares in the focal market regressions are reported in decimals.

investigation, export volume of treated products falls by over 50 percent relative to non-target products in the same industries, and this difference persists with the gap widening significantly over time. In panel (b), we see a much tighter relationship in the growth differential prior to investigation for treated and control products, and a sharp decline in growth rates for treated products relative to control products following an investigation. In the investigation year, import growth of treated products falls by 10 percent relative to control products, and in the two years immediately following investigation growth of treated products relative to control products falls by 35 and 29 percent respectively. The growth differential narrows five years post-treatment, and is present but weaker up to ten years post-treatment.[30]

Turning to the import share effects in Table 7, panel (b), we find much of the same – AD investigation is associated with both statistically and quantitatively significant reductions in the level of import share and the growth of the import share, though the magnitudes are smaller. Investigation leads to a fall in the import share of 1 to 2 percentage points, while the growth rate of the import share falls by 9 to 10 percentage points. The dynamics of these effects provide further insight. Figure 2, panel (a) plots the coefficients aggregated across cohorts for each length of exposure depicting the import share differential between treated and non-treated products within the same industry, and panel (b) plots the same but for the growth rate in the import share.

As with import volume, strong pre-trends in the level of the import share are present in Figure 2(a), reinforcing the selection issue that impacts our estimates. Post-investigation, treated products exhibit import shares that are consistently 7 to 10 percentage points lower than non-treated products within the same industry, until at least 10 years post-investigation. The growth effects depicted in Figure 2(b) are similar to the quantity growth effects, with a sharp immediate reduction in the growth rate of treated products relative to control products

[30]The weaker effect after 5 years post-treatment is consistent with institutional details: WTO mandates TTB orders reviewed every 5 years after duty imposition. While many cases are extended upon review (see Table 2), some are not, in which case duties are removed and we would expect dissipation of the negative growth effect.

of 22 to 31 percentage points. Up to 9 years post-investigation, growth of import share among treated products is lower by 3 to 9 percentage points relative to control products, with most statistically different from zero.

Finally, we turn to prices. Table 7, panel (c) contains estimation results for (4) and (5) using log unit value and log-differenced unit value as the dependent variables. We find a positive effect of AD investigation on both log unit value and the growth in unit value. Columns 1–3 suggest that average prices are 6 to 11 percent higher for treated products relative to control products following an AD investigation, and columns 4–6 suggest that growth in unit value is 2 to 3 percent higher for treated products relative to control products following an AD investigation. We decompose these estimates into dynamic effects in Figure 3. Figure 3 shows that the growth effect comes primarily from an immediate shock in the first three periods following investigation, with treated products exhibiting growth rates 5 to 9 percent higher than control products before returning to no significant differences beyond five years post-treatment. Log prices rise quickly in the first three periods, and then level off to a degree 20 to 30 percent higher among treated products relative to control products.

However, unit values in Table 7 and Figure 3 are constructed from import values. A point of recent discussion in the trade literature concerns the degree to which tariffs are passed through to consumers; for example Amiti et al. (2019, 2020) document complete passthrough of the 2018 US tariffs against China onto US consumers and firms. Our price results using import data lead us to suspect a similar phenomenon occurring more broadly across AD tariffs. To further investigate the validity of this claim, we estimate the same model as before, but using data on Chinese exports to the focal destinations. Results are reported in Table A3, and coefficients for the price regressions are plotted by length of exposure in Figure A1, panels (a) and (b). From here, we cannot identify a clear price effect. We believe this suggests that AD tariffs do not impact firms' export prices, but *do* impact the eventual price of the exports within the destination market – indicative of full tariff passthrough. Our finding that Chinese export prices do not respond to AD activity is consistent with

Felbermayr and Sandkamp (2020), while our finding that import prices rise post-tariff is consistent with Amiti et al. (2019, 2020).

5.1.2 Robustness

In addition to the OLS results, we also estimate (4) and (5) via WLS and the estimator proposed by Sun and Abraham (2021). Tables A4 and A5 in the appendix display the aggregated ATTs, and Figures A2–A7 in the appendix display the coefficient plots aggregated across cohorts by length of exposure for our three dependent variables import volume, import share, and average prices for the two estimation procedures. All together, the alternative estimators returns qualitatively and quantitatively similar results as the OLS estimator.

For additional robustness, we also use a wider sample of target exporters. Given our setting, one might wonder whether the identified trade effects are China-specific. Therefore, we extract AD activity against other frequent targets. For developing targets, we focus on India, Indonesia, Malaysia, and Thailand; for developing targets, we focus on the United States, the European Union, Japan, and South Korea – all of which are among the most frequent targets of AD action. For developing targets, we create similar data sets for imports into the same focal destinations used for the earlier analysis, as these economies share similar AD petitioners as China.[31] For developed targets, we use all AD activity from all petitioners and export data from all relevant focal petitioners.[32] from Table A6 and A7 report the results for developing and developed targets respectively, which echo the results for Chinese imports into focal destinations. AD investigation is followed by sharp drops in trade volume and trade growth even among a wider set of exporters.

Taken together, our focal market results have a similar flavor to the main findings of Steinbach and Khederlarian (2022), but with some distinct differences. While we also identify persistent trends in the pre-treatment periods that confound the estimation of treatment

[31] Since India is now considered as a targeted exporter, we do not use India as a focal destination. The other 9 focal destinations remain in the sample.

[32] Our departure from the focal sample used previously is spurred by the considerably different makeup of petitioners targeting developed economies.

effects in levels, we are able to identify a growth effect of AD policy beyond extrapolating the pre-treatment trend line. This growth effect is statistically and quantitatively significant, with persistently lower growth among target products for several years. This novel finding suggests the AD policy has a permanent impact within the focal market. We also find that while it appears average prices increase at the product level, export prices do not respond and it seems AD duties are passed through to the importing market (Amiti et al., 2019, 2020). These results are robust to alternative estimators, and seem to apply to a wider range of AD-affected exporting economies beyond China. With an idea of how AD actions impact the growth and level of trade flows within the investigating destination, we now move to address the impact of AD actions on trade to the rest of the world.

5.2 The effect of investigation on exports to other destinations

Our second question of interest concerns the effects of AD investigation on exports to destinations where the products are not being investigated. We present OLS estimation results of (6) and (7) for our two key dependent variables in Table 8. As in section 5.1, the baseline estimations of (6) and (7) are reported in columns 1 and 4, respectively, with alternative sets of fixed effects reported in adjacent columns. We focus on the alternative third market sample using the export share cutoff, but report results for the baseline third market sample and alternative estimators in the appendix. Later, we consider three different specifications with interaction terms to investigate heterogeneity of the third market ATTs along three dimensions: (1) the export share of the related focal market, (2) the pairwise correlation of AD incidence between the third destination and the related focal destination, and (3) geographic similarities/proximity via "extended gravity" considerations (Morales et al., 2019).

5.2.1 Main results

From Table 8(a), we see two contrasting results. In columns 1–3, we find that export volume of investigated products exported to non-investigating destinations increases by 10 to 13 percent relative to non-investigated products within the same HS4 category. Taken alone, this would be suggestive of trade deflection – target exports increase to non-investigating destinations in response to the AD investigation. However, this result ignores differential growth trends. We report estimates of (7) in columns 4–6, where the focal export share s_i^{AD} is standardized and coefficients correspond to a change of one standard deviation. We find lower growth in import volume of investigated products exported to non-investigating destinations – at the average focal export share, growth rates of investigated products in third markets are 1.3 percentage points lower post-investigation than non-investigated products within the same HS4 category. While the level of trade increases, it increases at a *lower* rate than before investigation. This deviation from the pre-investigation growth trend suggests that rather than deflection, we see dampening of trade in investigated products to non-investigating destinations.

Figure 4 reinforces the story told by panel (a) in Table 8. Figure 4(a) depicts coefficients by length of exposure, aggregated across cohorts, for the baseline level regression and Figure 4(b) depicts coefficients by length of exposure, aggregated across cohorts, for the baseline growth regression. As in section 5.1, there are strong trends in the level of import volume preceding investigation of the product in the focal market (which are excluded from the sample here). The point estimates illustrate a continuation of the trend post-treatment, but at a slower rate and with larger variance. The 95 percent confidence bands suggest that the quantity differential between treated and control products post-treatment may be zero, which is indicative of a possibly larger reduction in the growth rate of treated products. A linear trend of the coefficients in the pre-treatment period is drawn onto the figure, which further illustrates the deviation from the trend following AD investigation.

Figure 4(b) substantiates this reduction in the growth trend. Following investigation of the product, the growth rate of exports to non-investigating destinations falls by 3 to 4 percentage points. This growth effect is persistent, though marginally insignificant in most periods. This evidence suggests that AD investigations against China have a dampening effect on growth of trade to alternative destinations. We include lines denoting the average across pre-treatment coefficients and the average across post-treatment coefficients, which more clearly outline the reduction in growth rates following investigation. However, this dampening effect is smaller in magnitude than the dampening effect within the target destination. Further, the point estimates have large confidence bands that suggest heterogeneity we are not picking up. We investigate this heterogeneity later, after discussing the baseline price effects.

Next, we examine what happens to prices in the non-investigating destinations in response to an investigation from a focal destination. In particular, we are looking for evidence (or lack thereof) of a "chilling effect" in prices that has been discussed in previous work – if exporters believe AD cases are correlated across destinations, one investigation raises the probability of investigation in other markets. To reduce this probability of investigation in the third markets, exporters may wish to raise prices of exports to destinations that have not (yet) initiated AD action against them. Table 8, panel (b) and Figure 5 document our results on price level and growth.

Table 8(b), columns 1–3 show that we cannot identify any change to the pricing behavior of exporting firms in non-investigating destinations following an investigation of the product, relative to non-target products within the same industry. Columns 4–6 display estimates from the growth rate regressions, which similarly suggest we cannot identify changes to the pricing behavior in third markets. Figure 5(a) displays the dynamic coefficients by length of exposure to an AD action in another market for the log unit value dependent variable, and Figure 5(b) shows the same for the unit value growth dependent variable. In both panels, we cannot identify significant deviations in average prices for treated products relative to control products.

In addition to the OLS results reported above using the alternative sample focusing only on AD actions where the focal market share was greater than one percent, we also use the full third market sample and report results in Table A12 in the appendix. The results using the baseline sample are quantitatively similar, with a positive level effect paired with a negative level effect, and no price response. We also estimate (6) and (7) using both WLS and the estimator proposed by Sun and Abraham (2021). The overall ATTs are reported in Tables A13 and A14 for the two estimators, and the dynamic coefficients by length of exposure, aggregated across cohorts, are plotted in Figures A8–A11. The results are much the same as the OLS results reported above.

5.2.2 Exposure to the focal market

While we find consistently negative growth effects within the third market above, the large standard errors in Table 8 and large confidence bands of Figure 4(b) suggest further heterogeneity impacting our estimates. One source of this heterogeneity concerns the "importance" of the focal market. If the exporting destination targeted by AD action is responsible for a large share of Chinese exports, would the third market ATT be larger? To investigate the link between the size of Chinese exports within the treated market and the associated third market effect, we consider interacting the treatment variable with the export share variable s_i^{AD} included as a control that measures the share of the target product i exported to the investigating destination in the investigation year.

With this interaction, our question of interest concerns the effect of a higher or lower share of exports within the target destination on Chinese trade in that targeted product to other destinations, and how that modifies the effect of AD investigation – do products with higher exposure to the focal market see larger, or smaller reductions in growth across third markets? Table 9, panels (a) and (b) outline the results of this alternative specification across the same range of fixed effects we considered for the baseline results for quantity and unit value, respectively. Columns 1–3 display the estimates for the log level dependent, and 4–6 display the same for the growth dependent.[33] As above, we standardize the export share variable and report coefficients associated with a one standard deviation increase in

[33]Note that the HS6-ISO fixed effects of the level specifications absorb the first-order export share term, as in Table 8.

the variable to facilitate interpretation.

First, columns 1–3 of panel (a) illustrate no significant modifying effect of export share to the ATT in levels. At the average focal market share, the ATTs are quantitatively similar to the baseline third market estimation, with AD investigation in a focal market associated with a 9 to 12 percent increase in the log level of trade volume.[34] However, columns 4–6 show the focal exposure does modify the effect of AD investigation on the growth rate. With a focal market share in the treatment year at the average, an AD investigation within the focal destination reduces growth rates in third markets by 1.3 to 1.4 percentage points. This estimate is of a similar magnitude to our baseline result in Table 8. An increase in the focal share by one standard deviation reduces growth rates by 2.6 percentage points among treated products. For a product with a focal share one standard deviation higher than average, the total growth effect of an AD investigation within the focal market is -3.9 to -4.0 percentage points, compared to non-treated products.

Importantly, if AD investigation induced *trade deflection*, we would expect the coefficient on $AD \times s_i^{AD}$ to be *positive* – the larger the share of exports in the focal market, the more excess capacity exporting firms should try to offload in, or deflect to, third markets. However, we find the exact opposite – the larger the share of exports in the focal market, the *more* exporting firms *reduce* their growth to third markets. This points to the likelihood of supply-side factors as a fundamental driver of firm export responses to AD policy – firms with larger shares of lost exports due to focal market AD activity should make larger adjustments to their scale or investment, which propagate through the rest of their exporting networks. Our findings here are consistent with this story. Before moving on, we note that panel (b) shows we cannot identify any price effects, even accounting for focal market heterogeneity.

To further examine this heterogeneity, we depart from the DiD framework and focus on *treated products* only. We re-estimate both the level and growth models with the export share interaction, but only among treated products. Identification comes from the variation over

[34]The average focal market share across all products is 9.6%. Table 4 shows average shares by year of initiation.

time within a treated product and comparisons are made between treated and not-yet-treated products. We report the results of this estimation in Table 10, with the quantity dependent in panel (a) and the price dependent in panel (b). As before, columns 1–3 display estimates for the level specifications and columns 4–6 display estimates for the growth specifications. The export share variable is standardized as in the previous set of results.

While the coefficient on the treatment variable is no longer the ATT, we see that among treated products the relationship between the focal export share and growth holds. Treated products with a focal export share one standard deviation higher than the average see growth rates 1.9 percentage points lower, but no distinguishable difference in log levels. Comparing treated products to not-yet-treated products within the same destination-year, for a focal share one standard deviation above the mean the total growth effect of AD investigation is -6.7 percentage points. We conclude that export share heterogeneity is quite important among treated products.

5.2.3 Correlated AD imposition and the chilling effect

Next, while we do not identify a clear chilling effect in prices in either the main results or with the export share interaction, we are still concerned about the possibility of correlated AD cases across destinations having an impact on our estimates. In order to investigate this, we compute correlation coefficients from the AD data and re-estimate the model with these coefficients included as an interaction. First, from the AD data we obtain the list of all petitioning destinations that file AD investigations against China over the period 2000-2016 – there are 27 such destinations. Then, for each of these destinations we generate a binary indicator over all HS6 products in the sample that denote whether the destination filed against the HS6 product at least once over the period. We compute a correlation coefficient between each of these destination-specific list of binaries and each destination-specific list of binaries for our 10 focal destinations. This yields a correlation matrix of filing behavior between all 27 filers and the 10 top filers, across all products over the sample period.

We report the correlation matrix in Table A11 of the appendix. Each element signifies the degree of overlap between destinations, in the sense that a high correlation coefficient indicates the two destinations file against similar products. We believe that, if chilling effects are present, they can be captured via this variable – if an AD investigation is filed by some destination j against product i, then exports of i should fall more (or prices should rise more) in third markets where the correlation coefficient between that destination and filing destination j is higher. To integrate this measure into the data set, we reshape the correlation matrix into a pairwise form and merge into the trade data at the HS6 level.[35] As a final note, destinations that do not file have no AD activity to generate correlations, so the sample consists of the 27 destinations that file against China. We also drop non-treated products, as they do not have a linked focal market to generate a pairwise correlation.

Table 11 displays the results of interacting the pairwise correlation measure with the treatment variable over the same range of fixed effects previously considered. Panels (a) and (b) report the results for quantity and unit value, respectively, with the log level dependent in columns 1–3 and the growth dependent in columns 4–6. We cannot identify an effect of AD case correlation on log level of export quantity, or growth in export quantity. We also cannot identify an effect of AD case correlation on prices. Prices and quantity do not seem to respond in any systematic way among investigated products when AD imposition is highly correlated between a third market and its linked focal market. This suggests that a supposed chilling effect is unlikely to be a key driver of the main results we document above – as a chilling effect arises through the (perceived) increased probability of AD imposition in a non-investigating destination following an investigation initiated by another destination.

5.2.4 Extended gravity

Perhaps rather than correlation in AD filing, broader similarities between destinations impact firm exporting behavior and induce export reallocation. These "extended gravity"

[35]The first order term is absorbed by HS6-ISO fixed effects (focal market matches are made at the HS6 level, so destination-pairs are equivalent to HS6-ISO pairs), and thus is omitted from the level regressions.

considerations may imply an easier effort to reallocate exports from an investigating destination to ones nearby and with similar characteristics (Morales et al., 2019). To determine if this source of heterogeneity may be impacting our results, we construct an indicator variable denoting whether a third market exists within the same broader geographic region as the investigating destination for a given product.[36] Since non-treated products have no destination pair with which to calculate the indicator, we focus only on heterogeneity within treated products.

We report the results to this estimation in Table A15 in the appendix. As before, we present the level results in columns 1–3 and the growth results in columns 4–6. We cannot identify a significant relationship between sharing a geographic region and changes to trade flows induced by AD investigation. Regardless of whether the exporting destination is in relative proximity to the investigating destination, the growth effects of AD activity seem to be the same among investigated products. Reallocation among geographically similar destinations does not seem to be occurring in response to AD activity.

5.2.5 Target exporters beyond China

As a final robustness step, we also extend the analysis beyond Chinese exports as in section 5.1.2. For similar developing economies, we consider AD activity targeting India, Indonesia, Malaysia, and Thailand – four large developing exporters that are also among the most frequent targets of AD action. For developed targets of AD action, we consider the United States, the European Union, Japan, and South Korea which are also among the most frequent targets of AD action. We merge in AD activity initiated by the top 10 filers against these destinations (excluding cases initiated by any of the four), using the first case chronologically, within product and across petitioners, and exclude focal product-destination pairs from the sample. The results for developing and developed targets are reported in Table A16 and A17 in the appendix, respectively. From this, we can confirm that the findings we document

[36]We use the following delineations of region: North America, Central America, South America, Europe, Northern Africa, Sub-Saharan Africa, Asia, and Oceania.

here are not China-specific (and further, not even specific to export-oriented developing economies) but rather apply broadly across many common targets of AD action – most importantly the distinction between the level effects and the growth effects of AD activity on trade to non-target markets.

To summarize, in non-investigating destination markets we find several key results. First, while level regressions imply trade deflection, the growth of future trade volume falls among target products and this deviation from the trend implies trade destruction. This dampening effect is larger for products where the investigating destination is an important market. We cannot identify an effect of AD filing on prices in third markets, nor an effect of correlation among AD filing behavior on either prices or export growth for investigated exports to non-investigating destinations. This suggests that a chilling effect on prices or export growth is not the primary source of the reduction in growth we see across third markets. Finally, we show that "extended gravity" considerations (such as geographic proximity) do not drive significant reallocation within treated products following AD investigations. These key findings seem to extend beyond our setting of Chinese trade, and apply more broadly to export-oriented developing economies.

5.3 Implications

Altogether, our results imply that export growth of investigated products suffers *globally* following AD activity. Not only do we see large and persistent reductions in the growth of future trade of the target product within the investigating destination, but we also observe persistent reductions in the growth of future trade of the target product to other, unrelated destinations. These third market effects are larger when the treated product has a larger share in the relevant focal market. Further, we find export prices of investigated products exported to both investigating and non-investigating destinations do not respond to AD activity. We cannot identify any effect of correlated AD activity on prices or export growth, suggesting that the chilling effect is not the primary driver of the export response to AD activity. Beyond this, we suspect that export market complementarities and economies of scale may be responsible for the global reduction in growth that follows from AD investigations, whereby distinct destinations are complementary and when AD activity shocks one market, it reduces the firm's incentive to invest and innovate in exporting-related activities, or forces them to scale back firm size by moving up the average cost curve.

Two pieces of evidence support our proposed investment/innovation-driven channel. First, the plots of dynamic DiD coefficients show that while the negative growth effect in the focal market happens immediately after the AD duty is levied, it appears *gradually* (and with a delay) in the third markets. This is consistent with the well-acknowledged fact that adjusting firm's investment and innovation (for exporting) has a *gradual* and *delayed* effect on firm's exports to various markets, as these actions lead to dynamic effects. Second, results from Tables 9 and 10 are consistent with the investment/innovation-driven channel, as the coefficient in front of the interaction term is consistent with the prediction of the market size effect in an endogenous growth/innovation model. While our current set of empirical results cannot disentangle these various possible mechanisms, we aim to leverage firm-level data on Chinese exporters to quantify a partial equilibrium model of firm export responses to TTBs to shed further insight on the source of the findings presented here.

6 Conclusion

In this paper, we use a dynamic DiD methodology to examine the effect of AD investigation on trade flows to both the investigating destination, as well as non-investigating destinations. We first establish a relationship between pre-treatment export growth and AD imposition, which suggests a selection issue that potentially compromises the parallel trends assumption and thus canonical DiD estimation of the trade effects of AD policy. We find significant trends in the level of import volume and import share prior to treatment within the focal market, as well as significant trends in the level of import volume prior to treatment across third markets. With these trends in mind, we revisit classic questions in the AD literature through the lens of growth, using differenced specifications to estimate the effect of AD investigation on the growth of trade volume, import share, and average prices.

Within the focal markets, we find that AD investigations lead to significant and persistent reductions in the growth rate of import volume and the import share for target products relative to non-target products within the same industry. Within non-investigating markets, we also find significant and persistent reductions in the growth rate of trade volume for target products relative to non-target products within the same industry when the product is faced with an investigation in some other export destination. These effects are larger in magnitude the larger the share of that HS6 product is exported to the relevant investigating destination. Ignoring these growth effects in the third market leads to the finding that AD investigations induce trade deflection, as the level of trade volume increases post-treatment – but at a much slower rate. However, accounting for the growth trends suggests that in response to AD investigations, firms reduce export growth *globally*. We also find no robust evidence of a chilling effect in prices or export growth within non-investigating destinations, whereby firms raise price or slow growth to reduce the probability of investigation.

Our findings imply that the AD tariff shock in the focal market is likely to generate negative effects on supply-side factors of exporting that are product- but not market-specific. In particular, if exporting exhibits scale economies and export markets are complementary, the loss of one market via AD imposition may lead to the loss of exports to unrelated markets due to scale effects or reductions in investment and innovation. Our results are consistent with scale-driven and investment-driven channels, but cannot disentangle these mechanisms. Our next steps are to bring in firm-level data on Chinese exporters to construct a dynamic trade model to quantify the growth effects of AD activity on trade flows in an interdependent world to further investigate which of these channels contribute to the empirical findings documented here.

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Table 1: AD Cases and Target Products by Petitioning Destination

	Cases (Count)			HS6 Products (Count)		
Destination	All	Focal	Third Mkt	All	Focal	Third Mkt
India	154	113	96	207	207	165
United States	116	102	80	310	310	219
European Union	91	84	66	215	215	131
Brazil	83	74	33	130	130	44
Turkey	81	73	49	156	156	106
Argentina	70	64	49	144	144	84
Mexico	47	45	21	87	87	35
Colombia	41	38	20	105	105	57
Australia	39	33	21	60	60	28
Canada	36	30	18	102	102	62

Table 2: AD Case Success Rate and Duration by Petitioning Destination

	Success Rate			Duration (Years)					
				All		Focal		Third Mkt	
Destination	All	Focal	Third Mkt	Mean	SD	Mean	SD	Mean	SD
Argentina	0.79	0.77	0.76	9.25	4.17	9.22	4.22	9.32	4.55
Australia	0.59	0.61	0.52	6.61	3.09	6.70	3.26	7.18	4.14
Brazil	0.69	0.68	0.70	7.79	3.10	7.86	3.21	8.39	3.34
Canada	0.75	0.73	0.78	8.68	3.43	8.74	3.63	9.43	4.01
Colombia	0.59	0.58	0.60	7.05	3.26	7.15	3.41	8.18	3.82
European Union	0.77	0.79	0.79	9.04	3.50	9.23	3.45	9.54	3.44
India	0.86	0.87	0.86	8.92	3.96	9.31	4.04	9.29	4.02
Mexico	0.68	0.67	0.57	8.23	4.54	8.39	4.63	11.07	5.22
Turkey	0.95	0.95	0.98	12.31	4.58	12.29	4.64	13.15	4.21
United States	0.77	0.76	0.75	10.98	4.45	11.21	4.51	11.67	4.69

Table 3: Summary Statistics

Variable	N	Mean	Std. Dev.	Min	Pctl. 25	Pctl. 75	Max
Sample: Focal Market							
log(quantity)	277,612	12	3.7	-4.4	9.6	14	31
quantity growth	282,332	15	107	-200	-35	76	200
import share	387,481	0.18	0.25	0	0.000043	0.28	1
import share growth	293,838	14	94	-200	-20	52	200
Sample: Third Market							
log(quantity)	2,700,595	9.7	3.7	-6.2	7.5	12	26
quantity growth	2,986,767	15	134	-200	-81	129	200
Export Share Statistics							
focal market shares	796	0.083	0.1	0.00071	0.013	0.12	0.55
linked market shares	796	0.0054	0.004	0.00054	0.003	0.0065	0.066
unlinked market shares	5095	0.02	0.028	0.001	0.0066	0.022	0.53

Table 4: Summary Statistics: Export Shares

Panel (a): export shares by year, newly investigated products																
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
focal	0.083	0.064	0.16	0.12	0.1	0.1	0.06	0.12	0.096	0.086	0.1	0.12	0.13	0.074	0.08	0.1
linked	0.91	0.94	0.82	0.88	0.9	0.9	0.94	0.88	0.87	0.88	0.9	0.85	0.87	0.93	0.92	0.9
N	101	69	60	45	76	59	93	42	94	83	59	34	27	34	14	31

Panel (b): total export share by ever-treated status				
	2003	2007	2011	2015
treated	0.3	0.34	0.35	0.35
never-treated	0.7	0.66	0.65	0.65

Note: Panel (a) reports HS6-year export shares averaged across products; focal ISO is the first destination chronologically investigated the product. Focal and linked shares may not sum to 100% in the case an HS6 product is investigated by another focal destination. N denotes number of products investigated that year. Panel (b) reports the share of exports each year in products ever-treated over the sample period compared to never-treated.

Table 5: Average growth rates by treatment status

	All products		Same HS4	
Treatment	volume	share	volume	share
0	13.582	12.451	15.351	14.097
1	31.125	24.594	31.125	24.594

Table 6: Ex-ante growth and AD initation

Dependent Variable:		AD_{ijt}	
Model:	(1)	(2)	(3)
	OLS	Probit	Logit
Variables			
g_{ijt}	0.01288***	0.10117***	0.16415***
	(0.00371)	(0.02457)	(0.04494)
Fixed-effects			
HS2-year	Yes	Yes	Yes
dest_iso	Yes	Yes	Yes
Fit statistics			
Observations	7,450	5,524	5,524
Squared Correlation	0.35885	0.17949	0.18076
Pseudo R^2	0.54208	0.18164	0.18129
BIC	6,970.0	5,954.9	5,956.6

Note: Robust standard errors in parentheses, g_{ijt} standardized;
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Effect of AD investigation in the focal market

Dependent:	Level			Growth		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Panel (a): Quantity						
AD	-0.4423***	-0.5166***	-0.3570***	-12.09***	-11.27***	-10.50***
	(0.0453)	(0.0415)	(0.0474)	(0.6149)	(0.6475)	(0.6572)
Observations	277,612	277,612	277,612	282,332	282,332	282,332
R^2	0.84688	0.85795	0.89699	0.14278	0.14446	0.19185
Within R^2	0.00124	0.00173	0.00068	0.00054	0.00041	0.00036
Panel (b): Import share						
AD	-0.0120**	-0.0182***	-0.0044	-10.26***	-9.257***	-9.142***
	(0.0047)	(0.0047)	(0.0056)	(0.5059)	(0.5391)	(0.5493)
Observations	387,481	387,481	387,481	293,838	293,838	293,838
R^2	0.68358	0.69784	0.74746	0.10913	0.11039	0.14488
Within R^2	0.00008	0.00019	0.00001	0.00047	0.00034	0.00033
Panel (c): Unit Value						
AD	0.1038***	0.1128***	0.0683***	0.0279***	0.0218***	0.0184**
	(0.0165)	(0.0165)	(0.0203)	(0.0039)	(0.0040)	(0.0041)
Observations	277,612	277,612	277,612	243,043	243,043	243,043
R^2	0.95604	0.95760	0.97004	0.10974	0.11128	0.16863
Within R^2	0.00025	0.00029	0.00009	0.00004	0.00002	0.00002
Fixed effects						
ISO-year	✓	✓	–	✓	✓	–
HS-ISO	HS-6	HS-6	HS-6	–	HS-2	–
HS-year	HS-2	HS-4	–	HS-4	HS-4	HS-4
HS-year-ISO	–	–	HS-4	–	–	HS-2

Note: Standard errors in parentheses are clustered at the HS6-ISO level; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 8: Effect of AD investigation within third markets

Dependent:	Level			Growth		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Panel (a): Quantity						
AD	0.1072***	0.1339***	0.1116**	-1.254**	-1.338**	-1.310**
	(0.0381)	(0.0389)	(0.0447)	(0.6181)	(0.6209)	(0.6315)
s_i^{AD}				0.4407*	0.4465*	0.4483
				(0.2669)	(0.2682)	(0.2734)
Observations	2,173,522	2,173,522	2,173,522	2,412,041	2,412,041	2,412,041
R^2	0.84576	0.85319	0.90354	0.08242	0.08436	0.15391
Within R^2	0.00022	0.00026	0.00024	0.00001	0.00001	0.00001
Panel (b): Unit Value						
AD	-0.0007	0.0048	0.0107	0.0030	0.0030	0.0027
	(0.0175)	(0.0178)	(0.0206)	(0.0038)	(0.0038)	(0.0040)
s_i^{AD}				0.0016	0.0017	0.0019
				(0.0015)	(0.0015)	(0.0015)
Observations	2,173,522	2,173,522	2,173,522	1,715,749	1,715,749	1,715,749
R^2	0.90334	0.90905	0.93712	0.08782	0.08987	0.14140
Within R^2	0.00000	0.00000	0.00001	0.00001	0.00001	0.00001
Fixed effects						
ISO-year	✓	✓	–	✓	✓	–
HS-ISO	HS-6	HS-6	HS-6	–	HS-2	–
HS-year	HS-2	HS-4	–	HS-4	HS-4	HS-4
HS-year-ISO	–	–	HS-4	–	–	HS-2

Note: estimates using sample of AD cases where share of HS-6 exports from China $\geq 1\%$. s_i^{AD} is standardized. Standard errors in parentheses are clustered at the HS6 level; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: Effect of AD investigation within third markets: export share heterogeneity

Dependent:	Level			Growth		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Panel (a): Quantity						
AD	0.0909**	0.1229***	0.0972**	-1.345**	-1.424**	-1.399**
	(0.0410)	(0.0411)	(0.0468)	(0.6168)	(0.6198)	(0.6302)
$AD \times s_i^{AD}$	0.0270	0.0182	0.0244	-2.622***	-2.599***	-2.527***
	(0.0258)	(0.0278)	(0.0314)	(0.5587)	(0.5621)	(0.5734)
s_i^{AD}				2.309***	2.297***	2.251***
				(0.4308)	(0.4338)	(0.4407)
Observations	2,173,522	2,173,522	2,173,522	2,412,041	2,412,041	2,412,041
R^2	0.84577	0.85319	0.90354	0.08246	0.08440	0.15395
Within R^2	0.00025	0.00027	0.00026	0.00001	0.00001	0.00001
Panel (b): Unit Value						
AD	-0.0113	-0.0031	0.0023	0.0032	0.0032	0.0028
	(0.0184)	(0.0181)	(0.0209)	(0.0038)	(0.0038)	(0.0040)
$AD \times s_i^{AD}$	0.0175	0.0130	0.0141	0.0028	0.0027	0.0024
	(0.0112)	(0.0136)	(0.0152)	(0.0032)	(0.0032)	(0.0034)
s_i^{AD}				-0.0005	-0.0004	0.0001
				(0.0025)	(0.0025)	(0.0027)
Observations	2,173,522	2,173,522	2,173,522	1,715,749	1,715,749	1,715,749
R^2	0.90334	0.90905	0.93713	0.08782	0.08987	0.14140
Within R^2	0.00005	0.00002	0.00004	0.00001	0.00001	0.00001
Fixed effects						
ISO-year	✓	✓	–	✓	✓	–
HS-ISO	HS-6	HS-6	HS-6	–	HS-2	–
HS-year	HS-2	HS-4	–	HS-4	HS-4	HS-4
HS-year-ISO	–	–	HS-4	–	–	HS-2

Note: estimates using sample of AD cases where share of HS-6 exports from China $\geq 1\%$. s_i^{AD} is standardized. Standard errors in parentheses are clustered at the HS6 level; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 10: AD investigation within third markets: export share heterogeneity, treated products

Dependent:	Level			Growth		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Panel (a): Quantity						
AD	0.0328	0.0310	0.0546	-4.781***	-4.852***	-4.785***
	(0.0396)	(0.0541)	(0.0771)	(1.328)	(1.330)	(1.381)
$AD \times s_i^{AD}$	0.0353	0.0126	0.0194	-1.890*	-1.944*	-1.929*
	(0.0365)	(0.0459)	(0.0624)	(1.040)	(1.049)	(1.092)
s_i^{AD}				1.721**	1.757**	1.773**
				(0.7818)	(0.7893)	(0.8169)
Observations	970,532	970,532	970,532	1,055,243	1,055,243	1,055,243
R^2	0.83760	0.84887	0.93349	0.10443	0.10769	0.22804
Within R^2	0.00009	0.00001	0.00008	0.00008	0.00009	0.00009
Panel (b): Unit Value						
AD	-0.0093	0.0280*	0.0278	-0.0013	-0.0019	-0.0030
	(0.0174)	(0.0167)	(0.0234)	(0.0059)	(0.0060)	(0.0063)
$AD \times s_i^{AD}$	0.0235	0.0244	0.0268	0.0012	0.0015	0.0014
	(0.0146)	(0.0219)	(0.0290)	(0.0064)	(0.0064)	(0.0070)
s_i^{AD}				-0.0006	-0.0009	-0.0005
				(0.0054)	(0.0055)	(0.0060)
Observations	970,532	970,532	970,532	785,517	785,517	785,517
R^2	0.89399	0.90258	0.95797	0.13203	0.13628	0.24275
Within R^2	0.00013	0.00011	0.00024	0.00000	0.00000	0.00000
Fixed effects						
ISO-year	✓	✓	–	✓	✓	–
HS-ISO	HS-6	HS-6	HS-6	–	HS-2	–
HS-year	HS-2	HS-4	–	HS-4	HS-4	HS-4
HS-year-ISO	–	–	HS-4	–	–	HS-2

Note: estimates using sample of AD cases where share of HS-6 exports from China $\geq 1\%$. s_i^{AD} is standardized. Standard errors in parentheses are clustered at the HS6 level; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

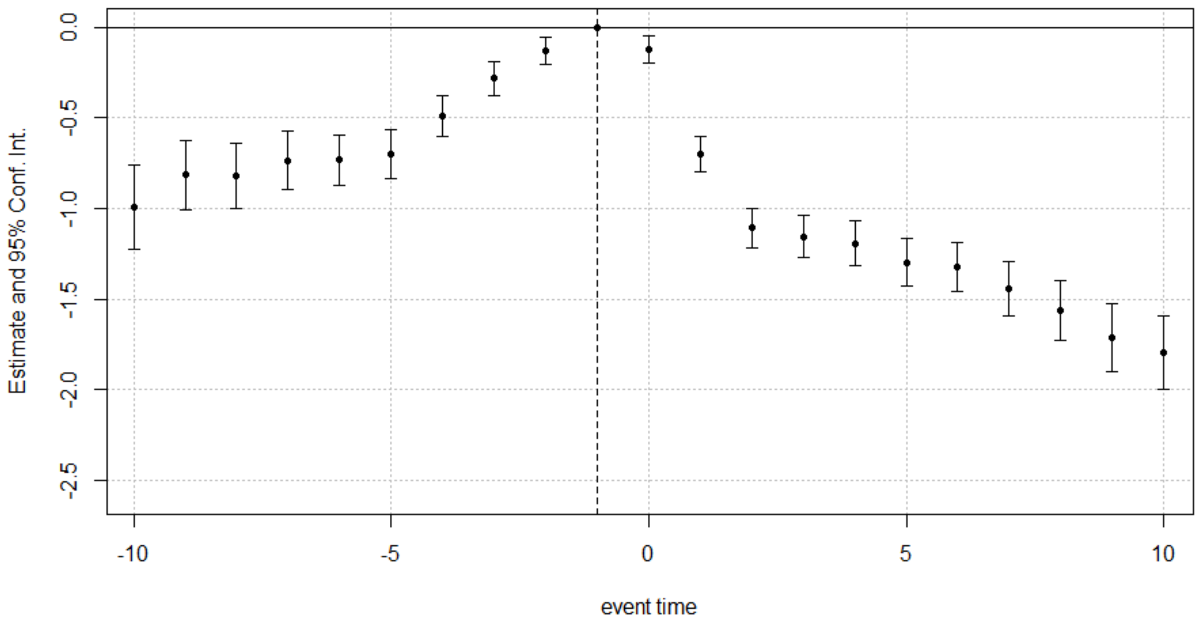
Table 11: AD investigation within third markets: AD case correlation, treated products

Dependent:	Level			Growth		
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Panel (a): Quantity						
AD	0.0504	0.0184	0.0307	-6.136***	-6.247***	-6.408***
	(0.0510)	(0.0643)	(0.0543)	(1.540)	(1.548)	(1.625)
$AD \times corr$	0.0019	-0.0001	0.0040	0.0499	0.0508	0.0596
	(0.0026)	(0.0020)	(0.0032)	(0.0430)	(0.0457)	(0.0514)
corr				-0.0570	-0.0104	-0.0209
				(0.0422)	(0.0472)	(0.0516)
Observations	247,501	247,501	247,501	249,843	249,843	249,843
R^2	0.84294	0.86545	0.85844	0.17717	0.17954	0.25351
Within R^2	0.00018	0.00001	0.00024	0.00018	0.00019	0.00021
Panel (b): Unit Value						
AD	-0.0127	0.0232	-0.0160	0.0040	0.0048	0.0030
	(0.0185)	(0.0192)	(0.0198)	(0.0068)	(0.0068)	(0.0072)
$AD \times corr$	0.0003	0.0007	0.0005	0.0002	0.0001	0.0003
	(0.0008)	(0.0007)	(0.0010)	(0.0003)	(0.0003)	(0.0003)
corr				0.0002	0.0002	0.0002
				(0.0002)	(0.0003)	(0.0003)
Observations	247,501	247,501	247,501	219,437	219,437	219,437
R^2	0.91538	0.92700	0.92193	0.19234	0.19362	0.26052
Within R^2	0.00002	0.00009	0.00003	0.00001	0.00001	0.00001
Fixed effects						
ISO-year	✓	✓	–	✓	✓	–
HS-ISO	HS-6	HS-6	HS-6	–	HS-2	–
HS-year	HS-2	HS-4	–	HS-4	HS-4	HS-4
HS-year-ISO	–	–	HS-2	–	–	HS-2

Note: estimates using only treated products, and sample of AD cases where share of HS-6 exports from China $\geq 1\%$. Standard errors in parentheses are clustered at the HS6 level; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure 1: Effect of AD on import volume in focal markets

(a) Log import volume



(b) Growth in import volume

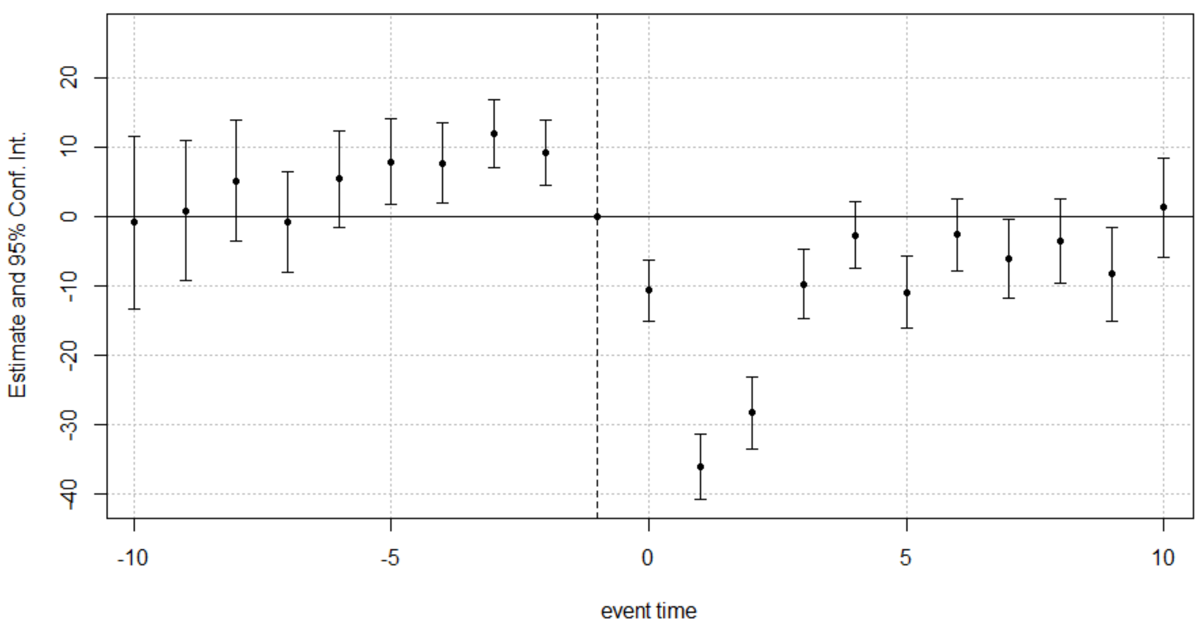
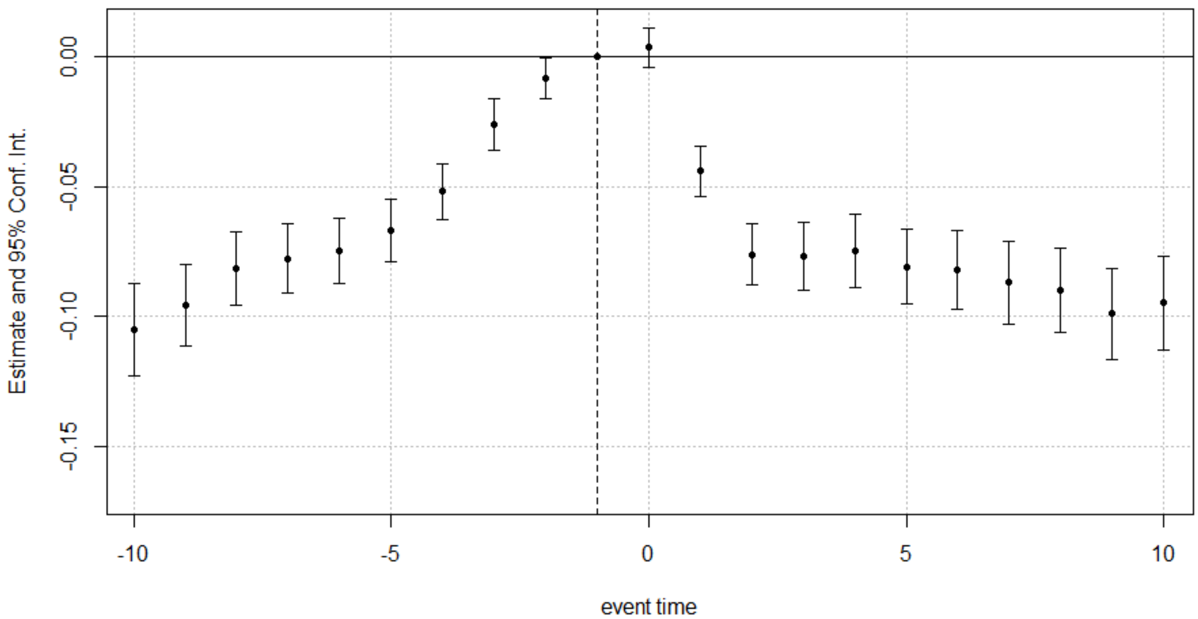


Figure 2: Effect of AD on import share in focal markets

(a) Import share



(b) Growth in import share

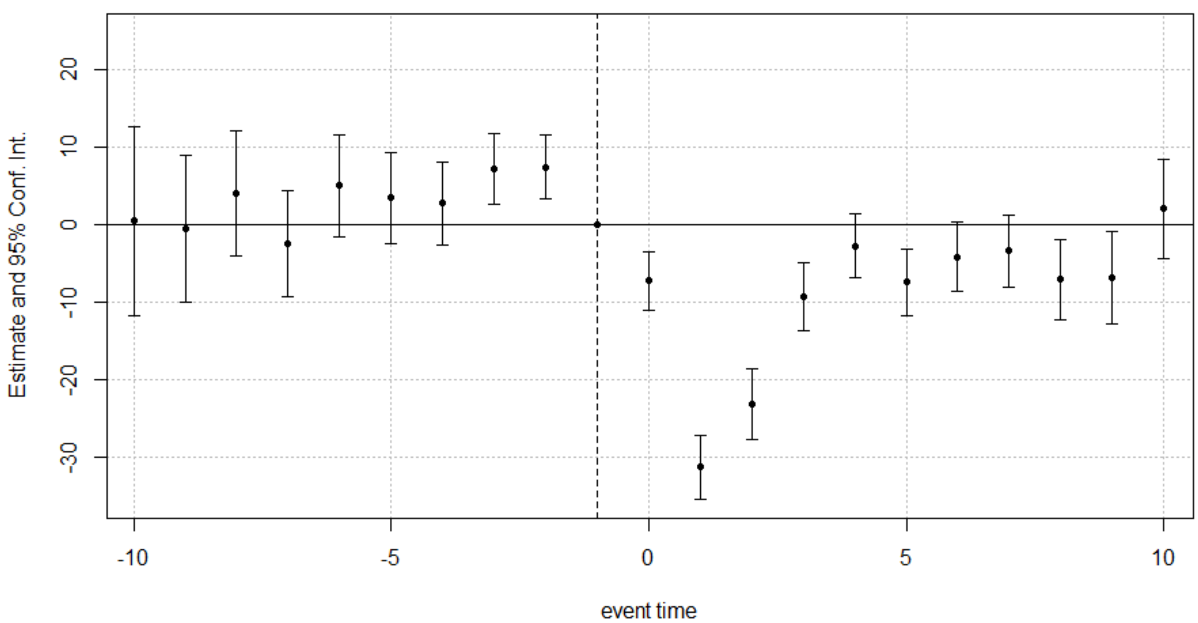
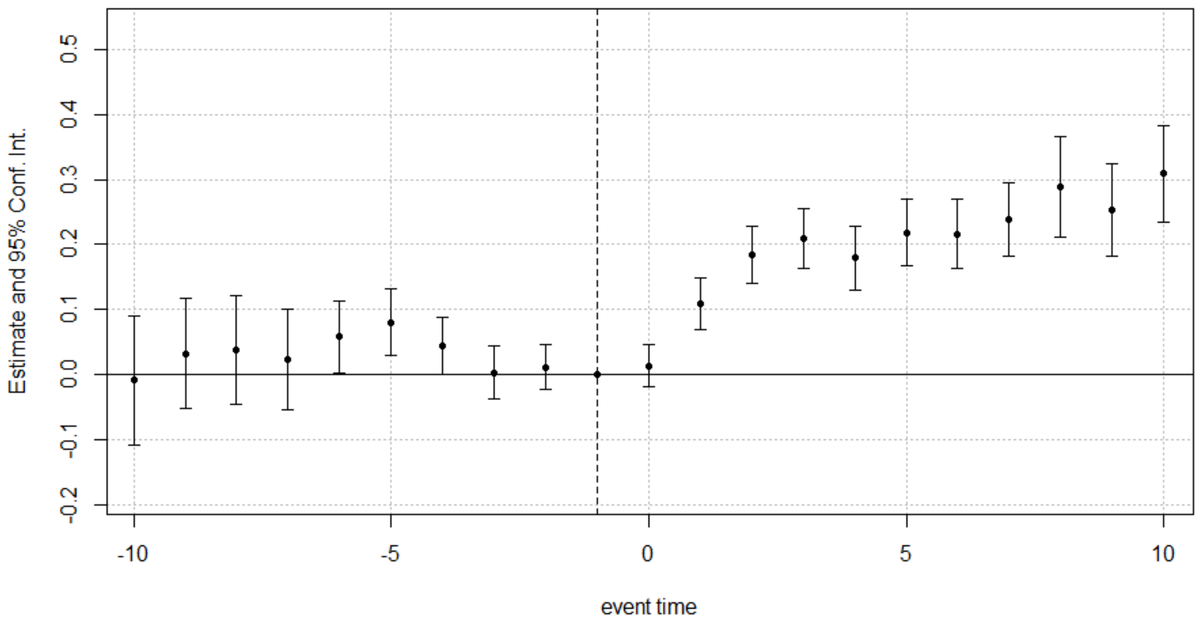


Figure 3: Effect of AD on unit value in focal markets

(a) Log unit value



(b) Growth in unit value

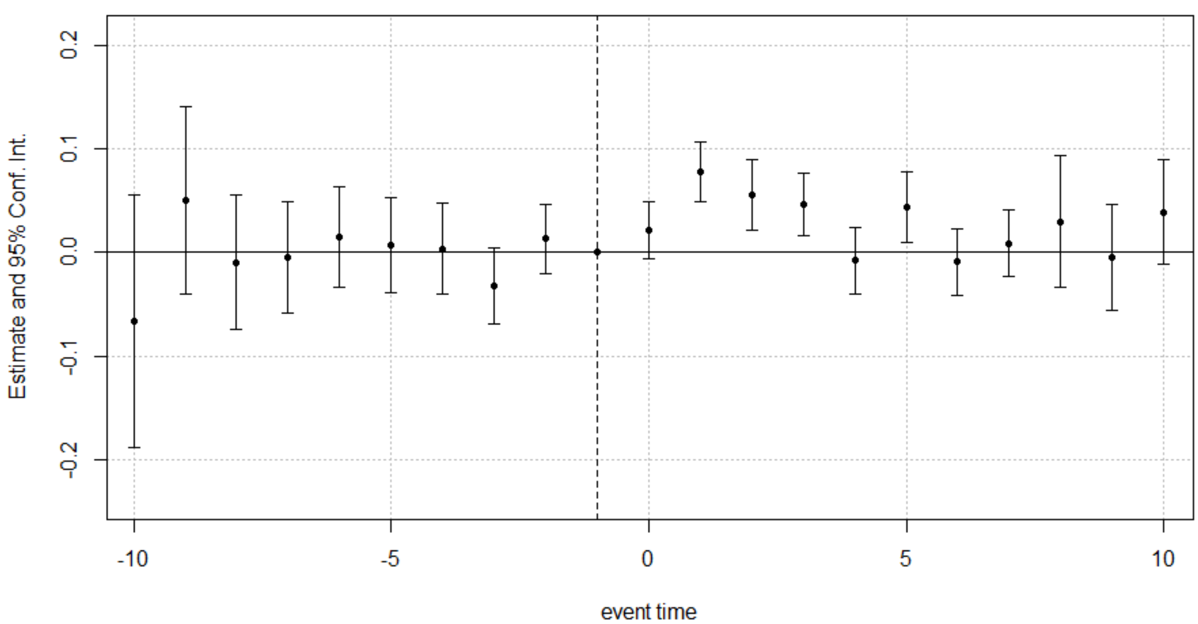
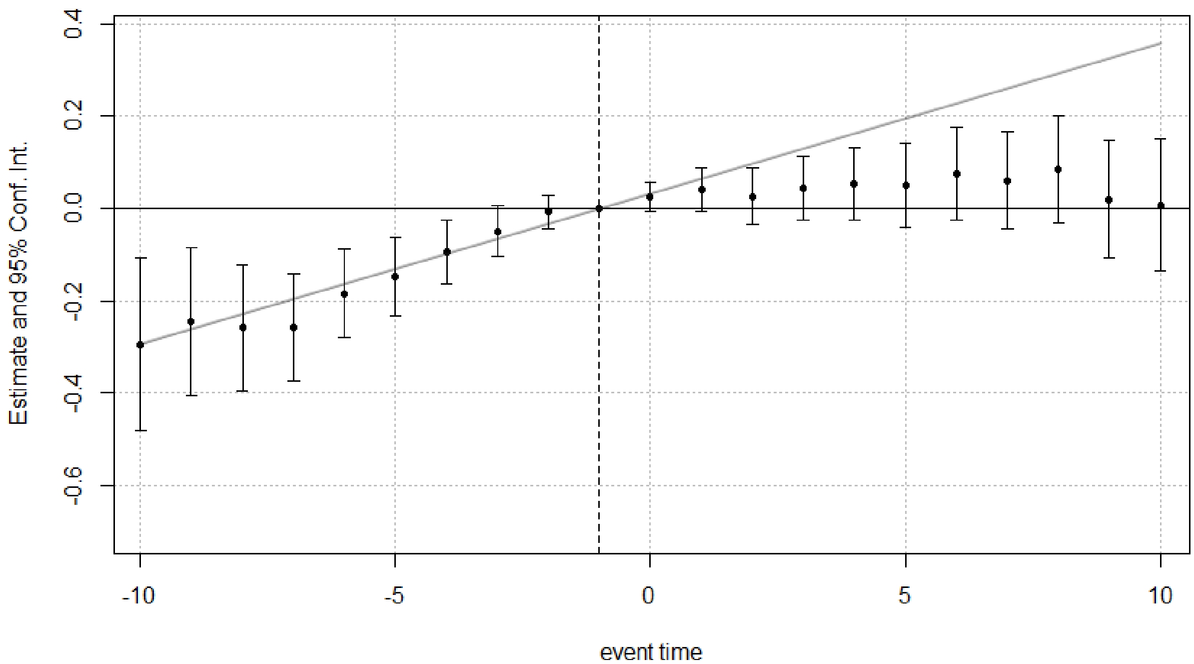


Figure 4: Effect of AD on import volume in non-target markets

(a) Log import volume



(b) Growth in import volume

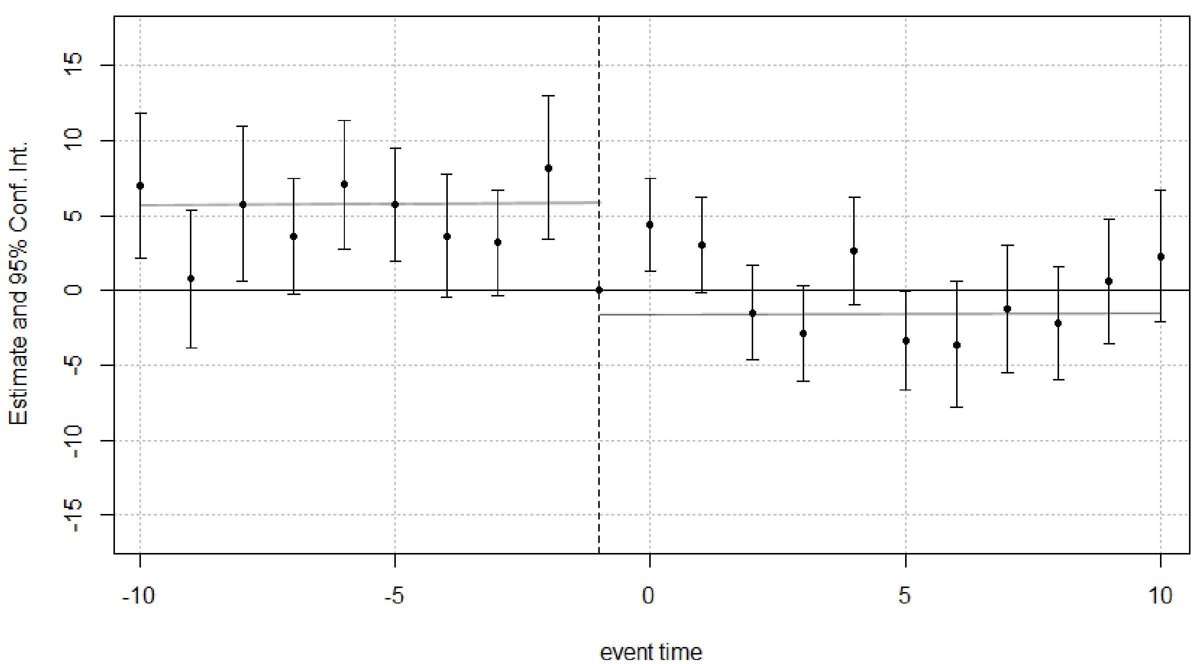
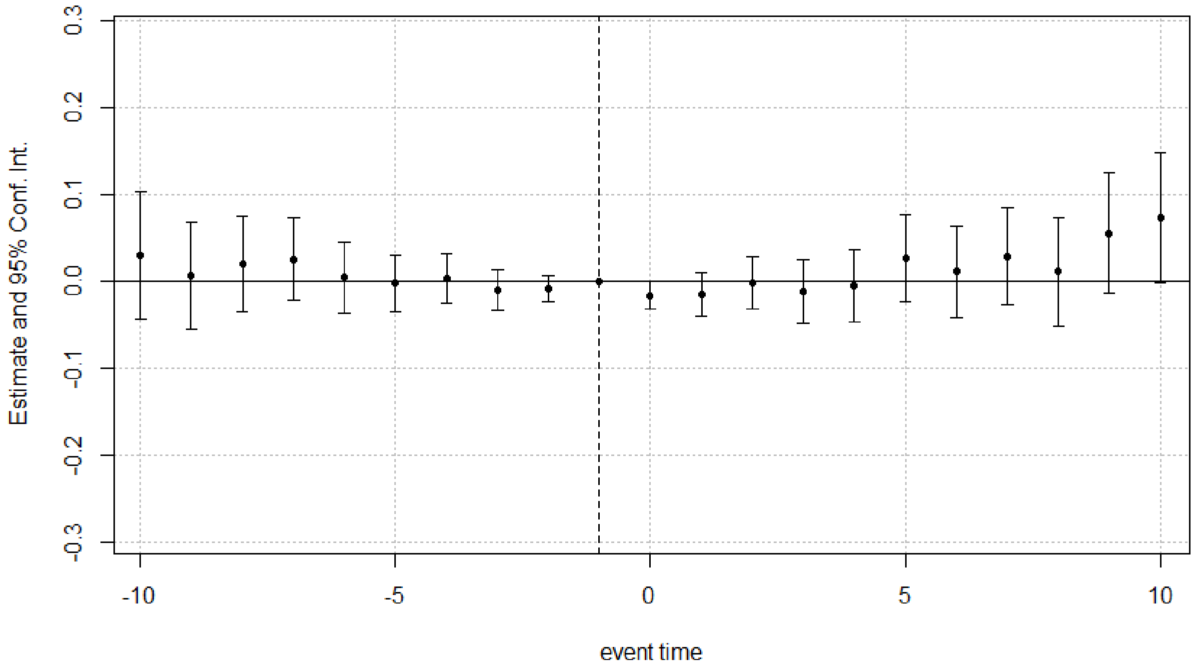


Figure 5: Effect of AD on unit value in non-target markets

(a) Log unit value



(b) Growth in unit value