The Margins of Evasion: Information and Tariff Compliance

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Abstract

This paper examines how information frictions shape tariff evasion. Using China's retaliatory tariffs during the US-China trade war as a natural experiment, we identify the role of information frictions in tariff evasion by exploiting variation in customs information captured by product characteristics, prior enforcement, and past transactions. We show that retaliatory tariffs substantially increase import underreporting, and then find that firms adjust the margin of evasion according to customs information, relying primarily on quantity underreporting for homogeneous goods and price underreporting for differentiated goods. Our results further demonstrate that tariff-induced underreporting is significantly weaker where customs possess richer information, suggesting that accumulated information deters evasion and strengthens long-term enforcement capacity. Beyond import underreporting, we show that tariffs affect trade through several distinct margins: a real intensive margin that reduces actual trade flows, a reporting margin that widens the bilateral trade data gap through underreporting, and an extensive margin consistent with potential smuggling.

Keywords: Tariff evasion, tax compliance, information friction, trade war, difference-in-differences

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1. Introduction

Information is a prerequisite for effective law enforcement (Pomeranz, 2015). Existing studies largely treat tariff evasion as a direct response to tariff changes, implicitly assuming similar information constraints across products. In practice, however, customs authorities possess uneven knowledge across products and over time, shaped by product complexity, historical trade patterns, accumulated enforcement experience, and limited cross-border information sharing. Whether and how this information environment shapes not merely the *amount* but the *form* of evasion, and whether the information a government accumulates from past enforcement durably raises its future detection capacity, remain open questions. This paper takes them on. Using China's 2018–2019 retaliatory tariffs as a tax shock, we show that the information available to customs governs both the margins along which firms evade and the feasibility of evasion itself.

In recent years, escalating geopolitical conflicts and frequent trade frictions have significantly widened the tariff wedges among different source countries, strengthening the incentive for tariff evasion. This problem is more prominent in developing economies, especially those with more corrupt governments (Fisman and Wei, 2009; Gordon and Li, 2009; Besley and Persson, 2013; Kellenberg and Levinson, 2019; Bussy, 2021; and Studnicka, 2025). Many developing economies started late in anti-avoidance enforcement, and their relevant experience and information accumulation are relatively limited. Therefore, a systematic understanding of the patterns of tariff evasion faced by developing economies under the coexistence of information frictions and enforcement constraints is of great significance for both academic research and policy discussions. For these reasons, as the world's largest developing country and premier trading nation, China serves as an ideal case study for examining information frictions in tariff evasion.

The 2018-2019 US-China trade war provides a unique natural experiment for at least three reasons. First, the US-China trade war is one of the most significant policy shocks to the global trading system in recent years (Fajgelbaum and Khandelwal, 2022; and Ma and Ning, 2024). The two sides imposed significant tariffs in multiple rounds on a large scale within a short period. The tariffs covered a wide range of products and were adjusted frequently, leading to significant changes in the tax burden across products and over time, thus clearly strengthening

the incentive for tariff evasion. Second, China, like most other developing economies, has not yet established a comprehensive set of anti-circumvention policies.[1] An analysis of China's retaliatory tariffs against the US can help to understand tariff evasion and enforcement from the perspective of developing economies. Third, the policy shock is identifiable and highly exogenous. The highly detailed list of specific products subject to tariffs makes it possible to clearly distinguish between affected and unaffected products. At the same time, the retaliatory measures are mainly based on the principle of reciprocal retaliation, and the pace of adjustment is largely driven by exogenous shocks from the US rather than by existing circumvention behaviors, making the policy shock plausibly exogenous to the evasion patterns we study.

In this paper, we examine the evasion of China's retaliatory tariffs on the US during the US-China trade war. In our main empirical analysis, we match the US-reported export data to China (X) and China-reported import data from the US (M) at the HS6-month level from 2017 to 2019. Following Fisman and Wei (2004), we construct a data reporting GAP measure based on the logarithmic difference between X and M. Then, we adopt a difference-in-differences (DiD) approach to estimate the effects of China's retaliatory tariffs on import (M) data underreporting, which is associated with a larger data gap. Our results imply substantial underreporting and tariff revenue losses. In addition, we find evidence for underreporting quantities and prices, but not for product misclassification. Our main findings are robust to a wide range of robust checks.

Our heterogeneity analysis centers on the role of information frictions between trading firms and customs authorities. The theoretical framework predicts that underreporting occurs primarily through quantity underreporting for homogeneous goods and through unit price underreporting for differentiated goods. We use Rauch's (1999) product differentiation classification to distinguish quantity underreporting from price underreporting. In a similar spirit, we construct a Global Price Dispersion (GPD) index, which measures cross-country variation in export prices and captures the extent of price ambiguity faced by customs authorities. In some specifications, the differential effect of tariff rates on trade value gaps for

[1] On March 4, 2025, China's Ministry of Commerce officially launched its first anti-circumvention investigation. On July 30, 2025, it released the "Rules for Anti-Circumvention Investigations of Trade Remedy Measures (Draft for Public Comment)," soliciting public opinions with the aim of establishing a systematic anti-circumvention investigation system. See http://www.news.cn/20250904/2df842974b814de69a840f2313e35ecf/c.html.

more differentiated products is statistically insignificant. To the best of our knowledge, our paper is the first to demonstrate that this apparent null effect masks the presence of offsetting mechanisms.

Beyond static product characteristics, we further introduce several novel proxies that reflect accumulated regulatory knowledge and compliance incentives to measure information stock. First, prior anti-smuggling campaigns generate lasting information on high-risk products and sectors, thereby strengthening future enforcement. Yang (2008a and 2008b) demonstrated that *contemporaneous* enforcement improvements reduced evasion based on variations in enforcement across countries. In contrast, our paper utilizes product level variations in information and emphasizes the role of information accumulated through *prior* enforcement efforts, which persists over time and affects customs' detection capacity. We show that the magnitude of evasion revealed in trade discrepancies depends systematically on this information stock, rather than on concurrent enforcement alone. Second, products traded more frequently generate richer benchmarks for prices and quantities; accordingly, we use transaction frequency in eastbound US–China trade as an alternative proxy for information stock. Unlike static product characteristics (like Rauch's differentiation), these measures capture the dynamics of information. They reflect information that accumulates over time, and hence provide more constructive and actionable insights for addressing tariff evasion through enhancing enforcement capabilities.

This paper is not primarily about whether higher tariffs induce evasion, an established fact since Fisman and Wei (2004). It is about how the information environment of the taxing authority shapes the form and feasibility of evasion. We establish three main results that, jointly, are new to the literature. First, evasion is reallocated across margins according to what the customs authority can verify. When reference prices are unavailable (differentiated goods, high global price dispersion) evasion operates mainly through under-reported unit values. Whereas when prices are easily benchmarked (organized-exchange and reference-priced goods), evasion operates mainly through quantities. This margin substitution is the customs-and-tariff analogue of Carrillo et al. (2017) and the displacement logic of Yang (2008a).

Second, opposite from the tariff evasion literature based on mirrored trade data, we demonstrate that China's retaliatory tariffs affect imports through another several distinct

margins by estimating the effects of tariffs on US-reported exports and China-reported imports separately. First, conditional on products continuing to be traded, Chinese importers increasingly underreport import values, generating a reporting margin that widens the bilateral trade data gap. This reporting margin is the primary focus of our mirror-statistics analysis. Second, conditional on products continuing to be exported and recorded by the US, tariffs reduce real trade flows, with U.S.-reported exports serving as the benchmark for true trade (the intensive margin). Third, products become more likely to disappear from China's recorded imports than from US-reported exports, consistent with an extensive margin reflecting potential smuggling. While the trade literature has long distinguished between intensive and extensive margins, our mirror-statistics approach helps to identify additional reporting margins that separates changes in recorded trade from changes in actual trade.

Third, a country's stock of pre-existing administrative information (e.g., prior anti-smuggling operations, earlier antidumping investigations, and the depth of customs' transaction records) substitutes for audit effort and dampens evasion, providing a tariff-shock-identified measure of enforcement capacity in the spirit of Pomeranz (2015), Kleven et al. (2011), and Basri et al. (2021). The unifying message is a public-finance one: the design of verifiable tax bases and the accumulation of information are first-order determinants of compliance, with direct implications for the choice between value- and quantity-based trade taxes. This paper bridges the international trade literature on customs enforcement with the public finance literature on tax compliance, information frictions, and state capacity.

The rest of this paper is structured as follows: Section 2 provides a review of the related literature; Section 3 introduces the policy background of the US-China trade war and China's retaliatory tariffs against the US; Section 4 describes the testable hypotheses, our empirical strategy, and data; Section 5 presents the empirical results, including the baseline findings and heterogeneity analysis, as well as robustness checks; and Section 6 concludes with remarks on welfare and policy implications.

2. Literature Review

This paper is related to at least the following several strands of literature.

First, we contribute to the literature on tariff evasion by shifting attention from the magnitude of evasion to the choice of evasion margins and information frictions. Following

Fisman and Wei (2004), a large literature uses trade discrepancies to identify tariff evasion.[2] While this literature documents that firms respond to tariff incentives, we show that firms strategically select the dimension of misreporting according to customs' ability to verify information. Our finding is related to Javorcik and Narciso (2008) on the role of product differentiation in tariff evasion and the displacement effects in tax evasion documented by Yang (2008a), where stronger monitoring in one area redirects noncompliance toward less monitored margins. We extend this literature to examine explicitly the roles of information frictions in tariff evasion. We go beyond the static measure of product characteristics and propose information stock measures based on the dynamic accumulation of information. We emphasize how enforcement today creates an "information stock" that deters evasion tomorrow.

Second, this paper contributes to the broader public finance literature on tax compliance and enforcement. A large literature shows that tax compliance depends on the enforcement capacity of the tax authority and on the information available to it (Slemrod, 2008; Gordon and Li, 2009; Dharmapala et al., 2011; and Brockmeyer et al., 2019).[3] A parallel body of field and experimental studies provides direct evidence on the information channel in particular: expanding third-party reporting or paper trails raises compliance (Kleven et al., 2011; Pomeranz, 2015; Slemrod et al., 2017; Naritomi, 2019; Doerr and Necker, 2021; and Shah, 2026). In developing countries, administrative and informational constraints are primary obstacles, as highlighted by Basri et al. (2021) and Okunogbe and Pouliquen (2022). Low tax evasion in advanced economies like Denmark, as shown by Kleven et al. (2011), is driven not primarily by taxpayers being unwilling to cheat, but by them being unable to cheat successfully due to widespread third-party reporting. These studies, however, focus primarily on domestic taxation. In contrast, we examine how information frictions systematically shape tariff evasion in the cross-border context.

Third, our findings relate to the literature on tax base design and verifiability. Best et al.

[2] See, e.g., Javorcik and Narciso, 2008 and 2017; Mishra et al., 2008; Fisman and Wei, 2009; Ferrantino et al., 2012; Stoyanov, 2012; Liu and Shi, 2019; Iyoha et al., 2024; Mejia, 2025; Che et al., 2025; Studnicka, 2025; Shi et al., 2025; and Gan et al., 2026. This method was also adopted by some papers to study other type of avoidance behaviors, such as the evasion of capital controls (Liu et al., 2023). Recent work in public finance has used tax data to study reporting discrepancies within domestic transactions by comparing seller-reported sales with buyer-reported purchases (e.g., Almunia et al., 2024).

[3] Slemrod (2019) provides a comprehensive review of the early literature on tax compliance and enforcement.

(2015) show that when economic activity is difficult to observe, governments may choose tax bases that trade off revenue efficiency against the scope for manipulation. Gordon and Kopczuk (2014) and Kopczuk et al. (2016) further emphasize that the effectiveness of taxation depends critically on the observability of the tax base and the institutional design of collection mechanisms. Our findings extend this insight to customs enforcement by showing that the verifiability of transaction characteristics shapes the margin along which firms evade. When transaction prices are easier to verify, firms have stronger incentives to manipulate quantities; when quantities are harder to conceal, firms shift toward price-based misreporting.

Finally, this paper contributes to the growing literature on the US-China trade war. Most existing studies of the US-China trade war focus on the economic impact of US tariffs such as quantitative and price adjustments (Amiti et al., 2019; Fajgelbaum et al., 2020; Flaaen et al., 2020; Jiang et al., 2023; Adão et al., 2025; and Handley et al., 2025), firm responses including the evasion of US tariffs (Benguria and Saffie, 2024; Iyoha et al., 2024; Che et al., 2025; Mejia, 2025; and Gan et al., 2026), and global value chain restructuring (Freund et al., 2024; Fajgelbaum et al., 2024).[4] However, research on the effects of China's retaliatory tariffs against the US is relatively limited (Fetzer and Schwarz, 2021; and Benguria and Saffie, 2025), and none of them examines the evasion of Chinese retaliation tariffs during the trade war, despite the equally high tariff rates and product coverage as the US tariffs. This paper intends to fill the gap. Crucially to the identification of the treatment effect, China’s retaliatory tariffs provide a cleaner test of "reciprocal" policy shocks that are exogenous to pre-existing evasion patterns. The retaliation is comprehensive, covering most of the industries, unlike some domestic tariffs that might be lobbied for by specific industries already struggling with smuggling.

3. Policy Background

In 2018, a large-scale trade war erupted between China and the US.[5] Trump embraced trade protectionism from the outset of his presidency after the 2016 presidential election. From March 2018 to December 2019, the US, under Section 301 of the Trade Act of 1974, imposed

[4] Fajgelbaum and Khandelwal (2022), Caliendo and Parro (2023), and Ma and Ning (2024) provide detailed reviews of studies on the impact of the US-China trade war from multiple perspectives.

[5] Bown (2021) and Ma and Ning (2024) provided detailed analyses of the tariff changes during the US-China trade war from 2017 to 2021. They demonstrate the unprecedented uncertainty and significant increase in the tariff burden on most products in US-China bilateral trade.

punitive tariffs in four rounds on approximately $370 billion worth of Chinese goods imported into the US, with tariff rates ranging from 7.5% to 25%, covering various categories. In retaliation, China's State Council immediately announced reciprocal countermeasures against imports originating from the US, also in four rounds, involving approximately $110 billion worth of imported goods, including agricultural products, automobiles, energy, and manufactured goods. China initially suspended tariff concessions on some imported goods originating from the US in April 2018, and subsequently implemented multiple rounds of retaliatory tariff measures on July 6, August 23, and September 24, 2018, and June 1 and September 1, 2019, involving 7,697 HS8 products, out of a total of 8,547 HS8 products (2017 version of the HS classification). In January 2020, after multiple rounds of high-level US-China trade talks, the Phase One Agreement was reached, and bilateral tariffs started to decline. Table B1 in the Supplemental Appendix lists the timeline of the trade war, showing the escalations over time, broad product coverage, and significant variations in tariff rates. Despite the Phase One Agreement, the average tariffs on both sides remain above 20%. These policy features provide a solid basis for our product-level identification strategy.

Figure 1 shows China's average tariff rates on US imports from January 2017 to December 2022. Figure 1(a) illustrates an upward trend in the average tariff rate of China's imports of US products subject to additional tariffs during 2018-2019. The dashed lines mark the effective dates of each round of retaliatory tariffs. Compared to the beginning of 2018, the average rate increased by nearly 20 percentage points cumulatively after the third round of retaliatory tariffs took full effect in September 2019. Figure 1(b) compares the annual average tariff rates of China's imports of US products subject to additional tariffs (treatment group) and those not subject to additional tariffs during the same period (control group). The former increased significantly and remains at a high level after 2020, while the latter remains low during the whole period.[6]

[Figure 1 here]

The effectiveness of tariffs depends not only on the statutory rate but also on the

[6] There was a brief reduction in the average tariff rate for the control group from 2018 to 2019. This occurred due to a composition effect: products that initially faced higher baseline tariff rates (and were later subjected to additional tariffs in 2019) were reclassified into the treatment group, leaving the remaining control group products with relatively lower average tariffs.

institutional capacity to enforce them and prevent circumvention. During the trade war, China had not yet established a systematic anti-circumvention investigation framework as an independent trade remedy tool. Although China's Foreign Trade Law as early as 1994 referenced investigations into and necessary measures against circumvention, such provisions were not actively implemented in practice. It was not until March 4, 2025, that China's Ministry of Commerce (MOFCOM) initiated the country's first formal anti-circumvention investigation (concerning certain US optical fiber imports subject to existing anti-dumping duties). Relative to the western developed countries, China's experience and institutional capacity for information collection, verification, and cross-agency sharing in anti-circumvention matters remained limited during the trade war period.[7] This institutional gap created substantial opportunities for tariff evasion in China at that time.

Effective control of tariff evasion also requires international cooperation. Although countries have made progress on information sharing within country and cross borders, the necessary information sharing is still very limited even among the most economically and geographically close economies such as the US and Canada, let alone other countries.[8] Organizations such as World Trade Organization (WTO) and the World Customs Organization (WCO) have made efforts in setting the rules of world trade and coordinating different countries. For example, the WCO manages a global network of Regional Intelligence Liaison Offices (RILOs). This network is used to collect, analyze, and exchange customs enforcement information, such as data on intellectual property rights infringements, drug trafficking, and smuggling of endangered species. It provides crucial intelligence support for member countries in their fight against transnational crime. However, due to WCO's soft-law nature, the supervision of international trade remains largely the duty of national Customs authorities, and

[7] For comparison: Council Regulation (EEC) No 1761/87 introduced anti-circumvention rules in the EC in 1987; the US first applied anti-circumvention provisions under section 781 of the Tariff Act of 1930 (as amended) in inquiries starting around 1997.

[8] For example, the Trade Fraud Task Force announcement issued by the US Department of Justice in February 2025 explicitly states that cross-departmental information sharing is a key mechanism for combating tariff evasion and smuggling, with participating departments including US Customs and Border Protection (CBP), US Immigration and Customs Enforcement/Homeland Security Investigations (ICE/HSI), and even independent agencies such as the Federal Maritime Commission. See https://www.cassidylevy.com/news/department-of-justice-emphasizes-trade-compliance-enforcement. A recent order of the General Administration of Customs of China establishes a mechanism for sharing enterprise credit information among government agencies. See http://www.customs.gov.cn/customs/2026-01/15/article_2026011508415067166.html.

information sharing is still limited. Even when information relevant for enforcement is provided across borders, it may be strategically disclosed or concealed through collusion. In such an environment, tariff adjustments alone do not mechanically translate into effective policy implementation due to tariff evasion. Instead, the impact of tariffs on compliance critically depends on the underlying information environment that governs detection, verification, and enforcement.

Here is a case on how tariff evasion works in practice during trade war, using underreporting as an example.[9] A Chinese company imported from the US hydraulic valves that are subject to Chinese retaliatory tariffs. These industrial products are highly differentiated in terms of functionality, technical parameters, and applicable scenarios. From July 2019 to January 2020, the freight forwarder created false contracts, invoices, and packing lists for customs declaration, which were then submitted to a customs broker for declaration, allowing the relevant importing company to complete customs clearance. According to customs verification, the dutiable value was underreported by RMB 1.86 million, and the tax evaded amounts to RMB 0.56 million. This case highlights the importance of information frictions and enforcement constraints faced by regulatory authorities in combating tariff evasion.

4. Hypotheses, Identification Strategies, and Data

In this section, we explain the empirical strategy to test our hypotheses and describe the variables and data.

4.1 Theory and testable hypotheses

In the Supplemental Appendix C, we develop a simple theoretical framework to rationalize trade data discrepancies arising from misreporting, distinguishing explicitly between quantity underreporting (predominant in homogeneous goods) and price underreporting (predominant in differentiated goods). We model customs authorities as imperfect enforcers that seek to ensure accurate reporting to collect tariff revenue but face substantial information frictions. Customs have limited knowledge of the true value, quantity, or quality of imported goods. Exporters and importers possess superior information about product characteristics, true transaction values, and invoicing practices, and thus choose whether and how much to

[9] The case was discussed by a partner at Hylands Law firm. https://www.hylandslaw.com/

misreport trade values, considering enforcement risk in the form of inspections and penalties. Misreporting therefore emerges as the equilibrium outcome of the interaction between firms' incentives to misreport and the government's ability to detect such behavior. This model yields the following three testable hypotheses:

Hypothesis 1: A tariff increase unambiguously raises equilibrium underreporting.

Hypothesis 2: Underreporting occurs primarily through quantity underreporting for homogeneous goods and through unit price underreporting for differentiated goods.

Hypothesis 3: Improvements in customs information reduce the responsiveness of both quantity and price underreporting to tariff shocks.

4.2 Identification strategy

To identify the impact of tariff shocks on potential avoidance behavior, we employ a difference-in-differences (DiD) framework using trade data at the HS6-month level. Exploiting China's retaliatory tariffs as an exogenous policy shock, we compare changes in US-China trade statistics, pre- and post-tariff, between products in the treatment group affected by tariffs and the control group unaffected by tariffs. We detect unobserved evasion based on observed trade data discrepancies.

Under the null hypothesis of compliance, and after adjusting for CIF (cost, insurance, and freight) factors, US-reported exports should align with China-reported imports. However, if firms engage in evasion through underreporting imports, the China-recorded values will be systematically lower than the US-recorded counterparts. Following Fisman and Wei (2004), we interpret the positive correlation between tariff rates and this trade gap as empirical evidence of tariff evasion.[10] Accordingly, our dependent variable is constructed as follows:

$$GAP_{it} = log(export_{it}) - log(import_{it}) \quad (1)$$

where subscripts *i* and *t* refer to HS6 product and time (year-month); *export* refers to the US-reported export value to China; *import* refers to China-reported import value from the US. Later in the paper, we also distinguish data discrepancies in quantity (GAP_q) and in unit value or price (GAP_p). A higher *GAP* reflects a higher degree of potential tariff evasion.

[10] The discrepancies in US-China trade statistics are not entirely due to tariff evasion. They may also be influenced by transportation and insurance costs, and statistical errors in re-export trade. However, these factors are generally not related to changes in tariffs. Therefore, omitting these factors in our analysis will not bias our estimates.

4.2.1 Econometric model

In our empirical analysis, the baseline regression is specified as follows:

$$GAP_{it} = \beta_0 + \beta_1 \text{Retaliation}_{it} + \gamma X + \mu_{jt} + \delta_i + \varepsilon_{it} \quad (2)$$

where subscripts *i*, *j*, and *t* refer to HS6 product, HS2 sector, and time (year-month).

The key explanatory variable, *Retaliation*, refers to China's retaliatory tariffs. It can be measured either as a dummy variable for tariff hikes or a continuous variable as tariff rate. As a dummy variable, it takes a value of 1 when product *i* is subject to China's retaliatory tariffs at time *t,* and 0 otherwise. Under this definition, the coefficient β_1 measures the average treatment effect (ATE), i.e., the change in *GAP* for the treated group products relative to the control group products before and after the tariffs. If variable rate (tariff) is used to measure *Retaliation*, β_1 represents the marginal impact of each unit increase in tariff rate on *GAP*. According to Hypothesis 1, in the presence of tariff evasion through import underreporting, the expected sign of β_1 is positive. According to Hypothesis 2, when GAP_q (GAP_p) is used as the dependent variable, β_1 should be positive for homogenous (differentiated) products.

Vector ***X*** covers other explanatory variables such as US tariffs on Chinese products during the trade war (*tariff_us*), used to control for confounding factors that may simultaneously influence China's retaliatory tariffs and trade data misreporting. Following Jiang et al. (2023), we also control for the Chinese New Year factor as a robustness check and introduce more stringent fixed-effects, including product*month fixed effects and product linear time trends. μ_{jt} refers to industry-time interaction fixed effects, used to absorb time-varying industry-level shocks such as sector-wide technological progress, changes in global demand, and industry-level trade policy adjustments. δ_i captures the product fixed effects, which absorb product-level heterogeneity that does not change over time, such as product tradability, technological complexity, and long-term demand structure. ε_{it} is a random disturbance term.

Guided by our theoretical framework, we augment our baseline regression specification as follows to test the heterogenous effects based on information (*I*) available to customs.

$$\text{GAP}_{it} = \beta_0 + \beta_1 \text{Retaliation}_{it} + \beta_2 \text{Retaliation}_{it} \times I + \gamma X + \mu_{jt} + \delta_i + \varepsilon_{it} \quad (3)$$

According to Hypothesis 3, in the above specification, β_2 is expected to be negative when *I* is measured by information stock. As discussed in the introduction section, information may accumulate through stricter enforcement in the past such as previous anti-smuggling campaign

(*AS*) or historical transactions measured by trading frequency (*freq*). When I is measured by product differentiation, such as a homogenous product indicator implying less information asymmetry, β_2 can be either negative or positive based on Hypothesis 2, depending on whether the dependent variable is the gap in price or quantity. This will be elaborated later.

4.2.2 Treatment vs. control groups

Although China's retaliatory tariffs are in the HS 8-digit product level, we conduct our empirical analysis at the HS6 level because HS product codes are harmonized or internationally comparable only up to 6-digit level.[11] If an HS6 line has at least one HS8 subheading subject to retaliatory tariffs during the sample period, then this HS6 product is classified into the treatment group, with the date of the initial imposition of the additional tariffs used as the treatment date.[12] The control group consists of HS6 products that had never been directly targeted by China's retaliatory tariffs during the sample period. Following Fajgelbaum et al. (2020), we assign a "pseudo-processing time" to the HS6 products in the control group: if there are other HS6 products subject to additional tariffs within an HS4 line, the earliest treatment time within that HS4 line is used; if none of the products within the HS4 are subject to additional tariffs, the earliest treatment time within the HS2 industry is used.

In practice, certain products targeted by retaliatory tariffs received temporary, phased exemptions; upon expiration, the additional tariffs were reinstated. In our main empirical analysis, we abstract from this complication by setting the Retaliation dummy equal to 1 in all post-treatment periods, irrespective of exemptions. This coding choice is motivated by two key considerations. First, exemptions were not granted automatically or exogenously but required active application by enterprises and selective approval by the Chinese government (typically via the Ministry of Finance or Customs). Approval likelihood depended on product-specific factors (e.g., strategic importance, domestic substitutability, supply-chain criticality, or firm characteristics), introducing potential endogeneity. Conditioning the Retaliation indicator on observed exemptions could therefore bias estimates by correlating treatment variation with unobserved determinants of firm behavior or outcomes. Second, our Retaliation variable is intended to capture the broader institutional and uncertainty effects of retaliatory tariffs on

[11] For an attempt to match HS codes manually at the HS8 level, please refer to Gan et al. (2026).
[12] This can create an attenuation bias, making it harder for us to identify the treatment effect.

firms (e.g., policy risk, anticipated reinstatement, and behavioral adjustments), rather than to precisely track time-varying effective tariff rates. Even during exemption periods, targeted firms faced the credible threat of future tariff reimposition, which could influence import declarations decisions. We address the role of exemptions more directly later in the robustness checks section.

4.2.3 Retaliatory tariff rates

Because the *Retaliation* dummy variable cannot capture the magnitude of tariff shocks, we also construct a product-level tariff rate measure as follows:

$$tariff_{hs6,t} = \sum_{hs8 \in hs6} \frac{import\ value_{hs8}}{\sum_{hs8 \in hs6} import\ value_{hs8}} \times statutory_tariff_{hs8,t}$$

where *statutory_tariff* refers to China's MFN tariff rate and retaliatory tariff rates against the US, at the HS8 level. We calculate HS6-level tariff rates by taking a weighted average of the corresponding HS8 tariffs, where the weights are given by each HS8 product's share in China's imports from the US within the HS6 category in 2017, the year before the trade war. The import share is computed directly from monthly import data reported by the General Administration of Customs of China (GACC).

As robustness checks, we also use effective tariff rates that account for exemptions, as well as alternative measures based on tariff changes. To construct the change in tariff rate for each HS6 product, we take the tariff rate in the month preceding the initial imposition of retaliatory tariffs as the benchmark (period 0). Following Benguria and Saffie (2024), we measure tariff adjustments using a logarithmic proportional change as follows.

$$tariff_change_{it} = ln\left(\frac{1+tariff_{it}}{1+tariff_{it0}}\right)$$

4.3 Data

Monthly import data reported by China and export data reported by the US, both at the HS6 level, are sourced from the Global Merchandise Trade Statistics Database of the Global Trade and Industry Growth Laboratory (GTI), provided by Sinoimex.[13] The sample period spans January 2017 to December 2019. This window includes the pre-trade-war baseline year

[13] Sinoimex is a specialized global trade data provider that collects, cleans, and standardizes official trade statistics from countries and regions worldwide. The GTI Global Merchandise Trade Statistics Database offers highly consistent bilateral trade flows for approximately 250 reporting economies since 2010, at the monthly HS6 level (and finer in some modules), ensuring synchronization with primary official sources such as China's General Administration of Customs and the US Census Bureau. Website: https://gti.sinoimex.com.

(2017) as well as the full 2018–2019 phase of tariff escalations, retaliatory measures, and phased consultations during the US–China trade war. We exclude data after 2019 to avoid distortions from the COVID-19 pandemic, which severely disrupted global trade patterns and supply chains. The only exception is our analysis of tariff exemptions in the robustness check section: because certain Chinese exemptions for US products remained in effect until the end of 2021 (see Supplemental Appendix Table B2), we extend the sample to December 2021 for that specific subsection.

Tariff data during the trade war are primarily drawn from official announcements issued by the Chinese Ministry of Finance and the Office of the US Trade Representative.[14] These official documents provide detailed information on tariffs imposed and exempted by both China and the US, including HS 8-digit product codes, product descriptions, tariff rates, announcement dates, and effective dates. The tariff exclusion lists further specify the HS8 codes of exempted products, along with their product descriptions, announcement dates, retroactive application dates, and actual effective dates. Baseline MFN tariff rates for each HS8 product prior to the imposition of additional tariffs are obtained from the WTO and are used to establish pre–trade war tariff levels and to construct tariff rate and tariff change measures.[15] In terms of timing, we use the effective date specified in each announcement as the implementation date of the tariff policy and adjust start dates accordingly when retroactive provisions apply, ensuring accurate alignment between tariff variables and monthly trade data.

We classify product differentiation using Rauch (1999), mapping the original SITC Rev. 2 codes (organized exchange, reference-priced, differentiated) to HS6 via concordance tables. To construct the information stock measure on China side, we obtained a list of products subject to China's anti-smuggling efforts based on the key taxable goods in the 2013 "*Special Campaign and Joint Action Plan against Smuggling*", and manually concorded them to HS6. The other information stock measure (*freq*) is calculated using the US-reported export data

[14] On the Chinese side, the data include the Announcement of the Customs Tariff Commission of the State Council on Suspending Tariff Concessions on Certain Imported Goods Originating in the US (Announcement No. 5 of the Customs Tariff Commission, 2018), as well as the subsequent five rounds of announcements covering additional tariffs and exclusion lists. Website: China: https://gss.mof.gov.cn/gzdt/zhengcefabu. On the US side, the data are based on the Actions under Section 301 of the Trade Act of 1974 and its subsequent amendments and exclusion notices. Website: https://ustr.gov/issue-areas/enforcement/section-301-investigations/tariff-actions.

[15] The WTO Tariff Download Facility is available at: https://tariffdata.wto.org/

from GTI.

4.4 Descriptive statistics

Panels A–C of Table A1 in the Supplemental Appendix report descriptive statistics for the main GAP and tariff variables for the full sample (Panel A), the treatment group (Panel B), and the control group (Panel C), respectively. The full sample consists of monthly observations for 3,735 HS6 product lines over the period 2017–2019, including 3,580 products in the treatment group and 155 products in the control group. The average tariff imposed by China on US imports (*tariff*) is substantially higher in the treatment group (0.147) than in the control group (0.041). By contrast, the average US tariff imposed on Chinese imports (*tariff_us*) differs little between the treatment group (0.099) and the control group (0.081), reflecting the distinct product coverage targeted by the two countries during the trade war. Unconditional differences in average trade discrepancies based on trade value (*GAP*), quantity (GAP_q), and price or unit value (GAP_p) between the treatment and control groups are relatively modest. The wide ranges and large standard deviations of these GAP measures indicate substantial heterogeneity across products.[16]

Panel D of Table A1 presents summary statistics for the variables used in the heterogeneity analysis. At the HS6 product level, homogenous products, including products sold on organized exchange and reference-priced products, account for approximately 32.8% of all products under the conservative classification of Rauch (1999). Key anti-smuggling commodities represent about 44.2 percent of the sample.

5. Empirical Results

In this section, we first present the benchmark results, followed by an event-study analysis and an examination of specific evasion mechanisms. We then turn to our core heterogeneous analysis, highlighting how information frictions shape tariff evasion behavior. The last subsection provides various robustness checks.

5.1 Benchmark analysis

Table 1 reports the baseline regression results based on specification (2), with the trade

[16] The number of observations for *GAPq* and *GAPp* is considerably smaller than that for the value-based *GAP*. Because *GAPq* and *GAPp* are computed only when the units of measurement reported in Chinese import and US export statistics are both measured in kilograms.

value GAP, defined in equation (1), as the dependent variable. In the first three columns, the key explanatory variable is the retaliatory tariff hike dummy, while the continuous retaliatory tariff rate is used in the last three columns. Columns (3) and (6) apply 5 percent winsorization to the dependent variable to mitigate the influence of outliers. All regressions control for US tariffs on Chinese exports and include HS6 product fixed effects. Some specifications additionally incorporate time (year–month) fixed effects or HS2×time fixed effects. Standard errors are clustered at the HS6 product level.

Across all specifications, the estimated coefficients on the retaliatory tariff dummy and the tariff rate are positive and statistically significant, providing strong support for Hypothesis 1. The magnitudes are also economically meaningful. For example, the estimate in column (2) of Table 1, which controls for HS6 product fixed effects and HS2×time fixed effects, implies that affected products experience, on average, a 28.2 percent increase in the trade value GAP following the imposition of retaliatory tariffs. Relative to the overall sample mean GAP of 14.2 percent (see Supplemental Appendix Table A1, Panel A), this corresponds to an increase of nearly 200 percent.

Similarly, the estimate in column (5) indicates that a one–percentage point increase in the retaliatory tariff rate raises the GAP by approximately 0.72 percent (i.e., exp(0.718/100) − 1). Using the difference in average retaliatory tariff rates between the treatment and control groups reported in Table A1 (14.7 - 4.1 = 10.6), this implies an increase in the trade value GAP of about 7.6 percent during the trade war (0.72 × 10.6). Given that total US exports to China subject to retaliatory tariffs during our sample period amount to USD 91.6 billion (in current prices), a back of envelop estimated value of underreported trade is approximately USD 7 billion (i.e., 91.6 × 0.076). From a fiscal perspective, this translates into an implied tariff revenue loss of roughly USD 742 million (7 × 10.6 percent).

[Table 1 here]

5.2 Decomposing tariff responses into real, reporting, and extensive margins

The mirror-statistics literature typically uses exporter-reported trade as the benchmark for measuring tariff evasion, implicitly assuming that exporter-reported data are unaffected by tariff-induced misreporting. Under this assumption, a tariff increase should generate a larger decline in importer-reported trade than in exporter-reported trade, thereby widening the

bilateral reporting gap. To reveal the different elasticities of tariffs on trade recorded by each side, we estimate the effects of China's retaliatory tariffs on US-reported exports (X) and China-reported imports (M) separately. We further distinguish tariff responses along both the intensive and extensive margins. Combining these analyses allows us to decompose the overall impact of tariffs into three distinct channels: (i) a real intensive margin, reflecting changes in actual trade flows; (ii) a reporting margin, reflecting underreporting by importers conditional on trade continuing; and (iii) an extensive or smuggling margin, reflecting products that disappear from China's official import statistics.

Table 2 reports the results from regressions using tariff rate as the key explanatory variable. Columns (1) and (2) estimate the effects of retaliatory tariffs at the intensive margin on log(X) and log(M), respectively, using the same specification as column (5) of Table 1. Because we use U.S.-reported exports as the benchmark for true trade, the sample is restricted to observations with positive X. As expected, the estimated tariff effect is substantially larger in absolute value for log(M) than for log(X). Because US exports approximate actual shipments, the decline in log(X) captures the reduction in real trade flows (the intensive margin). The additional decline in China's recorded imports, as reflected by the larger coefficient in the second column, therefore reflects underreporting at the Chinese border.

Columns (3) and (4) examine the extensive margin by estimating linear probability models for an indicator of positive trade flows.[17] To retain observations with zero trade, we use a fully balanced HS6-month panel, which approximately doubles the sample size relative to columns (1) and (2). The results reveal a striking asymmetry. Retaliatory tariffs have little effect on the probability that US exports to China fall to zero: the coefficients in column (3) are small and statistically insignificant. In contrast, column (4) shows a large and statistically significant decline in the probability that China-records positive imports from the US. Based on the tariff-rate specification, a one-standard-deviation increase in the tariff rate (0.109; Table A1) reduces the probability that China-reports positive imports by approximately 3.2 percentage points ($0.293 \times 0.109 = 0.032$). Because products with zero reported imports are excluded from the construction of the trade reporting gap in Table 1, this extensive-margin adjustment is not

[17] Results from fixed effects or conditional logit and random effect probit regressions provide very similar results, which are not reported to save space but available upon request.

captured by our baseline analysis. These "missing" imports may reflect outright smuggling or misclassification from tariff-targeted to non-targeted products. As shown later, the evidence for misclassification is weak, so the adjustment at the extensive margin results more likely from smuggling.

Taken together, the results suggest that China's retaliatory tariffs affect imports through three distinct channels. First, tariffs reduce real trade flows, as reflected in the decline in US-reported positive export flows (the real intensive margin). Second, among products that continue to be traded, Chinese importers increasingly underreport imports, generating a reporting margin. Third, some products disappear entirely from China's official import statistics, consistent with smuggling (the extensive margin). The export-side results indicate that the reduction in real westbound trade occurs primarily along the intensive margin, consistent with Alfaro and Chor (2025), who show that the decline in US imports from China (eastbound trade) during the trade war was likewise driven predominantly by intensive-margin adjustment.

[Table 2 here]

5.3 Event analysis

We employ an event-study approach to examine the dynamic effects of China's retaliatory tariffs against the US before and after their implementation. Specifically, we use the official effective date of each retaliatory tariff as the event date, define event time at the monthly frequency as the distance from this implementation date, and construct a symmetric event window spanning 12 months before and 12 months after implementation. We estimate the following specification:

$$\mathrm{GAP}_{it} = \beta_0 + \sum_{k=-11}^{12} \beta_k \left(\mathrm{Treat}_i \times \mathbf{1}\{t - T_i = k\}\right) + \gamma X_{it} + \mu_{jt} + \delta_i + \varepsilon_{it}, \qquad (4)$$

where $Treat_i$ indicates whether product i is subject to retaliatory tariffs, and $\mathbf{1}\{t - T_i = k\}$ is an indicator for event time k, measuring the effect k months relative to the effective date T_i. The twelfth month prior to implementation ($k = -12$) is omitted as the reference period.[18] Consequently, each estimated coefficient β_k captures the change in trade data discrepancies for

[18] While event-study specifications typically use the period immediately preceding treatment as the reference period, we instead use the beginning of the event window to avoid contaminating the comparison with anticipatory responses, since announcement and implementation dates may fall in different calendar months (e.g., the first round of retaliatory tariffs was announced on June 16, 2018 and took effect on July 6, 2018).

treated products relative to the base period. This framework allows us both to test the parallel trends assumption in the pre-treatment period and to trace the dynamic evolution of the retaliatory tariff shock.

Figure 2 presents the estimated dynamic effects. Panel (a) reports results based on monthly data, which serve as the baseline event-study specification. Because trade declarations and recorded trade flows may be influenced by short-term factors such as shipping delays and reporting lags, Panel (b) repeats the analysis using quarterly data as a robustness check. In Panel (a), the estimated coefficients in the pre-tariff period are generally small and statistically insignificant, with no clear upward or downward trend, supporting the validity of the parallel trends assumption. At the same time, there is some evidence of modest increases in the GAP shortly before implementation, suggesting potential anticipatory behavior. Following the imposition of tariffs, the estimated effects are initially muted but grow in magnitude after approximately six months, consistent with a gradual learning or adjustment process in trade misreporting during the trade war. These dynamic patterns become even more pronounced when quarterly data are used, as shown in Panel (b). To further address anticipatory responses, we conduct additional analysis later in the robustness checks section by explicitly including indicators for one-, two-, and three-month pre-implementation periods.

Our identification strategy falls within a staggered difference-in-differences framework, as products entered the retaliatory tariff list at different points in time. In the presence of heterogeneous treatment effects, conventional two-way fixed-effects estimators may suffer from weighting biases (Baker et al., 2022). Accordingly, we later assess the robustness of our findings using alternative estimators designed to address treatment-effect heterogeneity.

5.4 Evasion mechanisms

Having established that China's retaliatory tariffs significantly exacerbate discrepancies in bilateral trade statistics, a natural next question is how firms actually circumvent these tariffs. The existing literature suggests that, in response to tariff shocks, importers and exporters primarily rely on three channels to reduce their effective tax burden (Fisman and Wei, 2004): (i) underreporting the quantity of goods shipped; (ii) underreporting the declared price or unit value; and (iii) misclassifying high-tariff products as closely related products subject to lower tariff rates. Distinguishing among these channels is essential for understanding both the

mechanisms of tariff evasion and the informational constraints faced by customs authorities.

To this end, we separately examine discrepancies in reported quantities and unit values by constructing product-level measures of quantity gap (GAP_q) and price (unit value) gap (GAP_p). In addition, to test for evasion through product misclassification, we construct a measure of "*similar_tariff*" for each HS6 product. Specifically, this variable is defined as the weighted average tariff applied to other HS6 products within the same HS4 category, where the weights are given by China's imports from the US in 2017. If traders systematically evade tariffs by misclassifying products within HS4 lines, we would expect a significantly negative coefficient on this variable, indicating that higher tariffs on similar products encourage reclassification into lower-tariff categories.

Table 3 reports the regression results. As in the baseline analysis, the first three columns use a dummy variable indicating exposure to retaliatory tariffs, while the last three columns replace this indicator with the continuous tariff rate. The dependent variables are GAP_q, GAP_p, and the overall trade value gap (GAP), respectively. The estimated coefficients on the retaliation variable are consistently positive and statistically significant at the 1–10 percent levels, with the sole exception of column (4). These findings suggest that firms respond to retaliatory tariffs by simultaneously underreporting both quantities and unit values, rather than relying on a single margin of adjustment.

By contrast, the coefficients on the similar tariff variable are statistically insignificant in columns (3) and (6), providing no evidence of systematic tariff evasion through product misclassification within HS4 categories. Although misclassification is theoretically possible, it appears to be less prevalent in practice in the context of the US–China trade war. One possible reason is the unusually broad product coverage of the retaliatory tariff measures: unlike earlier episodes of trade protection that targeted a narrow set of products, the retaliatory tariffs during the trade war applied to the vast majority of US exports to China. As shown in Table A1 in the Supplemental Appendix, 3580 out of 3735 HS6 product lines in our sample were subject to at least one round of retaliatory tariffs, leaving limited scope for evasion through reclassification. Moreover, misclassification often requires substantial alterations to product descriptions or technical characteristics, making it more easily detectable by customs authorities than underreporting quantities or prices. As a result, misclassification likely entails higher

compliance risks and expected penalties, rendering it a less attractive evasion strategy relative to quantity or price underreporting.

[Table 3 here]

5.5 Heterogenous analysis: product differentiation and tariff evasion

This subsection presents a heterogeneous analysis of the treatment effects based on product differentiation, as formalized in Hypothesis 2. Following Rauch (1999), products that lack organized exchanges or reference prices are classified as differentiated, while products traded on organized markets or with widely available reference prices are classified as homogeneous. Because the prices of differentiated products are more difficult to verify, we expect tariff evasion for these products to occur primarily through price underreporting. In contrast, for homogeneous products—whose prices are more transparent and easier for customs authorities to benchmark—firms are more likely to evade tariffs by underreporting quantities. To capture these distinct channels, we explicitly distinguish between price and quantity misreporting.

Table 4 reports the regression results based on equation (3) with interaction terms between retaliatory tariff exposure and product differentiation measures ($Retaliation \times organized$ and $Retaliation \times reference$), taking the differentiated products as the default category. As in previous tables, the first three columns use a dummy variable indicating exposure to retaliatory tariffs, while the last three columns replace this indicator with the continuous tariff rates. The dependent variables are, in turn, the price gap (GAP_p), the quantity gap (GAP_q), and the overall trade value gap (GAP).

Consistent with Hypothesis 2, the coefficient of the retaliation variable in column (1) of Table 4 is large and statistically significant at the 5% level, suggesting price underreporting in differentiated goods. By contrast, the coefficients of the interaction terms in columns (1) are both negative and nearly cancel out the positive coefficient for the default category of differentiated products, indicating substantially weaker price underreporting for homogeneous products traded on organized exchanges and reference-priced products. The coefficient of the interaction term for reference-priced products is statistically significant at the 5% level. For homogeneous products, however, the coefficient is only marginally significant at the 15% level. This weaker statistical significance is likely, at least in part, due to the limited number of

homogeneous products in our sample, which account for only 7.3% of the treatment group and 3.1% of the control group (see Figure A1 in Supplemental Appendix). A test of $\beta_1 + \beta_2 = 0$ and $\beta_1 + \beta_3 = 0$ shows that the total effect for products traded on organized exchanges and reference-priced products are both statistically and economically insignificant ($\beta_1 + \beta_2 = 0.045$, p-value = 0.638; $\beta_1 + \beta_3 = 0.029$, p-value = 0.686).

Turning to quantity underreporting, the insignificant coefficient on the retaliation variable in column (2) of Table 4 provides no evidence of quantity misreporting for differentiated goods. By contrast, the interaction terms between retaliation and homogenous and reference-priced products are both positive and highly significant, indicating stronger quantity underreporting among these products. As expected, the evidence of quantity underreporting decreases with the level of product differentiation: it is the strongest among homogenous products traded on organized exchanges, turns a bit weaker for reference-priced products, and disappears for differentiated products.[19]

Column (3) in Table 4 reports results using the overall trade value gap as the dependent variable, based on the same sample as in the first two regressions.[20] The estimated coefficients exhibit a sign pattern closer to that observed in the quantity gap regression, except that the first coefficient is now also significant at the 1% level. Taken together, these results underscore both the central role of information asymmetry in shaping tariff evasion strategies and the importance of distinguishing between price and quantity misreporting.

Finally, the last three columns of Table 4 present results from specifications that replace the explanatory variable with tariff rates. The estimated coefficients exhibit a similar pattern for the signs and magnitudes to those in the first three regressions, providing consistent evidence for our main findings, although some estimates lose statistical significance.

[Table 4 here]

Next, considering the very small number of homogenous goods traded on organized exchanges (see Figure A1 in Supplemental Appendix), we construct an alternative Rauch

[19] Javorcik and Narciso (2008), in their baseline specification, find that differentiated products are more prone to underreporting along both price and quantity margins. Because our analysis relies on data from a different country pair and institutional setting, and exploits distinct sources of variation, we do not attempt a direct comparison of the results across studies.

[20] The results are very similar if we use the full sample, not limited to the products with weight information.

classification by combining them with reference-priced products into a broader category of homogenous goods. Table 5 reports the regression results. Consistent with Hypothesis 2, the interaction terms in columns (1) and (4) are negative and statistically significant at the 5 or 10 percent level, confirming substantially weaker price underreporting for homogeneous products relative to differentiated products. For example, the estimate in column (1) of Table 5 implies that, following the trade war, the price gap for differentiated products increased by an additional 16.8 percent, while the net effect for homogeneous products is only 0.03 (= 0.168 − 0.138) and is statistically indistinguishable from zero.

The coefficients on the retaliation variable in columns (2) and (5) of Table 5 are positive but statistically insignificant, suggesting limited quantity misreporting for differentiated products. In contrast, the interaction term is positive and statistically significant, indicating substantially stronger quantity underreporting among homogeneous products. Using column (2) as an example, the implied total effect for homogeneous products is 0.391 (= 0.079 + 0.312). Finally, columns (3) and (6) report results using the overall trade value gap as the dependent variable, based on the same sample as in other regressions in Table 4.[21] The estimated coefficients exhibit a sign pattern closer to that observed in the quantity gap regressions.

[Table 5 here]

Alternatively, we construct Global Price Dispersion (GPD) as an alternative information measure. GPD is defined as the cross-country dispersion of US export prices (unit values) at the HS6 level in 2017 and is computed using GTI data. To ensure comparability, we restrict the calculation to observations reported in kilograms. A higher GPD indicates greater price heterogeneity across destination markets, making transaction prices more difficult to verify and thus reflecting stronger information friction. We construct two versions of GPD. The first is the logarithm of the standard deviation (log(sd)) of unit values across partner countries for each HS6 product, which captures the absolute extent of price dispersion. The second is the coefficient of variation (cv) of unit values, which normalizes dispersion by the mean price and therefore measures relative price heterogeneity independent of price levels. While the standard deviation reflects the overall magnitude of dispersion, the coefficient of variation accounts for

[21] The results are very similar if we use the full sample, not limited to the products with weight information.

scale effects and provides a dimensionless measure of cross-country price variation. We apply a logarithmic transformation to the first measure to reduce skewness and limit the influence of extreme values.

Table 6 reports the regression results using the standard deviation (sd) measure of GPD. The findings are consistent with those in Table 5 based on Rauch's classification, further supporting the role of information frictions in shaping tariff-evasion behavior. Note that in columns (3) and (6) of Table 6, the coefficient on the interaction term, capturing the differential effect of tariff rates on trade value gaps for products with higher price variability, becomes statistically insignificant. This is not uncommon in the literature (e.g., Bussy, 2021). To the best of our knowledge, our paper is the first to provide clear evidence that this insignificance reflects offsetting mechanisms. Table A2 in the Supplemental Appendix reports the regression results using the coefficient-of-variation (cv) measure of GPD. The findings are broadly consistent with those in Table 6, except that the coefficient of the interaction term in column (3) turns statistically significant.

[Table 6 here]

5.6 Heterogenous analysis: information stock and tariff evasion

Product differentiation is an inherent characteristic of goods, determined by their technological attributes, quality variation, branding, etc. By contrast, information about products and trading behavior can also be accumulated through enforcement activities, administrative experience, and information provided by trading partners. In this subsection, to test Hypothesis 3, we move beyond product differentiation and construct a set of alternative measures that capture such accumulated information. We collectively refer to them as information stock. Richer information enhances enforcement capacity across all evasion margins, regardless of whether firms underreport prices or quantities. Therefore, we only use the trade value gap as the dependent variable in all subsequent regressions.

First, we exploit a nationwide anti-smuggling campaign launched by the State Council of China in 2013 to identify products with a high level of accumulated information resulting from concentrated enforcement. The campaign was described as the largest anti-smuggling operation in a decade. It was led by the General Administration of Customs and involved eleven government agencies, including public security and quality inspection authorities, and was

implemented simultaneously across the country. Its primary objective was to crack down on the smuggling of taxable goods and to strengthen tax collection and information verification capacity for high-risk commodities.[22]

Unlike routine customs enforcement, this special campaign was characterized by its concentrated scope, targeted design, and institutionalized coordination across agencies. Official policy documents explicitly identified a set of key taxable goods, covering multiple high-value or high-risk sectors, including refined oil products, automobiles and auto parts, electronic and electromechanical products, chemical raw materials, high-end consumer goods, agricultural products, and tobacco products.[23] For these goods, customs authorities not only intensified inspections but also systematically collected detailed information on product prices, quantities, firms, and trade patterns through cross-departmental information sharing, updated risk profiling, and retrospective audits of historical cases. Importantly, the information generated by such concentrated enforcement is persistent: once accumulated, it continues to shape the regulatory environment for affected products well beyond the conclusion of the campaign.

Crucially for our identification strategy, the 2013 anti-smuggling campaign predates the US–China trade war by several years. We therefore interpret it as an exogenous shock to product-level information stock rather than a contemporaneous enforcement response to retaliatory tariffs. This timing allows us to cleanly separate the role of information from enforcement intensity during the trade war period. Based on the officially published "Special Campaign and Joint Action Plan against Smuggling," we map the listed key tax-related commodities to the HS6 level and construct a product-level information stock indicator. Specifically, this anti-smuggling dummy variable (*AS*) equals one if an HS6 product falls within the scope of the campaign's key targeted commodities, and zero otherwise. Detailed classifications and HS code mappings are provided in Supplemental Appendix Table B3.

Columns (1) and (3) of Table 7 report the corresponding results. The coefficient on *Retaliation* is positive and highly significant for products not covered by the anti-smuggling

[22] China National Radio: " General Administration of Customs: Launches Largest Joint Crackdown on Smuggling in Ten Years " http://politics.people.com.cn/n/2013/0822/c70731-22663992.html (08-22-2013)
[23] The "Special Campaign and Joint Action Plan for Combating Smuggling" can be obtained from https://shanxi.chinatax.gov.cn/zcfg/detail/sx-11400-3815-1698491.

campaign, indicating a substantial increase in trade reporting gaps following the imposition of retaliatory tariffs. In contrast, the interaction term between *Retaliation* and *AS* is negative and statistically significant, implying a markedly weaker treatment effect for products with a high information stock. For example, in column (1), the baseline treatment effect of 0.461 for products not covered by the campaign is reduced to 0.129 (i.e., 0.461-0.332=0.129) for covered products, an offset of more than 70 percent attributable to information accumulated through prior enforcement.[24]

[Table 7 here]

Second, we use transaction frequency as an alternative proxy for information stock. Using monthly data on US exports to China from GTI in 2017, we calculate transaction frequency as the number of months in which each HS6 product records positive export values. Products that were never exported from the US to China during 2017 are excluded. Figure A2 in the Supplemental Appendix shows that about 50% of HS6 products were traded in every month of 2017, with an average transaction frequency of nine months (Table A1). Columns (2) and (4) of Table 7 report regression results using an interaction term between *Retaliation* and this information proxy. The estimated coefficients on the interaction term are consistently negative and highly significant, indicating that products traded more frequently exhibit smaller trade reporting gaps under tariff shocks. This finding is consistent with our interpretation that richer information stocks (e.g., more benchmark prices for comparison) provided through more frequent transactions mitigate tariff evasion driven by information frictions.

Taken together, these results suggest that accumulated information, whether through prior enforcement or repeated transactions, enhances customs authorities' ability to verify true transaction values and discourages collusion. As a result, richer information substantially weakens tariff evasion incentives and improves the effectiveness of trade policy enforcement.

5.7 Robustness Checks

In this subsection, we conduct various robustness checks. To save space, the results are presented in the Supplemental Appendix.

[24] Supplemental Appendix Table A3 provides the results from a balance test to check if the treatment and control groups are fundamentally similar in their observable characteristics prior their anti-smuggling and AD/CV exposure. The groups appear to be well balanced, except that treated products tend to be traded more frequently.

5.7.1 Heterogeneity treatment effect

In the benchmark analysis, we employ a staggered difference-in-differences (DiD) framework to identify the impact of retaliatory tariffs implemented at different times across products. Recent studies, however, caution that when treatment effects are heterogeneous across cohorts or over time, conventional two-way fixed effects (TWFE) estimators may suffer from weighting biases or even sign reversal (Baker et al., 2022). To address these concerns, we assess the robustness of our results using two heterogeneity-robust estimators that are now standard in the literature.

The first approach follows Borusyak et al. (2024), which uses an imputation-based strategy. This method estimates counterfactual outcome paths for treated units using observations that have not yet been exposed to the policy, thereby recovering average treatment effects without relying on potentially problematic linear weighting across cohorts. The second approach adopts the event-study estimator of Sun and Abraham (2021), which explicitly accounts for variation in treatment timing by comparing outcomes relative to each cohort's own treatment date. This method yields consistent dynamic treatment effect estimates even in the presence of heterogeneous effects.

Supplemental Appendix Figure A3 reports the results from these alternative estimators. Panel (a), based on the imputation method of Borusyak et al. (2024), shows a pronounced widening of trade reporting gaps for treated products following the onset of the trade war. Panel (b), using the Sun and Abraham (2021) estimator, reveals a similar dynamic pattern. These results confirm that our main findings are robust to treatment effect heterogeneity and do not hinge on the use of a TWFE specification.

5.7.2 Anticipatory effect

When estimating the causal effects of retaliatory tariff shocks, a potential identification concern is anticipatory behavior: exporters may adjust reporting practices in advance if tariff increases are expected. If such anticipation is pervasive, baseline estimates may partially capture preemptive responses rather than the causal impact of tariffs themselves. To address this issue, we augment the benchmark regression using the *Retaliation* dummy by introducing lead indicators that capture potential anticipatory effects one, two, and three periods before the tariffs take effect (*Retaliation_Pre1, Retaliation_Pre2, and Retaliation_Pre3*).

Appendix Table A4 reports the results. After controlling for these lead indicators, the estimated coefficient on the core treatment variable, *Retaliation*, remains significantly positive and quantitatively similar to the baseline estimates. Moreover, the coefficients on all three lead indicators are statistically insignificant, indicating no systematic evidence of advance evasion behavior prior to the official implementation of retaliatory tariffs. These findings suggest that the estimated treatment effects primarily reflect the realized impact of tariff shocks rather than anticipatory adjustments.

5.7.3 Placebo test

We conduct a placebo test to address the concern that the estimated treatment effects may reflect pre-existing divergence trends or other contemporaneous shocks rather than the retaliatory tariffs themselves. To implement this test, we restrict the sample to the pre-treatment period and artificially shift the implementation date of the retaliatory tariffs forward by six months, one year, and one and a half years, thereby constructing three sets of placebo treatment indicators. We then re-estimate the baseline specification using identical control variables and fixed effects.

Appendix Table A5 reports the results. Across all three placebo scenarios, the estimated coefficients on the placebo treatment variables are small in magnitude and statistically insignificant. This finding indicates the absence of systematic trade reporting adjustments prior to the actual tariff implementation and rules out the possibility that our baseline results are driven by pre-trends or unrelated shocks. These placebo tests strengthen the causal interpretation of the retaliatory tariff effects identified in this paper.

5.7.4 Other confounding factors

To further address potential confounding factors, we conduct three additional robustness checks. First, we account for potential seasonal disruptions associated with the Chinese New Year, which may affect trade volumes and reporting practices. We construct a Chinese New Year dummy that equals one in months containing the Spring Festival (January in 2017 and 2020; February in 2018 and 2019) and zero otherwise. To allow for heterogeneous seasonal effects across products, we include HS6 × Spring Festival fixed effects. As shown in columns (1) and (5) of Appendix Table A6, the estimated effect of retaliatory tariffs remains positive and statistically significant.

Second, we augment the fixed-effects structure to absorb unobserved product-level heterogeneity over time. Specifically, we introduce HS6 × Month fixed effects to control for systematic intra-year seasonal patterns at the product level, and HS6-specific linear time trends to capture smooth product-level dynamics.[25] The results, reported in columns (2) and (6) and columns (3) and (7) of Table A6, respectively, continue to show positive and significant coefficients on the *Retaliation* variable.

Third, to isolate the effects of retaliatory tariffs from other concurrent trade policy interventions, we exclude all products subject to affirmative antidumping or countervailing duty (AD/CV) final rulings during the sample period, based on China's AD/CV investigations against the US from the China Trade Remedy Information Network. These AD/CV cases are listed in Table B4 of the Supplemental Appendix. Re-estimating the benchmark specification on this restricted sample yields results reported in columns (4) and (8) of Table A6. The estimated coefficients on *Retaliation* are quantitatively similar to those in the baseline results reported in Table 1.

5.7.5 Alternative measures of key variables

To assess the sensitivity of our results, we re-estimate the baseline regressions using alternative measures of both the key dependent and explanatory variables.

First, because some products were partially or fully exempted from retaliatory tariffs, we replace the statutory tariff rate with the effective retaliatory tariff rate that accounts for exemptions. The results, reported in column (1) of Appendix Table A7, continue to support Hypothesis 1.

Second, following Benguria and Saffie (2024), we replace the *Retaliation* indicator with the change in the tariff rate to capture the intensity of the tariff shock more directly. The estimates reported in column (2) of Table A7 remain consistent with our main findings.

Third, zero trade flows in exports or imports may reflect reporting irregularities and can introduce bias when GAP is constructed using logarithmic differences, particularly when exports or imports equal zero. In the benchmark analysis, such observations are excluded when we take logs of X and M. As an alternative, we follow Fisman and Wei (2004) and define an

[25] HS6-specific linear time trends are implemented by interacting HS6 product fixed effects with a continuous time variable that takes values from 1 to 36, corresponding to the 36 months from 2017 to 2019.

alternative gap measure, $GAP2 = (X - M)/(X + M)$, which allows us to retain observations in which either exports or imports (but not both) are zero. Columns (3) and (4) of Table A7 report the corresponding results. The number of observations increases by nearly 47% relative to the benchmark regressions in columns (2) and (3) of Table 1. The estimated coefficient on *Retaliation* remains positive and highly significant when the tariff shock is measured by the retaliation dummy (column 3). When the continuous tariff rate is used (column 4), the coefficient becomes statistically weaker but remains marginally significant at 12% level.

These robustness checks indicate that our main conclusions are largely insensitive to alternative constructions of the key variables.

5.7.6 Issue of time lags in monthly trade data

Monthly trade flows may be affected by shipping and declaration lags, introducing noise into measured trade discrepancies. For instance, exports recorded by US customs in January may not be registered by Chinese customs until February, while some imports recorded by Chinese customs in January may have already cleared US customs in the previous December. Such timing mismatches can mechanically widen or narrow measured trade gaps. We address this concern using two complementary approaches.

First, we aggregate the monthly data to quarterly level, as temporal aggregation helps smooth out short-term timing mismatches. Columns (1) and (3) of Appendix Table A8 report the results using quarterly data. The estimated effects of tariffs remain positive and statistically significant.

Second, because air shipments involve substantially shorter transit times than ocean freight, declaration lags are less likely to be a concern for air-transported goods. We therefore restrict the sample to products with a high share of air shipping. Specifically, using China's import data from the US in 2015, we calculate the air-shipment share at the HS6 level and retain products with an air transport share of at least 90%. Columns (2) and (4) of Table A8 report the results for this subsample. The estimated coefficients on *Retaliation* remain positive and significant at the 10% level, despite the very small sample size.

5.7.7 Other model settings

In the baseline specification, we cluster standard errors at the HS6 product level and estimate treatment effects using a multi-period DiD framework with rich dynamic and fixed-

effects structures. While this approach is standard, it may raise two potential concerns. First, if tariff shocks or evasion behaviors are correlated within industries or over time, clustering at the product level may understate standard errors and overstate statistical significance. Second, if the estimated effects are sensitive to the assumed dynamic structure, this could weaken the robustness of the causal interpretation.

To address these issues, we conduct two additional robustness exercises. First, we consider alternative clustering schemes for standard errors. Specifically, we cluster at the HS2 industry level to allow for within-industry correlation in policy exposure and reporting behavior, and we also implement two-way clustering by HS6 product and time to account for dependence along both cross-sectional and temporal dimensions. Second, we adopt a simplified two-period DiD design by collapsing the sample into pre– and post–trade war periods, thereby reducing reliance on event-time dynamics and time-varying fixed effects.

The results are reported in Appendix Table A9. Across specifications on standard errors clustering in columns (1)–(2) and (4)–(5), the estimated standard errors on the *Retaliation* variable remain largely unchanged. In columns (3) and (6), which use the two-period DiD specification, the estimated coefficients on *Retaliation* remain positive and statistically significant, and their magnitudes are larger than the baseline multi-period estimates. This pattern is consistent with the fact that the simplified two-period DiD design abstracts from event-time structure in a staggered setting and instead captures the average post-treatment effect over the entire trade war period. If firms adjust gradually and learn how to evade tariffs over time, treatment effects may strengthen in later periods; averaging across post-treatment observations would therefore yield larger estimates. This interpretation is consistent with the dynamic adjustment pattern documented in the event-study analysis, where the effect of tariffs grows over time.

Overall, these findings indicate that our results are robust to alternative clustering strategies and to simpler model specifications.

5.7.8 Impact of the exemption

To mitigate the adverse impact of tariff increases on downstream industries, both China and the US introduced tariff exemption mechanisms during the trade war. Beginning in September 2019, China implemented its first exclusion list for goods exempted from additional

retaliatory tariffs, allowing eligible firms to apply for or automatically receive tariff exemptions for specified products within defined time windows. The scope of exemptions was subsequently expanded through multiple rounds. The detailed implementation timeline is summarized in Appendix Table B2.

Unlike one-time, uniform tariff adjustments, the exclusion list policy is characterized by phased releases, rolling extensions, and dynamic revisions across both products and time. As a result, even within the same HS6 category, different HS8 sub-lines may face different effective tariff rates in a given month. This fine-grained variation generates a useful policy experiment for studying tariff evasion and its mechanisms. Between 2019 and 2021, the exclusion lists covered 370 HS8 product lines, which together accounted for approximately USD 28.8 billion of China's imports from the US in 2017, nearly 19% of total US exports to China that year.

If the trade data discrepancies documented above primarily reflect tariff-evasion behavior, then exemptions from retaliatory tariffs should weaken evasion incentives and lead to narrower trade reporting gaps. To test this prediction, we construct two HS6-level measures of tariff exemptions. The first is a continuous variable, *exempt_sh*, defined as the share of China's imports from the US that are exempt from tariffs within an HS6 category, based on HS8-level exemption announcements and weighted by China's 2017 import values. The second is a binary indicator, *exempt*, which equals one if at least one HS8 sub-line within an HS6 product is exempted in a given month.[26]

We incorporate these exemption measures into the benchmark specification and report the results in Table A10. Columns (1) and (3) use the exemption dummy, while columns (2) and (4) use the continuous share measure. Across all specifications, the coefficient on *Retaliation* remains positive and statistically significant, while the coefficients on the exemption variables are consistently negative and significant at the 5% or 10% level. These results indicate that tariff exemptions substantially dampen the impact of retaliatory tariffs on trade reporting gaps. For example, in column (1), the presence of an exemption reduces the trade gap by 0.111. Similarly, the estimate in column (2) implies that a one-percentage-point increase in *exempt_sh*

[26] The baseline analysis in this paper covers the period from January 2017 to December 2019, primarily encompassing the implementation phase of China's retaliatory tariffs. However, due to the successive releases of the exclusion list policy starting in January 2019 and its subsequent multiple postponements, the sample period is extended to December 2021 in this section to fully characterize the dynamic impact of tariff exemptions.

lowers the trade gap by approximately 0.12%. These magnitudes are economically meaningful.

The analysis provides further evidence that the observed trade data gaps are driven by tariff-induced evasion and that reducing the effective tariff can significantly curb such behavior.

5.7.9 The impact of each round of tariff increases

China's retaliatory tariffs were implemented in multiple rounds, with clearly defined implementation dates and product coverage. If firms' evasion behavior involves learning, adjustment costs, or phased responses, the magnitude of avoidance may differ across tariff rounds. Moreover, because products targeted in earlier rounds were often subject to additional tariffs in later rounds, failing to distinguish across rounds may obscure important heterogeneity in responses. Therefore, we examine tariff evasion separately by tariff round. We group China's retaliatory tariffs into three rounds, incorporating the preliminary actions into the first round (see Appendix Table B1 for the detailed timeline).

Table A11 presents the results. Panel A isolates the effect of *newly targeted* products in each round by defining the treatment group as HS6 products that first entered the retaliatory tariff list in that round, while the control group consists of HS6 products never subject to retaliatory tariffs during the whole sample period. This design captures the impact of a single, discrete tariff shock, free from confounding effects of prior exposure. Panel B, in contrast, measures the *overall* effect of each tariff round by treating all HS6 products subject to retaliatory tariffs in that round, whether newly included or previously affected, as treated, using the same control group as in Panel A. It captures the cumulative impact of each round of tariffs.

In Panel B, the estimated cumulative effect is always positive and statistically significant. In Panel A, the separate new-in-round treatment effects are statistically significant for the first two rounds, but not for the third round. This likely reflects both the small number of newly targeted products in the September 2019 round—only 26 HS6 lines, compared with 276 in the preliminary and first rounds combined and 3,278 in the second round—and the short time window between implementation and the end of the sample period (December 2019), which limits firms' ability to adjust. Overall, these results are consistent with our earlier findings: tariff evasion responses strengthen over time as firms learn and adapt as shown in Figure 2, and persist as long as the tariff-induced incentives remain in place.

6. Conclusion: Welfare and Policy Implications

This paper studies China's retaliatory tariffs against the US during the 2018–2019 trade war to examine how tariff policies operate in an environment characterized by information frictions and imperfect enforcement. Departing from the conventional view that tariff evasion is a mechanical response to tax rate changes, we emphasize that the effectiveness of tariff policy critically depends on the information available to regulators.

Using product-level monthly bilateral trade data, we show that retaliatory tariffs substantially widened trade data reporting gaps between China and the US. On average, the affected products experienced a 28% increase in discrepancies, nearly doubling the sample mean. The implied magnitude is economically meaningful, corresponding to an estimated USD 7 billion in underreported trade and approximately USD 742 million in lost tariff revenue. Event-study analyses and extensive robustness checks confirm that this pattern reflects persistent behavioral responses to tariff shocks rather than transitory noise or estimation artifacts.

We also show that tariffs affect trade through several other distinct margins: a real intensive margin, a reporting margin, and an extensive or smuggling margin. By disentangling these channels, we demonstrate that the contraction in recorded imports reflects both real economic adjustment and endogenous reporting responses to customs enforcement, offering a more complete understanding of tariff evasion.

Our results further suggest that the form and magnitude of tariff evasion are shaped by the information environment. Firms evade tariffs primarily by underreporting quantities for homogeneous products and unit values for differentiated products. Moreover, evasion is substantially weaker when customs authorities possess richer information, including information accumulated through prior anti-smuggling campaigns and frequent historical transactions. These findings suggest that enforcement capacity is determined not only by contemporaneous audit effort but also by the gradual accumulation of administrative information that improves customs' ability to detect fraud.

The findings have broader implications for both trade policy and public finance. First, they suggest that increasing tariff rates alone may have limited effectiveness when information frictions are severe, as stronger tax incentives may simply induce greater evasion. Investments

in information infrastructure, including systematic product-level monitoring, international information sharing, and the accumulation of administrative records, can therefore be as important as tariff policy itself.[27] As tax administration enters the digital era, both the magnitude and the forms of tax evasion are likely to evolve. Recent investments in digital customs systems, including China's Smart Customs initiative,[28] illustrate how big data, artificial intelligence, and cross-agency information sharing can enrich customs' information stock and combat evasion. Second, our results provide new insights into the classic choice between ad valorem and specific trade taxes. A long-standing literature argues that ad valorem taxes are generally more efficient because they automatically adjust to quality differences and inflation, whereas specific taxes are simpler to administer (e.g., Musgrave 1959). Our findings suggest that this trade-off also depends on verifiability. When transaction values are difficult to observe or verify, ad valorem tariffs become more vulnerable to value underreporting, making quantity-based duties or reference-price systems relatively more resistant to evasion. Conversely, when quantities are easier to manipulate than prices, ad valorem taxation may offer a more robust tax base. More broadly, the optimal design of trade taxes depends not only on economic efficiency but also on the information available to the enforcing authority.

Overall, this paper contributes to a growing literature emphasizing information as a fundamental determinant of regulatory effectiveness. We show that bilateral trade data represent a potential enforcement technology. Mirror statistics provide a low-cost third-party information source that allows customs authorities to compare exporter and importer declarations. By showing how information frictions shape both the incidence and the form of tariff evasion, it bridges the international trade literature on customs enforcement with the public finance literature on tax compliance, information, and state capacity, and highlights the central role of administrative information in determining the effectiveness of trade policy.

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[27] Existing studies also emphasizes the role of information systems in shaping regulatory compliance. Barwick et al. (2024) show that pollution information disclosure changes firm behavior by reducing information asymmetry and strengthening incentives for compliance. We extend it to customs enforcement by showing that information constraints determine not only whether firms evade tariffs but also the margin along which evasion occurs.
[28] https://en.people.cn/n3/2024/0322/c90000-20148302.html

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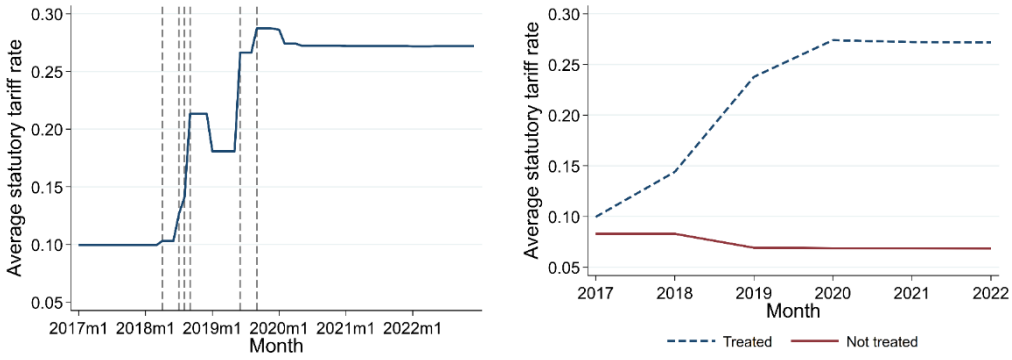
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Figures

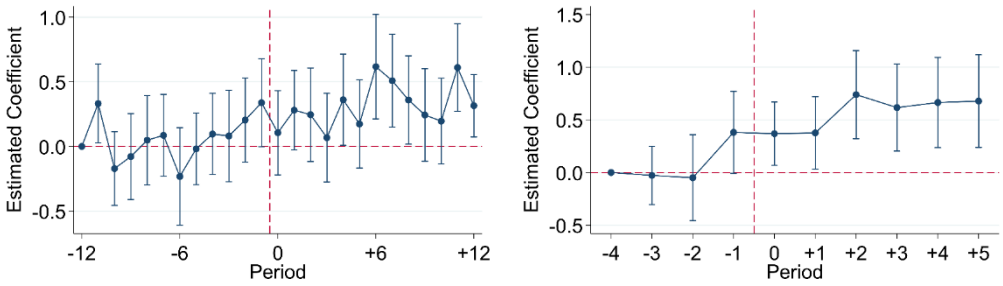
Figure 1: Trends in China's Import Tariff Rates, 2018–2022



（a）China tariff schedule during the US-China trade war (b) Treatment Group vs. Control Group

Notes: This figure shows the average effective tariff rates imposed by China on US products at the HS8-digit level from January 2017 to December 2022. Figure 1(a) shows the changes in the average effective tariff rates on products subject to retaliatory tariffs imposed by China on imports from the US from 2017 to 2022. The dashed lines correspond to the effective dates of China's retaliatory tariffs against the US (April, July, August, and September of 2018, and June and September of 2019). Figure 1(b) compares the annual average effective tariff rates of products subject to retaliatory tariffs and those not subject to the tariffs during the same period. Please refer to Jiang et al. (2023) for the method used to calculate the tariff rates. Data sources: official announcements issued by the Chinese Ministry of Finance and the Office of the US Trade Representative.

Figure 2: An Event Study Analysis



(a) Monthly data (b) Quarterly data

Notes: This figure plots the estimated coefficients and their 95% confidence intervals from the event study model. Figure 2(a) uses monthly data, with the event window covering 12 months before and after policy implementation; Figure 2(b) uses quarterly data, with the event window covering 4 quarters before and 5 quarters after policy implementation. The baseline period is set as the 12th month or 4th quarter before policy implementation (the corresponding coefficient is normalized to 0). The regression controls for product fixed effects and HS2 × Time fixed effects, and standard errors are clustered at the HS6 product level.

Tables

Table 1: Baseline Results

	Retaliation in (1)-(3) = Dummy			Retaliation in (4)-(6) = Tariff Rate		
	(1)	(2)	(3)	(4)	(5)	(6)
	GAP	*GAP*	*GAP_w5*	*GAP*	*GAP*	*GAP_w5*
Retaliation	0.151**	0.282***	0.230***	0.799***	0.718***	0.615***
	(0.062)	(0.067)	(0.051)	(0.157)	(0.200)	(0.167)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes			Yes		
HS2 × Time FE		Yes	Yes		Yes	Yes
adj. R^2	0.499	0.510	0.506	0.499	0.510	0.506
Observations	90841	90672	90672	90841	90672	90672

Notes: This table reports the baseline regression results of the impact of China's retaliatory tariffs against the US on trade data discrepancies. The dependent variable is the trade value discrepancy (GAP) defined according to formula (1); GAP_w5 is the variable with 5% winsorization. Retaliation is the retaliatory tariff shock variable. Columns (1)–(3) use a dummy variable for retaliatory tariffs to measure the policy shock, while columns (4)–(6) use the product-level tariff rate. All regressions include a control variable for US tariffs imposed on China (*tariff_us*). In terms of time dimension, columns (1) and (4) use time (Year × Month) fixed effects, while the remaining columns use HS2 × Time fixed effects to absorb common time shocks at the HS2 industry level. Standard errors, clustered at the HS6 product level, are shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 2: Decomposition into Real, Reporting, and Extensive Margins

	Intensive margin		Extensive margin	
	(1)	(2)	(3)	(4)
	ln*X* (X>0)	ln*M* (X>0)	Pr(X>0)	Pr(M>0)
Tariff Rate	-0.730***	-1.275***	-0.019	-0.294***
	(0.162)	(0.184)	(0.023)	(0.026)
adj. R^2	0.818	0.844	0.634	0.689
Controls	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes
HS2 × Time FE	Yes	Yes	Yes	Yes
Observations	103565	90672	182088	182088

Notes: This table reports the results from regressions for trade data recorded by each side separately, along both the intensive and extensive margins. X and M refer to the trade values of US-reported exports and China-reported imports, respectively. Columns (1)–(2) use a sample with X > 0, with ln(X) and ln(M) as the dependent variable. Columns (3)–(4) use a fully balanced panel dataset with zero trade flows, with a dummy variable for positive trade flows as the dependent variable. All regressions include a control variable for US tariffs imposed on China (*tariff_us*). Standard errors, clustered at the HS6 product level, are shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 3: Evasion Channels

	Retaliation in (1)-(3) = Dummy			Retaliation in (4)-(6) = Tariff Rate		
	(1)	(2)	(3)	(4)	(5)	(6)
	GAP_p	GAP_q	GAP	GAP_p	GAP_q	GAP
Retaliation	0.117*	0.195*	0.272***	0.097	0.732**	0.629***
	(0.062)	(0.118)	(0.072)	(0.199)	(0.348)	(0.223)
similar_tariff			0.211			0.145
			(0.265)			(0.276)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes
HS2 × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
adj. R^2	0.446	0.450	0.512	0.446	0.450	0.512
Observations	44407	44407	84439	44407	44407	84439

Notes: This table reports the results of an analysis of how China evades tariffs. The dependent variable is GAP in price or unit value (GAP_p) or quantity (GAP_q), or trade value (GAP). Retaliation is the retaliatory tariff shock variable. Columns (1)–(3) use a dummy variable for retaliatory tariffs to measure the policy shock, while columns (4)–(6) use the product-level tariff rate. Variable *similar_tariff* refers to the tariff on similar products, defined as the weighted average of retaliatory tariff rates for other HS6 products within the same HS4 category for a specific month in a year, excluding the HS6 product itself, with weights being China's imports from the US in 2017. All regressions include a control variable for US tariffs imposed on China (*tariff_us*). Standard errors are clustered at the HS6 product level, and clustered robust standard errors are shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% significance levels, respectively.

Table 4: Heterogeneity Analysis – 3-way Product Differentiation

	Retaliation in (1)-(3) = Dummy			Retaliation in (4)-(6) = Tariff Rate		
	(1)	(2)	(3)	(4)	(5)	(6)
	GAP_p	GAP_q	GAP	GAP_p	GAP_q	GAP
Retaliation	0.168**	0.075	0.243***	0.370	0.209	0.579*
	(0.067)	(0.123)	(0.093)	(0.257)	(0.433)	(0.333)
Retaliation × organized	-0.124	0.502***	0.378***	-0.274	1.144*	0.870*
	(0.086)	(0.173)	(0.135)	(0.343)	(0.665)	(0.526)
Retaliation × reference	-0.139**	0.292***	0.153**	-0.489*	0.825*	0.337
	(0.057)	(0.098)	(0.070)	(0.268)	(0.456)	(0.340)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes
HS2 × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
adj. R^2	0.446	0.451	0.478	0.446	0.450	0.478
Observations	44407	44407	44407	44407	44407	44407

Notes: This table reports the results of the heterogeneity analysis based on product differentiation defined by the conservative definition of Rauch (1999). The dependent variable is GAP in price or unit value (GAP_p) or quantity (GAP_q), or trade value (GAP). Retaliation is the retaliatory tariff shock variable. Columns (1)–(3) use a dummy variable for retaliatory tariffs to measure the policy shock, while columns (4)–(6) use the product-level tariff rate. All regressions include a control variable for US tariffs imposed on China (*tariff_us*). Standard errors, clustered at the HS6 product level, are shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 5: Heterogeneity Analysis – 2-way Product Differentiation

	Retaliation in (1)-(3) = Dummy			Retaliation in (4)-(6) = Tariff Rate		
	(1)	(2)	(3)	(4)	(5)	(6)
	GAP_p	GAP_q	GAP	GAP_p	GAP_q	GAP
Retaliation	0.168**	0.079	0.247***	0.375	0.216	0.591*
	(0.067)	(0.123)	(0.093)	(0.257)	(0.432)	(0.333)
Retaliation × *Homogenous*	-0.138**	0.312***	0.175**	-0.464*	0.862*	0.398
	(0.056)	(0.096)	(0.068)	(0.264)	(0.447)	(0.332)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes
HS2 × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
adj. R^2	0.446	0.451	0.478	0.446	0.450	0.478
Observations	44407	44407	44407	44407	44407	44407

Notes: This table reports the results of the heterogeneity analysis based on product differentiation. According to the conservative definition of Rauch (1999), "*Homogenous*" dummy = 1 for categories "r" (reference-priced products) and "w" (products traded on organized exchange), and zero otherwise. The dependent variable is GAP in price or unit value (GAP_p) or quantity (GAP_q), or trade value (GAP). Retaliation is the retaliatory tariff shock variable, and its coefficient captures the effect for differentiated products (the base category). The interaction term Retaliation × Homogeneous captures the additional effect for homogeneous products relative to differentiated products. Columns (1)–(3) use a dummy variable for retaliatory tariffs to measure the policy shock, while columns (4)–(6) use the product-level tariff rate. All regressions include a control variable for US tariffs imposed on China (*tariff_us*). Standard errors, clustered at the HS6 product level, are shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 6: Heterogeneity Analysis – Global Price Dispersion (GPD, log(sd) measure)

	Retaliation in (1)-(3) = Dummy			Retaliation in (4)-(6) = Tariff Rate		
	(1)	(2)	(3)	(4)	(5)	(6)
	GAP_p	GAP_q	GAP	GAP_p	GAP_q	GAP
Retaliation	0.027	0.372***	0.380***	-0.204	1.239***	0.995***
	(0.070)	(0.132)	(0.103)	(0.214)	(0.405)	(0.362)
Retaliation × *GPD* (sd)	0.026**	-0.052***	-0.012	0.109*	-0.188*	-0.009
	(0.011)	(0.019)	(0.015)	(0.061)	(0.105)	(0.080)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes
HS2 × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
adj. R^2	0.440	0.450	0.491	0.440	0.450	0.491
Observations	43667	43667	45729	43667	43667	45729

Notes: This table reports the results of the heterogeneity analysis based on Global Price Dispersion (GPD), calculated as logarithm of the standard deviation (sd) of the unit values or prices (P_j) of US' exports across destination countries (j). The dependent variable is GAP in price or unit value (GAP_p) or quantity (GAP_q), or trade value (GAP). Retaliation is the retaliatory tariff shock variable. Columns (1)–(3) use a dummy variable for tariffs to measure the policy shock, while columns (4)–(6) use the product-level retaliatory tariff rate. All regressions include a control variable for US tariffs imposed on China (*tariff_us*). Standard errors, clustered at the HS6 product level, are shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 7: Heterogeneity Analysis – Anti-smuggling (*AS*) & Transaction Frequency (*freq*)

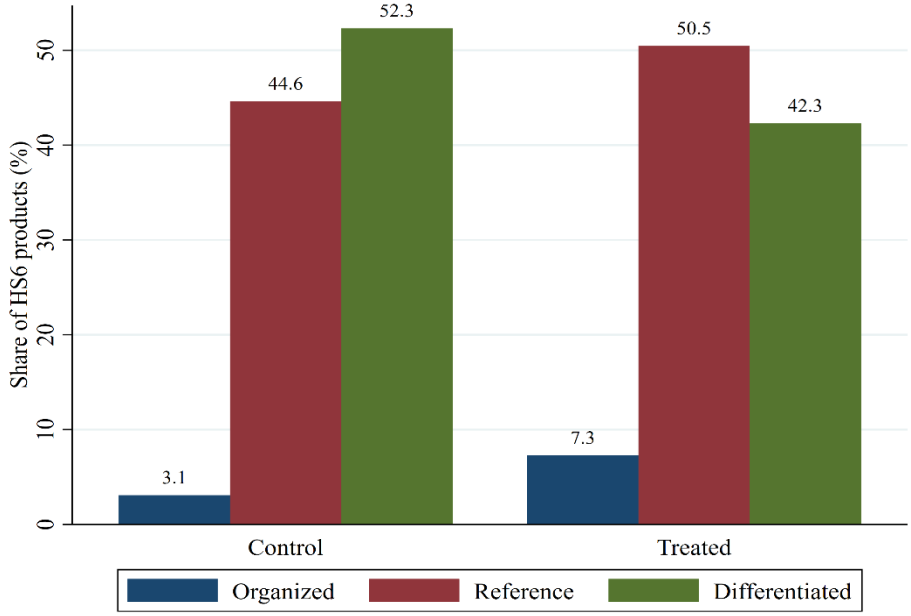
	Retaliation = Dummy		Retaliation = Tariff Rate	
	(1)	(2)	(3)	(4)
Retaliation	0.461***	0.639***	0.720***	2.405***
	(0.100)	(0.111)	(0.280)	(0.513)
Retaliation × *AS*	-0.332***		-0.003	
	(0.113)		(0.372)	
Retaliation × *freq*		-0.032***		-0.157***
		(0.008)		(0.044)
Controls	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes
HS2 × Time FE	Yes	Yes	Yes	Yes
adj. R^2	0.510	0.508	0.510	0.508
Observations	90672	90117	90672	90117

Notes: This table reports the results of the heterogeneity analysis using information stock measures. The dependent variable in all of the regressions is GAP in trade values according to formula (1). Retaliation is the retaliatory tariff shock variable. Columns (1)–(2) use a retaliatory tariff dummy variable to measure the policy shock, while columns (3)–(4) use the product-level tariff rate. In columns (1) and (3), *AS* = 1 if the product belongs to the key tax-related commodities listed in the 2013 national anti-smuggling special action, and 0 otherwise. In columns (2) and (4), *freq* measures the transaction frequency of US' exports to China in 2017. All regressions control for product fixed effects and HS2 × Time fixed effects, and include a control variable for US tariffs imposed on China (*tariff_us*). Standard errors, clustered at the HS6 product level, are shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Supplemental Appendix (Not for Publication)

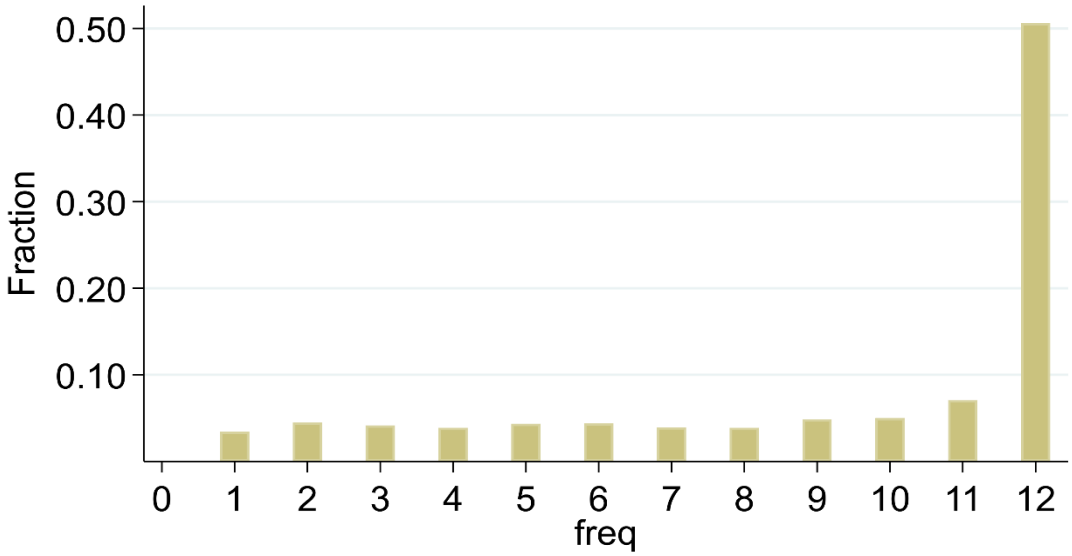
Appendix A

Figure A1: Product Composition Based on Rauch Product Differentiation



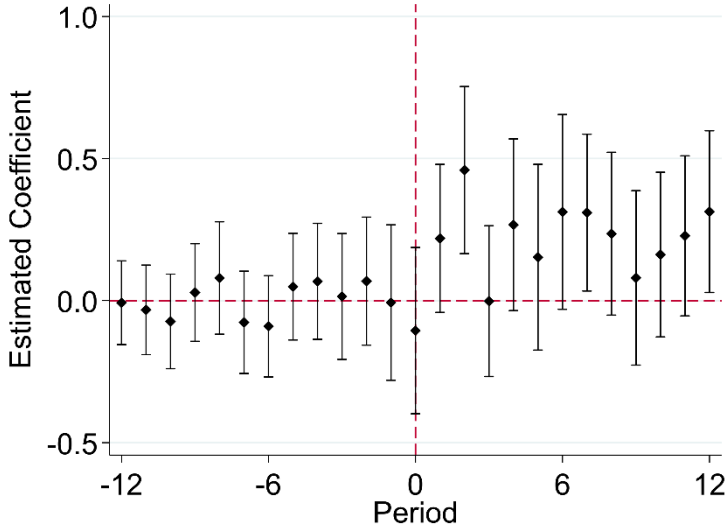
Notes: This figure is based on the sample used in Column (1) of Table 5. "Organized" refers to homogenous products traded on international organized exchanges. "Reference" refers to reference-priced products. "Differentiated" refers to differentiated products.

Figure A2: Distribution of Transaction Frequency

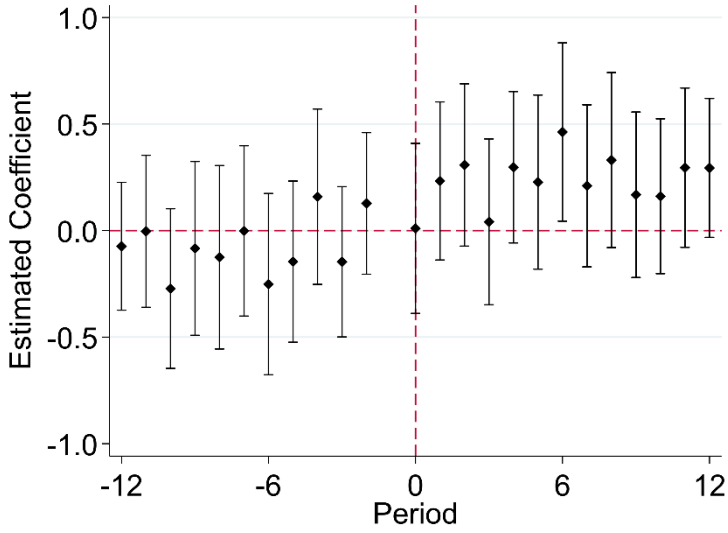


Notes: This figure shows the distribution of HS 6-digit products based on their transaction frequency, which counts the number of months in 2017 in which a product records a positive trade value, using US-reported exports to China at monthly level. This figure is based on the sample used in columns (2) and (4) in Table 7. The products never exported to China from the US are excluded. Data source: GTI.

Figure A3: Heteroskedasticity - Robust Estimators



(a) Borusyak et al. (2024)



(b) Sun and Abraham (2021)

Note: This figure plots the estimated coefficients and their 95% confidence intervals for each period using heteroskedasticity-robust estimators. Figure A3(a) is based on the reversible treatment effect estimation method of Borusyak et al. (2024), and Figure A3(b) is based on the heteroskedasticity-robust event study method of Sun and Abraham (2021). The event window covers 12 months before and after policy implementation, with the baseline period set as the 12th month before policy implementation. Product fixed effects and HS2 × Time fixed effects are controlled for in the regressions, and standard errors are clustered at the HS6 product level.

Table A1: Descriptive Statistics

Variable	N	Obs	Mean	SD	Min	Max
Panel A: Full sample						
GAP	3735	90672	0.142	1.950	-10.930	13.891
GAP_q	1841	44407	0.471	2.437	-12.106	17.657
GAP_p	1841	44407	-0.413	1.373	-11.044	11.485
tariff	3735	90672	0.143	0.109	0	1.062
tariff_us	3735	90672	0.098	0.112	0	0.941
Panel B: Treatment group						
GAP	3580	87843	0.144	1.939	-10.930	13.891
GAP_q	1776	43053	0.466	2.440	-12.106	17.657
GAP_p	1776	43053	-0.407	1.371	-11.044	11.485
tariff	3580	87843	0.147	0.109	0	1.062
tariff_us	3580	87843	0.099	0.112	0	0.941
Panel C: Control group						
GAP	155	2829	0.079	2.262	-9.864	11.375
GAP_q	65	1354	0.630	2.344	-9.843	11.320
GAP_p	65	1354	-0.607	1.440	-8.214	5.951
tariff	155	2829	0.041	0.041	0	0.350
tariff_us	155	2829	0.081	0.113	0	0.434
Panel D: Product level						
Rauch (Rauch product classification)	3734	3734	2.631	0.561	1	3
Homogeneous	3734	3734	0.328	0.469	0	1
GPD (Global Price Dispersion, log(sd))	1878	1878	3.204	2.510	-3.300	13.431
GPD (Global Price Dispersion, cv)	1878	1878	1.771	1.338	0.084	10.141
AS (products s.t. anti-smuggling)	3735	3735	0.442	0.497	0	1
freq (transaction frequency)	3614	3614	9.255	3.601	1	12

Note: This table reports descriptive statistics for the sample of US-China bilateral trade from 2017-2019. Panel A shows the full sample; Panel B shows the treatment group (HS6-digit products affected by China's tariffs on the US at least once during the sample period); Panel C shows the control group (HS6-digit products not affected by China's tariffs on the US during the sample period); and Panel D shows the summary statistics of variables used in our regressions at the HS6 product level. N represents the number of HS6 products, and Obs represents the number of observations. GAP refers to trade data discrepancy based on reported trade values according to formula (1). GAP_q and GAP_p refer to the corresponding measures in trade quantity and price (or unit value, in USD/kg), respectively, based on the trade statistics measured in kilogram on both the US and China sides (therefore, the number of observations for GAP_q and GAP_p is less than that for GAP). Variable *tariff* refers to the rates of China's retaliatory tariffs on the US products, while *tariff_US-re*fers to the rates of US tariffs against China during the trade war. *Rauch* is the numeric Rauch product classification (1 = organized-exchange products, 2 = reference-priced products, and 3 = differentiated products). *Homogenous* dummy = 1 for categories "r" (reference-priced products) and "w" (products traded on organized exchange) in Rauch classification, and zero otherwise.

Table A2: Heterogeneity Analysis – Global Price Dispersion (GPD, cv Measure)

	Retaliation in (1)-(3) = Dummy			Retaliation in (4)-(6) = Tariff Rate		
	(1)	(2)	(3)	(4)	(5)	(6)
	GAP_p	GAP_q	GAP	GAP_p	GAP_q	GAP
Retaliation	0.043	0.346***	0.418***	-0.304	1.322***	1.222***
	(0.068)	(0.128)	(0.098)	(0.237)	(0.424)	(0.351)
Retaliation × *GPD* (cv)	0.036***	-0.073***	-0.038**	0.224**	-0.339**	-0.137
	(0.014)	(0.023)	(0.017)	(0.088)	(0.150)	(0.106)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes
HS2 × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
adj. R^2	0.440	0.450	0.491	0.440	0.450	0.491
Observations	43667	43667	45729	43667	43667	45729

Notes: This table reports the results of the heterogeneity analysis based on Global Price Dispersion (GPD), calculated the coefficient of variation (cv) of the unit values or prices (P_j) of US' exports across destination countries (j). The dependent variable is GAP in price or unit value (GAP_p) or quantity (GAP_q), or trade value (GAP). Retaliation is the retaliatory tariff shock variable. Columns (1)–(3) use a dummy variable for tariffs to measure the policy shock, while columns (4)–(6) use the product-level retaliatory tariff rate. All regressions include a control variable for US tariffs imposed on China (*tariff_us*). Standard errors, clustered at the HS6 product level, are shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table A3: Balance Tests Based on Rauch Product Differentiation

	Mean_T (Treatment Group)	Mean_C (Control Group)	Diff	Std diff	p-value
GAP	0.210	0.111	0.099	0.054	0.743
GAP_q	0.710	0.869	-0.160	-0.067	0.675
GAP_p	-0.500	-0.759	0.259	0.171	0.317
tariff	0.084	0.045	0.039	0.749	0.000
tariff_us	0.024	0.010	0.013	0.493	0.000
Rauch	2.334	2.574	-0.241	-0.420	0.004
Homogenous	0.597	0.404	0.192	0.390	0.012
GPD (cv)	1.811	2.216	-0.405	-0.293	0.054
GPD (log(sd))	3.127	5.082	-1.955	-0.772	0.000
AS	0.365	0.319	0.046	0.096	0.515
AD/CV	0.022	0.021	0.000	0.003	0.985
freq	9.660	10.404	-0.744	-0.242	0.076

Notes: This table reports the results from balance tests for group means and differences (two-sample t-test), based on the sample used in Column (1) of Table 5. Each HS6 enters the calculation only once (total 2017 products). Standardized difference (Std diff) = (Mean_T - Mean_C)/sqrt((sd_T^2+sd_C^2)/2), where sd stands for standard deviation. |Std diff| > 0.25 indicates meaningful imbalance. p-value is from the unequal-variance t-test.

Table A4: Anticipatory Effects

	Retaliation=Dummy		
	(1)	(2)	(3)
Retaliation	0.301***	0.340***	0.293***
	(0.073)	(0.075)	(0.078)
Retaliation_Pre1	0.115	0.123	0.107
	(0.100)	(0.109)	(0.114)
Retaliation_Pre2		0.028	0.002
		(0.095)	(0.110)
Retaliation_Pre3			-0.086
			(0.120)
Controls	Yes	Yes	Yes
Product FE	Yes	Yes	Yes
HS2 × Time FE	Yes	Yes	Yes
adj. R^2	0.510	0.510	0.510
Observations	90672	90672	90672

Notes: This table reports the estimation results of the anticipatory effects. The dependent variable in all regressions is GAP in trade values according to formula (1). Retaliation is the dummy variable for retaliatory tariff shock. A dummy variable for each of the first three months before the retaliatory tariffs is sequentially added to the baseline specification (*Retaliation_Pre1, Retaliation_Pre2, and Retaliation_Pre3*) to control for potential anticipatory behavior by traders. All regressions include a control variable for US tariffs imposed on China (*tariff_us*). Standard errors, clustered at the HS6 product level, are shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table A5: Placebo Tests

	Retaliation=Dummy		
	(1) Shift Treatment Forward by 6 Months	(2) Shift Treatment Forward by 1 Year	(3) Shift Treatment Forward by 1.5 Years
Retaliation	-0.038	0.021	-0.016
	(0.074)	(0.071)	(0.102)
Controls	Yes	Yes	Yes
Product FE	Yes	Yes	Yes
HS2 × Time FE	Yes	Yes	Yes
adj. R^2	0.539	0.539	0.539
Observations	50548	50548	50548

Notes: This table reports the results of placebo tests. The dependent variable in all regressions is GAP in trade values according to formula (1). Retaliation is the dummy variable for retaliatory tariff shock. We shift the actual implementation time of China's retaliatory tariffs forward by half a year in Column (1), one year in Column (2), and one and a half years in Column (3), to construct a false treatment variable, and then re-estimate the baseline regression. All regressions include a control variable for US tariffs imposed on China (*tariff_us*). Standard errors are clustered at the HS6 product level, and clustered robust standard errors are shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% significance levels, respectively.

Table A6: Other Confounding Factors

	Retaliation in (1)-(4) = Dummy				Retaliation in (5)-(8) = Tariff Rate			
	(1) Spring Festival	(2) HS6*Month FEs	(3) HS6 Level Time Trend	(4) Concurrent AD/CV	(5) Spring Festival	(6) HS6*Month FEs	(7) HS6 Level Time Trend	(8) Concurrent AD/CV
Retaliation	0.276***	0.209***	0.174**	0.289***	0.711***	0.574***	0.547**	0.722***
	(0.067)	(0.071)	(0.088)	(0.067)	(0.201)	(0.217)	(0.259)	(0.200)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HS2 × Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HS6 × Spring Festival FE	Yes	No	No	No	Yes	No	No	No
HS6 × Month FE	No	Yes	No	No	No	Yes	No	No
HS6 Level Time Trend	No	No	Yes	No	No	No	Yes	No
adj. R^2	0.488	0.474	0.554	0.512	0.488	0.474	0.554	0.512
Observations	90076	83760	90672	90467	90076	83760	90672	90467

Notes: This table reports the results of robustness checks controlling for other confounding factors. The dependent variable in all regressions is GAP in trade values according to formula (1). Retaliation is the retaliatory tariff shock variable. The first four columns use a retaliatory tariff dummy variable to measure the policy shock, while the last four columns use the product-level tariff rate. Columns (1) and (5) add HS6 × Spring Festival fixed effects to the baseline regression; columns (2) and (6) introduce HS6 product × month fixed effects; columns (3) and (7) further control for product-level linear time trends; columns (4) and (8) exclude product samples affected by concurrent anti-dumping or countervailing final rulings (AD/CV) during the US-China trade war. All regressions include a control variable for US tariffs imposed on China (*tariff_us*). Standard errors, clustered at the HS6 product level, are shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table A7: Alternative Key Variables

	Retaliation= tariff_exempt	Retaliation= lnΔtariff	Retaliation= Dummy	Retaliation= Tariff Rate
	(1)	(2)	(3)	(4)
	GAP	*GAP*	*GAP2*	*GAP2*
Retaliation	0.666***	0.901***	0.128***	0.362***
	(0.196)	(0.249)	(0.019)	(0.058)
Controls	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes
HS2 × Time FE	Yes	Yes	Yes	Yes
adj. R^2	0.510	0.510	0.438	0.438
Observations	90672	90672	133382	133382

Notes: This table reports the robustness checks using alternative measures of Retaliation. In the first two columns, the dependent variable is GAP in trade values according to formula (1). In the last two columns, the dependent variable is GAP2 = (exports - imports) / (exports + imports) to avoid dropping observations when taking logs for zero trade flows. The key independent variable (Retaliation) in Column (1) is the effective retaliatory tariff rate after considering exemptions (tariff_exempt); it is the tariff rate change in logarithm (lnΔtariff) in Column (2). In Columns (3) and (4), Retaliation is measured as on previous tables by either a dummy variable or tariff rate. All regressions include a control variable for US tariffs imposed on China (*tariff_us*). Standard errors, clustered at the HS6 product level, are shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table A8: Alternative Samples

	Retaliation in (1)-(2) = Dummy		Retaliation in (3)-(4) = Tariff Rate	
	(1)	(2)	(3)	(4)
	Quarterly Data	Ship by Air	Quarterly Data	Ship by Air
Retaliation	0.470***	1.194*	1.060***	5.435*
	(0.114)	(0.633)	(0.261)	(2.818)
Controls	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes
HS2 × Time FE	Yes	Yes	Yes	Yes
adj. R^2	0.599	0.544	0.599	0.544
Observations	37511	1314	37511	1314

Notes: This table reports the results of robustness checks with alternative samples. The dependent variable in all regressions is GAP in trade values according to formula (1). Retaliation is the retaliatory tariff shock variable. The first two columns use a retaliatory tariff dummy variable to measure the policy shock, while the last two columns use the product-level tariff rate. In Columns (1) and (3), we aggregate the monthly data to the quarterly level. Columns (2) and (4) use the subsample of products transported mainly by air (at least 90%). All regressions include a control variable for US tariffs imposed on China (*tariff_us*). Standard errors, clustered at the HS6 product level, are shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table A9: Alternative Specifications

	Retaliation in (1)-(3) = Dummy			Retaliation in (4)-(6) = Tariff Rate		
	(1) Cluster by HS2	(2) Cluster by HS6*Time	(3) 2-period DiD	(4) Cluster by HS2	(5) Cluster by HS6*Time	(6) 2-period DiD
Retaliation	0.282***	0.282***	0.733***	0.718***	0.718***	1.801**
	(0.062)	(0.051)	(0.193)	(0.192)	(0.137)	(0.728)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes
HS2 × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
adj. R^2	0.510	0.511	0.695	0.510	0.511	0.693
Observations	90672	90672	6866	90672	90672	6866

Notes: This table reports the robustness checks for alternative clustering of standard errors or DiD methods. The dependent variable in all regressions is GAP in trade values according to formula (1). Retaliation is the retaliatory tariff shock variable. The first three columns use a retaliatory tariff dummy variable to measure the policy shock, while the last three columns use the product-level tariff rate. Standard errors in columns (1) and (4) are clustered at industry-level (HS2). In columns (2) and (5), standard errors are two-way clustered at HS6 × Time level. Columns (3) and (6) use a two-period DiD method, collapsing the sample into two periods (pre- and post-trade war). All regressions include a control variable for US tariffs imposed on China (*tariff_us*). Standard errors, clustered at the HS6 product level, are shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table A10: Further Analysis of Exemptions

	Retaliation in (1)-(2) = Dummy		Retaliation in (3)-(4) = Tariff Rate	
	(1)	(2)	(3)	(4)
Retaliation	0.294***	0.294***	0.386**	0.389**
	(0.078)	(0.078)	(0.194)	(0.194)
exempt	-0.111**		-0.095*	
	(0.055)		(0.055)	
exempt_sh		-0.121**		-0.105*
		(0.060)		(0.059)
Controls	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes
HS2 × Time FE	Yes	Yes	Yes	Yes
adj. R^2	0.476	0.476	0.476	0.476
Observations	147835	147835	147835	147835

Notes: This table reports the results of an analysis of tariff exemptions. The dependent variable is GAP in trade values according to formula (1). Retaliation is the retaliatory tariff shock variable; the first two columns use a dummy variable to measure the policy shock, while the last two columns use the product-level tariff rate. Dummy variable *exempt* indicates whether a given HS6 category includes at least one exempted HS8 product in a month; *exempt_sh* represents the trade weighted share of exempted HS8 products within a given HS6 category. All regressions include a control variable for US tariffs imposed on China (*tariff_us*). Standard errors, clustered at the HS6 product level, are shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table A11: Further Analysis on the Effects of Each Round of Tariffs

	Retaliation in (1)-(3) = Dummy			Retaliation in (4)-(6) = Tariff Rate		
	(1)	(2)	(3)	(4)	(5)	(6)
	Preliminary+First	Second	Third	Preliminary+First	Second	Third
Panel A: Treatment Group Covers Only Products Targeted the First Time in A Round (New-in-round)						
Retaliation	0.317*	0.295***	0.159	1.504**	0.607***	1.648
	(0.173)	(0.080)	(0.599)	(0.583)	(0.235)	(4.545)
adj. R^2	0.508	0.511	0.684	0.508	0.511	0.684
Observations	8270	84409	2624	8270	84409	2624
Panel B: Treatment Group Covers All Products Targeted in A Round (Cumulative)						
Retaliation	0.317*	0.291***	0.298***	1.504**	0.558**	0.953***
	(0.173)	(0.075)	(0.077)	(0.583)	(0.225)	(0.234)
adj. R^2	0.508	0.512	0.521	0.508	0.512	0.521
Observations	8270	85400	55027	8270	85400	55027
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes	Yes	Yes
HS2 × Time FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports the subsample analysis results of tariff increases in each round. The dependent variable is GAP in trade values according to formula (1). Retaliation is the retaliatory tariff shock variable. Columns (1)–(3) use a dummy variable for retaliatory tariffs to measure the policy shock, while columns (4)–(6) use the product-level tariff rate. Panel A uses HS6 products that were included in the retaliatory tariff list for the first time in each round as the treatment group; Panel B uses all products subject to retaliatory tariffs in that round as the treatment group. In both panels, the control group consists of HS6 products that were never directly affected by China's retaliatory tariffs against the US during the sample period. See Table 1 for a timeline of the tariff rounds. All regressions include a control variable for US tariffs imposed on China (*tariff_us*). Standard errors, clustered at the HS6 product level, are shown in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Appendix B: Supplemental Materials

Table B1: Tariff Timelines during the US-China Trade War

Tariff Round	Imposing Country	Amount (100m USD)	Num of targeted HS8 lines	Tariff rates (%)	Announcement Dates	Effective Dates
Preliminary	US	—	—	10; 25	2018-03-08	2018-03-23
Preliminary	China	33	128	10; 25	2018-04-01	2018-04-02
First	US	340	818	25	2018-06-15	2018-07-06
First	China	340	545	25	2018-06-16	2018-07-06
First	US	160	279	25	2018-06-15	2018-08-23
First	China	160	333	25	2018-08-08	2018-08-23
Second	US	2000	5733	10	2018-07-10	2018-09-24
Second	China	600	5207	5-10	2018-09-18	2018-09-24
Second	US	2000	5733	25	2018-07-10	2019-05-10
Second	China	600	5140	5-25	2019-05-13	2019-06-01
Third	US	3000		15	2019-08-15	2019-09-01
				15	2019-08-15	2019-12-15 (cancelled)
Third	China	750	3361	5-10	2019-08-23	2019-09-01
			1717	5-10	2019-08-23	2019-12-15 (cancelled)

Notes: This table reports the main rounds of tariff increases imposed by both sides during the US-China trade war, including the implementation dates and policy coverage. It was compiled by the authors based on information from the official websites of the Chinese Ministry of Finance and the US Trade Representative's Office.

Table B2: Timeline of China's Tariff Exclusion List for US Goods, 2019-2021

Time Period	Rounds of Exemptions (Numbers of Covered Products)
1/1/2019 – 3/31/2019	Suspension of additional tariffs on automobiles & parts originating from the US (28+116+67)
4/1/2019	Continued suspension of additional tariffs on automobiles & parts originating from the US (28+116+67)
9/17/2019 – 9/6/2020	First round of exclusion list for goods subject to additional tariffs on US imports (First patch: 12+4)
12/26/2019 – 12/25/2020	First round of exclusion list for goods subject to additional tariffs on US imports (second patch: 6)
2/28/2020 – 2/27/2021	Second round of exclusion list for goods subject to additional tariffs on US imports (First patch: 55+10)
5/19/2020 – 5/18/2021	Second round of exclusion list for goods subject to additional tariffs on US imports (Second patch: 79）
9/17/2020 – 9/16/2021	First extension list for goods subject to additional tariffs on US imports (16)
12/26/2020 – 12/25/2021	Second extension list for goods subject to additional tariffs on US imports (6)
2/28/2021 – 9/16/2021	Third extension list for goods subject to additional tariffs on US imports (65)
5/19/2021 – 12/25/2021	Fourth extension list for goods subject to additional tariffs on US imports (79)
9/17/2021 – 4/16/2022	Fifth extension list for goods subject to additional tariffs on US imports (81)
12/26/2021 – 12/31/2021	Sixth extension list for goods subject to additional tariffs on US imports (6+79)

Note: This table presents the timeline of China's tariff exclusion lists for goods imported from the US, compiled by the author based on information from the official website of the Chinese Ministry of Finance. The case dated April 1, 2019 did not specify an end date for the continued suspension of additional tariffs on automobiles and parts; although an announcement on August 23, 2019 indicated a resumption of the tariffs from December 15, 2019, a subsequent notice on the same date (12/15/2019) nullified the previous announcement and continued the suspension, and no later termination notice has been officially announced.

Table B3: Products Covered by China's Anti-smuggling Campaign in 2013

Product Category	HS Codes (2012 Version)	Product Descriptions
Refined petroleum products	2710	Petroleum and oils extracted from bituminous minerals (excluding crude oil)
Automobiles	8701–8704	All types of motor vehicles (tractors, passenger cars, trucks)
	8705–8706	Special vehicles, chassis
	8708	Automotive parts
Electronic products	8471	Computers
	8473	Computer components
	8504	Power supply equipment
	8517	Communication equipment (mobile phones, etc.)
	8525–8528	Imaging and broadcasting equipment
	8541–8542	Semiconductors, integrated circuits
Electromechanical products	84	Mechanical equipment
	85	Motors and electronic products
Chemical raw materials	28–29	Inorganic and organic chemicals
	32	Dyes, pigments
	34	Detergents
	38	Various chemical products
	39	Plastics and their products
High-end consumer goods (luxury goods)	4202–4205	Leather products
	61-62	Clothing accessories (mid-to-high end)
	9101–9114	Watches
	7113–7118	Jewelry
	3303–3307	Cosmetics
	2204–2208	High-end alcoholic beverages
Meat products	0201–0210	Various types of meat and meat products
Tobacco products	2401–2403	
Grain	1001–1008	Various types of grains
Sugar	1701–1703	

Notes: This table lists the key tax-related commodities and their corresponding HS codes included in China's "Special Campaign and Joint Action Plan to Combat Smuggling" in 2013. The original 2012 version of HS 2-digit or 4-digits codes were manually concorded by authors to the 2017 version of HS6 codes in our dataset.

Table B4: China's Anti-dumping & Countervailing Cases against the US, 2017-2019

Product	Type	HS8 Code	Initiation Date	Decision Date	Decision
Phenol	AD	29071110	2018/3/26	2019/9/3	Affirmative
Sorghum	AD	10079000	2018/2/4	2018/5/18	Closed
Sorghum	CV	10079000	2018/2/4	2018/5/18	Closed
n-Butanol	AD	29051300	2017/12/29	2018/12/28	Affirmative
Ethanolamine	AD	29221100 29221200 29221310	2017/10/30	2018/10/29	Affirmative
Hydroiodic acid	AD	28111990	2017/10/16	2018/10/15	Affirmative
Halogenated butyl rubber	AD	40023910 40023990	2017/8/30	2018/8/10	Affirmative
Styrene	AD	29025000	2017/6/23	2018/6/22	Affirmative

Notes: This table lists the anti-dumping and countervailing duty cases initiated by China against the US since 2017 with an affirmative final determination reached by 2019. In the second column, AD refers to an anti-dumping case, while CV refers to a countervailing case. In the last column, "Closed" means that a case was closed without further actions, while "Affirmative" means an affirmative final decision. Source: https://cacs.mofcom.gov.cn

Appendix C: A Theoretical Framework on Information Frictions in Tariff Evasion

For a given shipment, the true transaction value is denoted by $v = p \cdot q$, where p is the true price per unit and q is the true physical quantity. The importer submits the following declared value to customs $d = p_d \cdot q_d$, where p_d is the declared unit price and q_d is the declared quantity. Importers can underreport trade values along two distinct margins depending on the economic nature of the product line.

Quantity underreporting is denoted by $u_q \equiv q - q_d \geq 0$. The importer hides physical units while reporting a baseline unit price close to the market standard. This strategy is primarily deployed for homogeneous goods, where reference price ranges are readily transparent to customs, making price manipulation easily detectable. Similarly, price underreporting is denoted by $u_p \equiv p - p_d \geq 0$. The importer under-declares the unit price while reporting the correct physical volume. This strategy is heavily concentrated in differentiated goods, where quality variations, brand equity, and customization create steep information asymmetries, masking the true unit value from customs inspectors. With the option to underreport prices, it will be less likely for traders of differentiated goods to underreport quantities. The extent of quantity underreporting of differentiated goods compared to homogenous goods will be an empirical question. To simplify the analysis, here we assume that traders of homogenous goods underreport only quantity while traders of differentiated goods underreport only prices. Therefore, total value underreporting can be defined as $u \equiv v - d = pu_q + qu_p$.

Let I denote customs information for the product, measured either by a homogenous product indicator (less information asymmetry) or information stock we construct. Following standard trade literature, homogeneous markets possess low product differentiation and high reference pricing information, restricting firms to quantity manipulation u_q. Conversely, highly differentiated markets feature deep information asymmetry and scarce external pricing benchmarks, expanding the scope for price manipulation u_p.

For homogeneous goods, price manipulation is unfeasible ($p_d = p$), meaning $u_p = 0$. The importer optimizes solely over the missing physical quantity $u_q \in [0, q]$. Total underreporting is $u = pu_q$. Let τ denote the ad valorem tariff rate. Under-declaring quantity by u_q reduces tariff payments by $\tau p u_q$, yielding private gains of $G(u_q) = \tau p u_q$.

The expected cost of quantity evasion stems from physical inspections and audits. Let the detection probability be $Pr(\text{detection} \mid u_q, I) = \pi_q(I) \cdot h_q(u_q)$. This implies that the probability of detection depends on both information I and the extent of underreporting through a function $h_q(u_q)$. We assume $h_q(0) = 0, h_q'(u_q) > 0$, and $h_q''(u_q) > 0$ to captures the idea that larger discrepancies are more likely to trigger scrutiny. We also assume $\partial \pi_q / \partial I > 0$, suggesting easier detection if customs have reliable information on true values.

If detected, the firm faces a proportional penalty on the unpaid value: $Penalty(u_q) = \kappa_q p u_q$, where $\kappa_q > 0$. The expected cost of quantity underreporting is therefore $C_q(u_q; I) = \pi_q(I) h_q(u_q) \kappa_q p u_q$.

The importer chooses u_q to solve

$$\max_{u_q \in [0,q]} \left[\tau p u_q - \pi_q(I) h_q(u_q) \kappa_q p u_q\right].$$

Assuming an interior solution $u_q^* \in (0, q)$, the first-order condition is

$$\tau - \pi_q(I)\kappa_q \left[h_q^{'}(u_q^*)u_q^* + h_q(u_q^*)\right] = 0.$$

Defining $H_q(u_q) \equiv h_q(u_q) + u_q h_q^{'}(u_q) > 0$, the first-order condition simplifies to

$$\tau = \pi_q(I)\kappa_q H_q(u_q^*).$$

Using implicit differentiation, the response of quantity underreporting to tariff changes is given by

$$\frac{\partial u_q^*}{\partial \tau} = \frac{1}{\pi_q(I)\kappa_q H_q^{'}(u_q^*)} > 0.$$

since $\pi(I) > 0$, $\kappa > 0$, and $H'(u^*) > 0$ (e.g., h is convex).

The cross-partial derivative with respect to customs information (I) yields

$$\frac{\partial^2 u_q^*}{\partial \tau \, \partial I} = -\frac{\partial \pi_q / \partial I}{\pi_q^2 \kappa_q H_q^{'}(u_q^*)} < 0.$$

This implies that greater customs information reduces the extent to which tariff shocks induce quantity underreporting. Similarly, for differentiated products, we have

$$\frac{\partial u_p^*}{\partial \tau} = \frac{1}{\pi_p(I)\kappa_p H_p^{'}(u_p^*)} > 0.$$

The cross-partial derivative with respect to I yields

$$\frac{\partial^2 u_p^*}{\partial \tau \, \partial I} = -\frac{\partial \pi_p / \partial I}{\pi_p^2 \kappa_p H_p^{'}(u_p^*)} < 0.$$

This implies that improvements in customs information reduce the responsiveness of price underreporting to tariff shocks.

The three testable hypotheses in Section 4 of our main text follow naturally.