Tariffs and State Capacity: A Specific Example

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Abstract

Misvaluation and misclassification pose major challenges for customs revenue collection. We study how governments design tariff codes to limit evasion when administrative capacity is limited. We develop an equilibrium model in which enforcing different tariff lines across shipments is costly, as is verifying declared values when using ad valorem tariffs. Policymakers can instead use specific (quantity based) tariffs, which do not suffer from misvaluation but distort relative prices. Using newly compiled historical records from the Early American Republic, we show that the model predicts several empirical patterns. Specific tariffs are concentrated on goods that are homogeneous, cheap, or lightly taxed. As administrative capacity improved, tariff codes became more disaggregated, allowing policymakers to assess increasingly tailored specific tariffs, obviating misvaluation while minimizing price distortions. We show that similar patterns are present in modern tariff schedules.

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1 Introduction

Tariffs have historically been a key source of government revenue, accounting for around 90 percent of federal government revenue in the United States until the Civil War (Reamer, 2016; Irwin, 2020). They continue to play an important role in the public finances of developing countries, due to the relative ease of observing goods entering at ports (Besley and Persson, 2009; Bown and Irwin, 2019). Nevertheless, collecting import duties is challenging due to evasion: Importers may misrepresent their cargo in an effort to reduce assessments. Multilateral agencies emphasize customs fraud as a major constraint on revenue collection (World Bank, 2005; IMF, 2025).

In this paper, we argue that concerns over misvaluation and misclassification shape the design of tariff codes, focusing on the Early American Republic. We emphasize two features of tariff design: the *complexity* (the number of distinct rates) and the *type* (which goods get specific tariffs and which get ad valorem tariffs).[1]

In the spirit of Bates et al. (1998), we build on historical narratives to develop our theory of the design of the tariff code. Policymakers consistently argued that the structure of tariffs was important to combat evasion. In particular, policymakers understood that ad valorem tariffs were preferable to specific tariffs "theoretically," because specific tariffs distort relative prices. However, many policymakers considered ad valorem tariffs worse than specific tariffs "practically," because of their susceptibility to "deception" (Burrows, 1894). Conversely, others such as the Polk administration viewed specific tariffs as "oppressive" because they led to higher effective rates on cheaper varieties (Falvey, 1979).

In principle, policymakers can leverage complexity in order to mitigate the costs of specific tariffs, as tailored specific tariffs on narrowly-defined goods limit relative price distortions. Indeed, for goods with no price variation, ad valorem and specific tariffs are equivalent. However, in practice, disaggregation required costly investment in Customs capacity. For example, Jones (1835) describes how British mills could produce rolled iron bars that mimicked hammered iron in order to evade tariffs. Detecting such evasion required the Customs official overseeing iron imports to be a "skillful artist who has a knowledge of chemistry," capable of distinguishing iron bars based on their oxide content. Officers had to be trained to make many such subtle distinctions in order to determine the appropriate tariff rate.

In sum, policymakers face two enforcement frictions. First, a tariff schedule with distinct rates creates scope for misclassification across categories, requiring costly expertise to enforce those distinctions (Grant, 2023). Second, ad valorem duties give importers scope to misvalue

[1]Specific tariffs are charged as a function of quantities (such as weight, number of units, or volume), and ad valorem tariffs are charged as a function of value. In practice, some tariffs are a mix of both types, or have other features. We focus on specific and ad valorem tariffs, which comprise the vast majority of all tariffs, both historically and currently.

their goods, potentially requiring customs officials to verify reported prices (Bhagwati, 1964).

We develop a stylized model of tariff collection to show how these two frictions shape tariff design. Absent enforcement concerns, the standard result obtains: the optimal tariff schedule is ad valorem and uniform across goods (Costinot et al., 2015). With imperfect enforcement, however, policymakers face a tradeoff. Misvaluation makes ad valorem tariffs harder to enforce and increases the appeal of specific tariffs. At the same time, costs of tariff-code complexity make it costly to apply different rates to different goods, reducing the appeal of specific tariffs. Policymakers must balance these two countervailing forces when designing the tariff code.

We model complexity costs as a splitting cost that the planner must incur to assign different tariffs to different types of imports. We model the enforcement of ad valorem tariffs as a game between Customs officials and importers. Importers may underreport values to evade duties, while officials may pay for costly audits, fining importers caught misreporting. This game has a unique outcome within a natural class of equilibria with monotone reporting strategies. We compare this regime to one in which the planner instead uses specific tariffs, which are perfectly enforced but distort consumer prices.

To illustrate the practical relevance of misvaluation in this era, we use the model to highlight the effects of a large policy change. In 1846, all specific tariffs were replaced with ad valorem ones (Walker, 1847). Customs officials immediately reported a rise in fraudulently low valuations. However, theoretically, a decline in unit values could be driven by an Alchian and Allen (1964)-style effect, as switching from specific to ad valorem tariffs relatively lowers the effective tariff for cheaper varieties. We validate these reports using a simple difference-in-differences exercise: the policy change led to a large decline in relative reported import prices for tariff lines that switched from specific to ad valorem, relative to those that never had specific tariffs, capturing Alchian and Allen (1964)-style effects with rich microfounded controls.

We then consider the tradeoff between enforcement costs (under ad valorem tariffs) and price distortions (under specific tariffs). Our model yields several testable predictions for which type of tariff is preferred, which we validate in a new dataset that we created on the complete American tariff code from 1789–1842.

First, the model correctly predicts that the planner chooses specific tariffs when the expected customs revenue from a shipment is low, because the object is either inexpensive or its effective tariff rate is modest. Intuitively, the government wants to avoid paying verification costs that would consume most or all of the tariff revenue.[2]

[2]As noted in a different context by Becker (1968), if the social loss from misvaluation is small, then it is optimal not to have to enforce the rules.

Second, the model also correctly predicts that specific tariffs are more likely to be imposed on goods with little variation in prices, such as commodities (Rauch, 1999). This may seem surprising, since a common argument is that prices of homogeneous products are harder to falsify (Javorcik and Narciso, 2008), which would instead favor the use of ad valorem tariffs. In our framework, the key force is that specific tariffs distort relative prices, an issue which is less relevant when prices are relatively uniform; by contrast, verification costs need to be paid even when price uncertainty is small.

Third, while we focus on the choice of specific versus ad valorem tariffs, the model also has implications for ad valorem tariff rates: The government charges higher rates on cheaper goods in order to tilt consumption towards relatively expensive shipments, which require less enforcement per dollar of imports.

Over the course of our sample period, there were dramatic improvements to Customs collection capacity. Expenditure on Customs collection (and imports) increased by an order of magnitude. This growth was accompanied by a ten-fold increase in the Customs house workforce, which in turn was increasingly staffed by more specialized workers. Conceptually, improved capacity could either lower the costs of verifying reported prices or lower the costs of complexity. We evaluate comparative statics of the model for either kind of improvement, and find that the data is consistent with state capacity lowering the cost of complexity. In particular, the number of distinct tariff rates tripled during our sample. The model successfully predicts that this increasing complexity is associated with a shift from ad valorem to specific tariffs, as over our sample the share of goods with specific tariffs tripled.

During our primary sample period, specific tariffs represented around half of total tariff revenue. While specific tariffs are now less common, the relationship between state capacity, tariff code complexity, and tariff specificity remains relevant in contemporary settings. High-capacity countries continue to invest in complex tariff schedules—for instance, Switzerland's tariff schedule contains over 1,600 distinct rates, all of which are specific. The United States currently has over a thousand different specific rates and has recently expanded efforts to enforce customs regulations (Koehler et al., 2025). Conversely, many less-developed countries such as Senegal and Peru have fewer than five distinct tariff rates, all of which are ad valorem. We analyze modern tariff systems both as a robustness check, and because in the modern data we have access to information that is unavailable historically: For instance, we have direct measures of cross-country customs house capacity (Farhad et al., 2024),[3] as well as direct measures of price dispersion using disaggregated data on unit values available in American data from the early 1980s.

[3]Using different data, Betz (2019) also shows that more modern bureaucratic capacity is associated with more distinct tariffs.

A growing empirical literature discusses the effects of specific tariffs in the United States (Crucini, 1994; Irwin, 1998; Acosta and Cox, 2024; Greenland and Lopresti, 2025; Greenland et al., 2025b; Klein and Meissner, 2025).[4] To the best of our knowledge, ours is the first work connecting specific tariffs to state capacity or tariff code complexity. The trade literature on specific tariffs has typically focused on the role of competition, uncertainty, and price and quality dispersion (Das and Donnenfeld, 1987; Helpman and Krugman, 1989; Krishna, 1990).[5] We also build on a large literature considering how heterogeneity across goods in supply, demand, or political importance can generate heterogeneous tariffs across goods (Grossman and Helpman, 1994; Grant, 2023; Lashkaripour and Lugovskyy, 2023; Bartelme et al., 2025), though we show the value of a complex tariff code even in a model with simple demand and no industrial-policy considerations.

Our research also relates to work on administrative capacity.[6] As states collect revenue and expand their bureaucracy, they develop the capacity to generate funds more effectively (Levi, 1988; Brewer, 1990; Besley and Persson, 2009; Moreira and Pérez, 2024). Our work demonstrates one channel through which capacity leads to improved revenue collection, contributing to a literature studying such mechanisms (Rodrik, 2008; Jensen, 2022; D'Arcy et al., 2024; Goyal et al., 2025).

Finally, our findings complement a large literature on tax evasion (Allingham and Sandmo, 1972; Border and Sobel, 1987; Yitzhaki, 1987; Slemrod and Yitzhaki, 2002; Basri et al., 2021). A growing empirical literature has documented tariff evasion (Fisman and Wei, 2004; Fisman et al., 2008; Javorcik and Narciso, 2008; Mishra et al., 2008; Ferrantino et al., 2012; Rotunno et al., 2013; Sequeira, 2016; Iyoha et al., 2025), finding that policies to reduce evasion have had mixed success (Yang, 2008; Javorcik and Narciso, 2017; Chalendard et al., 2023). Rather than focusing on improvements in valuation technology, we show that the design of the tariff regime itself can help deter evasion.

2 Historical Context

Tariffs were extremely important for the early American Republic. Indeed, a central motivation for the Constitutional Convention was the desire to impose tariffs federally (Elkins and McKitrick, 1993; Irwin, 2017). In this section, we discuss three historical trends that provide context for our analysis.[7]

[4] For a discussion of 19th century European tariffs, see Bairoch (1989).

[5] A companion literature in public finance also broadly comes to the conclusion that specific tariffs are, if ever, only preferable to ad valorem under narrow circumstances (Cournot, 1838; Keen, 1998; Wang and Wright, 2017).

[6] In particular, a large literature emphasizes the importance of observability for the state (Scott, 1998; Mastrorocco and Teso, 2025).

[7] See Young (1877), Goss (1897), Taussig (1910), and Irwin (2017) for more detailed descriptions of tariff policy during the period.

First, we provide a short history of U.S. Customs House operations during our time period (1789-1846), with a focus on increasing capacity. Second, we review major tariff legislation in the United States. Finally, we discuss the administrative history of tariffs, focusing on the debate between ad valorem and specific tariffs.

2.1 Roles and Capacity of the Customs House

The first law enacted by the Washington Administration outlined the oath of office to be taken by the President and other appointed officials. The second addressed the new republic's most pressing need: It established a tariff to generate revenue. However, revenue generation requires more than legislation, it requires bureaucrats.

The fifth law, "An Act to regulate the Collection of the Duties imposed by law on the tonnage of ships or vessels, and on goods, wares and merchandises imported into the United States," established the administrative structure of customs collection. Customs officials oversaw inspection and quantification of cargo in order to calculate duties. The Surveyors and those under them typically engaged in one of four tasks: *weighing* of bulk goods, *gauging* of liquid goods, *measuring* of goods where duties were calculated on dimension, and *proving* and marking of spirits.[8] These tasks were regulated by Congress, who determined official definitions of weights, measures, and proofs. For calculating ad valorem duties, inspectors and collectors would compare manifests to the cargo on board. The larger Customs houses eventually hired appraisers, but without in-house expertise, if there was a question as to the value of the good, Customs officials would hire qualified merchants to adjudicate values.

The operations of the Customs houses, and the revenue they were able to collect, grew rapidly over time. Panel A in Figure 1 plots the large increase in expenditures on Customs houses, which tracks the growth in gross imports. To further document the increasing capacity at Customs houses, we digitized the *Official Register of the United States* (Mastrorocco and Teso, 2025). The register not only contains data on all workers at the Customs house, but also reports the exact tasks they performed, including if they performed multiple tasks.

In the wake of a scandal revealing the low rate of customs collections, in 1818 Congress invested in tariff collection by hiring "well qualified" staff (Rao, 2016). Panel B of Figure 1 shows the rapid increase in Customs house employment, from around 200 in 1816 to 2000 by the 1840s.[9] As employees were added, they became more specialized. Panel C of Figure 1 shows that the fraction of workers engaged in more than one task over time declined from nearly 20 percent in 1821 to 7.5 percent by the end of our sample. Moreover, even as workers become more specialized on single tasks, more total tasks were added. In Panel D of Figure

[8] In the original text of the 1798 bill, the task of proving was delegated to inspectors.

[9] Total employment in 1816 number is likely underestimated, as only the Collector, the Surveyor, and the Naval Officer were recorded as federal employees.

1 we plot the number of occupation titles over time. In 1821 there were a handful of workers focusing key tasks such as weighing, measuring, gauging. By 1851, the number of distinct job titles nearly tripled. An important part of the expansion was the development of a hierarchy, with management and assistant tiers (Caliendo et al., 2020).

The majority of the documented specialization is in measuring distinct goods, as workers had increasingly narrow remits. Ultimately, this is the form of state capacity we model and analyze empirically: the ability to distinguish a wider range of goods.

2.2 Tariffs and Revenue

Initially, tariffs served almost entirely to generate revenue (Taussig, 1910). After the War of 1812, policymakers also used tariffs as a tool to protect key industries from foreign competition (Irwin, 2017). One approach was the introduction of so-called "minimum" tariffs, beginning with cotton manufactures in 1816 (Taussig, 1910). For many imports, while they nominally paid ad valorem rates, they were also subject to a statutory minimum price, protecting low-cost American producers. For instance, in 1816 the minimum price for cotton manufactures was 25 cents per square yard. Given the ad valorem rate of 25%, cheap cotton manufactures imported under the 1816 regime effectively paid a specific tariff of 6.25 cents per square yard. Over the 1820s, minimum tariffs were applied to a variety of goods, from broad categories such as woolen manufactures to narrow ones such as straw hats.

The Tariff of 1824 broadened protection for iron and wool, reflecting mounting pressure from northern producers (Taussig, 1910). Controversy deepened with the Tariff of 1828, (the "Tariff of Abominations") which sparked fierce objections in the South due to its high rates. The Tariff of 1832 was passed with some Southern support, but not enough to mollify all objectors, culminating in the Nullification Crisis (Irwin, 2008). In response, under President Andrew Jackson, Congress passed the Compromise Tariff of 1833, simplifying the tariff code and lowering rates to mitigate tensions (Taussig, 1910). The Tariff of 1842 (the "Black Tariff") dramatically increased rates after the economic downturn of the late 1830s, reinstating high duties (Irwin, 2017). In 1846, the Walker Tariff lowered tariff rates and simplified the tariff code, including removing all specific tariffs. Throughout the period, there were many smaller tariff bills as well.

2.3 Administrative History of Tariffs

As tariffs evolved to serve both protective and fiscal purposes, administration and enforcement posed ongoing challenges. From the early days of the Republic, there were concerns over "frauds of the revenue," and calls for rigorous enforcement against smugglers and unscrupulous traders (Hamilton, 1790).

Policymakers argued that to prevent evasion, tariffs should be "simple in their provisions

and easily understood" (Hayes, 1877). They understood that ad valorem rates, while theoretically ideal, invited misrepresentation of goods' value (Rao, 2016). To that end, Congress instructed Customs officials to inspect a random set of packages (often a tenth), in order to partially deter evasion. It was understood that the costs of collection would be non-trivial, and so Treasury reports consistently reported tariff revenue *net* of collection costs. Over the course of our sample period at least five Treasury Secretaries reported to Congress that specific duties were preferable to ad valorem in order to prevent evasion (Burrows, 1894), and President Taylor made the same argument during his only State of the Union Address (Taylor, 1849).[10]

However, policymakers understood the downsides of specific duties (Walker, 1847). Even those who broadly supported the use of specific tariffs understood that they were not "practicable" for all goods (Burrows, 1894).

3 Model

In this section, we describe and solve a stylized model of tariff code design in the presence of misvaluation. After setting up the model, we characterize the optimal code in several steps. First, we characterize equilibrium revenue collection and price distortions under specific and ad valorem tariffs. We then turn to optimal policy and comparative statics. Broadly, we condense our findings into two sets of testable predictions which can be taken to the data. The first is on the importance of state capacity in general: tariff patterns that emerge when a government cannot costlessly enforce any arbitrary tariff code. Second, we consider improvements in state capacity, and how those would generate changes in the tariff code.

3.1 Setup

3.1.1 Government's problem

The government of a small open economy operates a customs house with the goal of raising revenue through tariffs. The government can levy either a specific tariff, assessed as a fixed payment per unit imported; or an ad valorem tariff, charged as a percent of declared import value. Its objective is to raise an exogenously-specified target revenue $R > 0$, net of any collection costs, while minimizing the impact of tariffs on consumer welfare. It has no additional motives for imposing tariffs.[11] For simplicity, we normalize consumer expenditures on imports to 1, so that R is the revenue raised *per import dollar*. It can also be interpreted as the equivalent ad valorem tariff burden (i.e., the percentage of expenditure collected by

[10] They were Secretaries Hamilton, Gallatin, Dallas, Crawford, and Meredith.

[11] Our assumption of a small open economy ensures that tariffs do not impact economic outcomes beyond their direct incidence on the prices consumers face for imported goods. Real-world policymakers may additionally impose tariffs for reasons not captured by our model. In our view, these additional motives are plausibly orthogonal to the revenue-raising and consumer-welfare concerns we model.

the government) in a frictionless benchmark.

There are two potential costs associated with tariff enforcement. The first is a *splitting* cost. In order to distinguish between imported varieties, the government must incur a fixed cost, for instance to acquire the human and physical capital needed to classify potentially similar shipments. The second is a *verification* cost, as importers may misreport the value of their shipments. For each import, the government can choose to incur a cost to verify its true value, for example by hiring an expert and, if necessary, pursuing adjudication. The crucial distinction for enforcement lies in what must be verified. Product type and quantity are objective and observable once the government has paid the initial cost of defining and classifying goods. We therefore assume that no further enforcement costs are required along these dimensions.

In contrast, shipment value is inherently subjective and cannot be fully codified ex ante. As a result, verifying value requires ex post enforcement effort, costs that are made on a per shipment basis.[12] Even for importers who were *obviously* lying, an expert and a judge still needed to be involved. Indeed, Customs officials reported difficulties punishing importers whose submitted invoices containing prices that "no one believes," particularly since "the accused party (especially with French goods) can bring witnesses to prove almost anything" (Walker, 1845; Meredith, 1849). It remains difficult and costly to bring charges of misvaluation through the courts (United States Court of International Trade, 2018).

3.1.2 Goods, Importers, and Consumer Preferences

We assume that a representative consumer purchases a continuum of varieties of domestic and imported goods. He has nested CES preferences over these goods, with an elasticity of substitution of 1 (i.e., Cobb-Douglas preferences) at the outer nest and $\sigma > 1$ at the inner nest. As a result, consumption of domestic goods is independent of the tariff code, and total expenditure on imports is a fixed share of national income. We therefore normalize national income to 1 and drop domestic goods from our analysis.

Each variety of imported good is produced at a constant marginal cost and has an infinitely elastic supply curve. The equilibrium price of each variety is therefore its production and transportation cost, which we refer to as its *value*, plus expected tariff payments.[13] Letting $T(v)$ be the expected per-unit tariff payment for a variety of value v, the equilibrium price of such a variety is $p(v) = v + T(v)$.

Our assumption of CES preferences over imported goods implies that the consumer price

[12] Policymakers considered to creating standardized rules for valuing all shipments. However, the proposed methods were complicated and politically contentious due to their imprecision, and were ultimately never implemented (Goss, 1897; Smith, 1948).

[13] Formally, we assume that importers agree to prices and quantities before shipping their goods. In equilibrium, importers correctly predict the expected tariff they will pay at the dock when choosing supply.

index

$$P = \left(\mathbb{E}\left[p(v)^{1-\sigma}\right]\right)^{\frac{1}{1-\sigma}}$$

is a sufficient statistic for consumer welfare, where we model the value v of an imported variety as a random variable with distribution $F \in \Delta(\mathbb{R}_+)$. For technical convenience, we assume that F has full support on $\mathbb{R}_+$ and is absolutely continuous with density f. We further assume that $\mathbb{E}[v] < \infty$ and $\mathbb{E}[v^{-\sigma-1}] < \infty$.

3.1.3 Tariff Assessment and Verification

The government may choose to charge different tariffs to different import units (for instance, for different kinds of flannels). In order to split up units to charge different units, the government must pay a cost $c_S > 0$.

After the tariff schedule is chosen and posted by the government, importers each choose a quantity to import, following which tariffs are assessed in two stages. First, each importer declares a non-negative value for each imported unit and pays the posted tariff on the declared value. Next, the government decides whether to verify each unit's value, at a cost per unit of $c_v > 0$. We assume that each unit is assessed separately and units are unbundled from shipments prior to assessment. As a result, the government cannot make inferences regarding a unit's value based on the other goods with which it arrives.

Verification allows the government to perfectly observe a unit's value. Following verification, it collects any tariff revenue that an importer attempted to evade by fraudulent declaration at a penalty rate of up to $\kappa > 1$ times the scheduled rate (as in Yitzhaki 1987). We interpret the maximum penalty rate as an exogenous restriction which cannot be tailored by the government, for instance because of jurisprudential limits on civil penalties or practical difficulties with collecting large fines from importers.

Consistent with goals of profit and revenue maximization, we assume that each importer acts to maximize expected profits net of tariff payments, while the government acts to maximize its expected tariff income net of verification costs from each importer. Our solution concept is perfect Bayesian equilibrium of the importation game, with no precommitment by the government to verify reports.

3.2 Equilibrium Tariff Collection

We begin considering the government revenue and price index under a uniform tariff (which is either specific or ad valorem), applied evenly to all goods. Afterward, we extend our analysis to tariff codes which may customize the tariff regime and rate across multiple identifiable categories.

3.2.1 Specific Tariffs

Given our assumptions, there is no possibility for evasion with a specific tariff of $t > 0$ per unit. As a result:

Proposition 1. *There exists a perfect Bayesian equilibrium of the importation game under a specific tariff. In every equilibrium, no verification takes place and the expected tariff payment on each unit is $T_S(v;t) = t$, while the government's net tariff income is*

$$\Pi_S(t) = t \cdot \frac{\mathbb{E}[(v+t)^{-\sigma}]}{\mathbb{E}[(v+t)^{1-\sigma}]}.$$

3.2.2 Ad Valorem Tariffs

Under an ad valorem tariff of $\tau > 0$ per dollar, some verification must take place in equilibrium to deter misreporting, and some misreporting must take place to motivate verification. For tractability and plausibility, we restrict attention to *monotone* equilibria, in which the importer's equilibrium declaration policy is a pure strategy $\rho : \mathbb{R}_+ \to \mathbb{R}_+$ that is nondecreasing and (strictly) increasing whenever positive. With this notation, $\rho(v)$ is the value declared by an importer with true value v. We let $\phi : \mathbb{R}_+ \to [0,1]$ denote the government's (potentially mixed) verification policy, with $\phi(v')$ the probability that a declared value of v' is verified. (Trivially, whenever verification takes place, the maximum permissible penalty rate is levied on any evasion.)

The following proposition establishes that there is a unique equilibrium outcome within the class of monotone equilibria, and it characterizes this outcome. Let $\bar{v} \equiv \mathbb{E}[v^{1-\sigma}]/\mathbb{E}[v^{-\sigma}]$ be the *unit value of consumption* under an ad valorem tariff; i.e., the average value of a unit of imported goods. (Under an ad valorem tariff, this value is independent of the tariff rate.)

Proposition 2. *If $\tau < c_v/(\kappa \cdot \bar{v})$, then there exists a perfect Bayesian equilibrium of the importation game under an ad valorem tariff satisfying $\phi(v') = 0$ for every v' and $\rho(v) = 0$ for every v. In this equilibrium, the expected tariff payment on each unit is $T_{AV}(v;\tau) = 0$, while the government's net tariff income is $\Pi_{AV}(\tau) = 0$. Further, every monotone equilibrium is outcome equivalent to this one.*[14]

If $\tau > c_v/(\kappa \cdot \bar{v})$, then there exists an equilibrium satisfying $\phi(v') = 1/\kappa$ for every v' and

$$\rho(v) = \begin{cases} v - c_v/(\kappa \cdot \tau), & v \geq v^* \\ 0, & v < v^*, \end{cases}$$

[14] In the knife-edge case $\tau = c_v/(\kappa \cdot \bar{v})$, this outcome remains an equilibrium, but there are additional monotone equilibria which differ in the verification rate when $v' = 0$. Any choice of $\phi(v') \in [0, 1/\kappa]$ is consistent with equilibrium, and all choices generate the same net tariff income. The choice $\phi(v') = 0$ maximizes consumer welfare.

where $v^* \in (c_v/(\kappa \cdot \tau), \infty)$ *uniquely satisfies*

$$\frac{\mathbb{E}[v^{1-\sigma} \mid v < v^*]}{\mathbb{E}[v^{-\sigma} \mid v < v^*]} = c_v/(\kappa \cdot \tau).$$

In this equilibrium, the expected tariff payment on each unit is $T_{AV}(v;\tau) = \tau \cdot v$*, while the government's net tariff income is*

$$\Pi_{AV}(\tau) = (1+\tau)^{-1} \cdot \left(\tau - \frac{c_v}{\kappa \cdot \bar{v}}\right).$$

Further, every monotone equilibrium is outcome equivalent to this one.

When the tariff rate is sufficiently high, every importer shades their value down by a fixed *absolute* amount $c_v/(\kappa \cdot \tau)$, except for importers with values close to zero, who shade all the way down to zero.[15] Meanwhile, the government verifies all reports at a fixed rate. Perhaps surprisingly, importers do not gain from misreporting on average—their reports are verified just often enough that their expected tariff payment (including penalties) is the same as if they reported truthfully. While verification effectively dissipates any gains from underreporting, it also incurs costs relative to a benchmark without misreporting. These costs are substantial enough that the government does generate income from an ad valorem tariff unless the tariff rate is sufficiently high.

3.2.3 Testing for Misvaluation

Before turning to optimal tariff design, we first consider how our set-up provides an empirical test for the presence of misvaluation. When switching the tariff from specific to ad valorem while holding fixed the ad valorem equivalent, reported unit values change for two reasons. First, under ad valorem tariffs importers misreport values in equilibrium (Proposition 2). Second, specific tariffs distort relative prices across varieties within a category. As the implied ad valorem rate $t/(v+t)$ is higher for low-v varieties, a switch to a proportional tax relatively lowers the tariff on cheaper varieties, endogenously shifting consumption toward cheaper varieties and (honestly) lowering average reported unit values (Alchian and Allen, 1964). In particular:

Proposition 3. *Fix a specific tariff* $t \geq 0$*, and let*

$$\tau = \frac{t \cdot \mathbb{E}[(v+t)^{-\sigma}]}{\mathbb{E}[v(v+t)^{-\sigma}]},$$

[15] If the distribution of potential values is strictly positive, it is straightforward to construct an alternative equilibrium, with equivalent payoffs, in which the lowest report in equilibrium is strictly positive.

The change in reported log unit values when the category switches from the specific tariff t to the ad valorem tariff τ is

$$\log\left(1-\frac{c_v}{\kappa\cdot\tau\cdot\bar{v}}\right)-\sigma\left(\frac{\mathbb{E}[v^{1-\sigma}]\mathbb{E}[v^{-\sigma-1}]}{\mathbb{E}[v^{-\sigma}]^2}-1\right)\cdot\tau+o(\tau).$$

To a first order the change in reported values is the sum of a misvaluation term (which vanishes when $c_v = 0$), and an Alchian–Allen term which is linear in the initial ad valorem equivalent. We can use this result to test for misvaluation, by investigating if reported unit values change when switching from specific to ad valorem tariffs, conditional on ad valorem equivalents.

3.3 Optimal Tariff Regime

Our result that importers shade their reports by a constant value stands in contrast to standard assumption in the literature on tariff evasion, as importers are usually assumed to evade a fixed *share* of value (Mishra et al., 2008; Jean and Mitaritonna, 2010). In line with the lessons of a venerable literature on policy adaptations to strategic behaviors (Mirrlees, 1971; Björkegren et al., 2024), if importers choose to evade a constant share of tariffs, then the government can simply increase the ad valorem rate to compensate (Haan et al., 2012). However, if importers evade tariffs non-proportionally, the possibility of evasion has non-trivial implications for the efficiency of raising revenues through ad valorem tariffs.

We now explore the tradeoff between ad valorem and specific tariffs as tools for raising revenue. For expositional simplicity and technical convenience, we restrict attention to value distributions under which revenue is globally increasing in the tariff rate.[16]

Assumption 1. Π_S *is increasing in* t*.*

The following lemma identifies a simple sufficient condition on the distribution of values ensuring that this assumption holds. The condition strengthens the commonly-utilized assumption of log-concavity of the distribution function. The condition is satisfied by a wide class of parametrized distributions:

Lemma 1. *Assumption 1 holds if f is differentiable and $v\cdot f'(v)/f(v)$ is decreasing in v. This condition is satisfied by the lognormal, generalized Gamma (including Gamma, Weibull, and half-normal), inverse Gamma, Lomax, and log-logistic distributions.*

[16]This monotonicity is automatic under an ad valorem tariff, because ad valorem tariffs do not distort relative prices. However, a rising specific tariff tilts consumption toward high-value goods, which become proportionally cheaper, reducing the total quantity of imports and counteracting the higher revenue from each unit. We assume that this substitution effect never dominates the direct effect of a rising tariff.

The following result establishes basic properties of the specific and ad valorem tariffs required to achieve any given revenue.

Proposition 4. *For every $R \in (0,1)$, there exists a unique specific tariff $t^*(R)$ such that $\Pi_S(t^*(R)) = R$. This tariff is increasing in R and satisfies $t^*(0+) = 0$ and $t^*(1-) = \infty$.*

For every $R \in (0,1)$, there exists a unique ad valorem tariff $\tau^*(R)$ such that $\Pi_{AV}(\tau^*(R)) = R$. This tariff is increasing in R and satisfies $\tau^*(0+) > 0$ and $\tau^*(1-) = \infty$.

A key distinction between specific and ad valorem tariffs is that the specific tariff converges to zero as the revenue goal vanishes, while the ad valorem tariff does not. Intuitively, the ad valorem tariff must cover verification costs on every unit imported even when very little revenue is required, and these costs do not vanish towards the limit of no revenue.

Let $P_S^*(R)$ and $P_{AV}^*(R)$ be the consumer price indices under, respectively, the specific and ad valorem tariffs which collect revenue R. The following result characterizes their relative growth rates and establishes a single-crossing condition.

Proposition 5. *The following relationships hold:*

- $P_S^*(0+) < P_{AV}^*(0+)$,
- $\frac{d}{dR} \log P_S^*(R) > \frac{d}{dR} \log P_{AV}^*(R)$ *for all* $R > 0$,
- *There exists a* $\bar{c}_v > 0$ *such that* $\lim_{R \to 1} P_S^*(1)/P_{AV}^*(1) > 1$ *iff* $c_v < \bar{c}_v$.

The first part of this result establishes that specific tariffs are less distortionary than ad valorem tariffs for small revenue goals. This result follows directly from the ad valorem verification costs discussed above. The second part establishes that the price distortion from specific tariffs grows more quickly than from ad valorem tariffs. This comparison arises because specific tariffs distort relative prices and push consumers to substitute toward higher-value goods, reducing the total quantity of goods consumed. This substitution effect reduces the rate at which revenue can be raised by increasing the specific tariff, entailing larger marginal price distortions than an ad valorem tariff, which preserves relative prices.

These two properties taken together imply that P_S^* and P_{AV}^* cross at most once. Whether they cross depends on the cost of verification. When verification costs are low, crossing occurs, and there exists a revenue goal $\bar{R} \in (0, \infty)$ such that the specific tariff is more efficient when $R < \bar{R}$, while the ad valorem tariff is more efficient otherwise. If verification costs are high, then a specific tariff is *always* more efficient no matter the revenue goal.

The behavior of the price index under specific and ad valorem tariffs is visualized in Figure 2. Panel A plots the price index distortion by revenue target for different tariff regimes. As a benchmark, we also plot the price index if the customs house had access to a

perfectly-enforced ad valorem tariffs. Panel B plots the lower envelope of the price indices, tracing out the distortion under the optimal tariff.

3.3.1 Impact of Splitting Goods

We now demonstrate how increased state capacity leads to both increased tariff complexity as well as a shift toward specific tariffs. We model state capacity as the ability to disaggregate goods into multiple distinguishable categories $j = 1, 2, ..., N$, each of which can be assigned a distinct tariff rate and regime. Values in each category are distributed as $v \sim F_j$, with a fraction $\mu_j \in (0, 1)$ of goods falling into each category. The accounting identity $F = \sum_j \mu_j F_j$ ensures that the two categories aggregate up to the original distribution of goods.

We first establish that, generically, the government imposes either distinct tariff rates, distinct tariff regimes, or both across every pair of categories.

Proposition 6. *Fix an optimal tariff code. Suppose that two categories j and k are assigned an ad valorem tariff. Then the tariff rates are unequal whenever*

$$\mathbb{E}_j[v^{1-\sigma}]/\mathbb{E}_j[v^{-\sigma}] \neq \mathbb{E}_k[v^{1-\sigma}]/\mathbb{E}_k[v^{-\sigma}]$$

Suppose that two categories j and k are assigned a specific tariff. Then the tariff rates are unequal whenever

$$\mathbb{E}_j[(v + t^U)^{-\sigma}]/\mathbb{E}_j[(v + t^U)^{-\sigma-1}] \neq \mathbb{E}_k[(v + t^U)^{-\sigma}]/\mathbb{E}_k[(v + t^U)^{-\sigma-1}],$$

where t^U is the uniform specific tariff raising the desired revenue from the two categories.

This result demonstrates that, except under knife-edge conditions on the value distributions in each category, the optimal rate must vary across each pair of categories whenever the same tariff regime is used in both categories. The remaining possibility is that different regimes (specific vs. ad valorem) are used in the two categories, which also requires an increase in complexity. In other words, having the capacity to distinguish goods generically implies an increase in the optimal complexity of the tariff code. Note that this result depends on $c_v > 0$. If verification were free, then the optimal tariff would be uniform and ad valorem.

Next, we establish that as goods become homogeneous in a single-category problem, specific tariffs become optimal no matter the revenue goal. Let $\{F_n\}_{n=1,2,...}$ be a sequence of value distributions, with $v_1, v_2, ...$ distributed as $v_j \sim F_j$. We say that values along the sequence *become homogenized* if v_j converges in probability to some known value $\bar{v}$, and if further the sequences $\{v_n\}_{n=1,2,...}$ and $\{v_n^{-\sigma}\}_{n=1,2,...}$ are each uniformly integrable.

Proposition 7. *Fix any sequence of value distributions $\{F_n\}_{n=1,2,...}$ along which values become homogenized. Then for sufficiently large n, an optimal tariff code raising any amount of*

revenue from a single category imposes a specific tariff when values are distributed according to F_n.

Intuitively, in the extreme case where goods are perfectly homogeneous, specific and ad valorem tariffs with perfect costless enforcement are equivalent tools for raising revenue. Because ad valorem tariffs incur verification costs in practice, the government would prefer a specific tariff no matter the revenue goal. Proposition 7 shows that specific tariffs are optimal even when goods are sufficiently (even if not perfectly) homogeneous.

3.3.2 Patterns of Tariff Incidence

We now explore patterns of tariff incidence across the tariff code in a typical environment, with imperfect state capacity. In particular, we consider an environment where c_v is high enough that the planner does not optimally set a single ad valorem tariff, but c_S is also high enough that some varieties with different values share a tariff. We first establish that the optimal tariff regime correlates with the desired tariff burden, i.e., with the percentage of consumer spending within a category which is collected as tariff income.

Proposition 8. *Under an optimal tariff code, the burden of taxation is higher in categories subject to ad valorem tariffs than in those subject to specific tariffs.*

This result is a natural multi-category analog of Proposition 5, which showed in a single-category environment that the optimal regime switches from specific to ad valorem as the revenue goal rises. Higher revenue is also associated with a switch from specific to ad valorem tariffs across multiple categories.

Next, we study the pattern of tariff rates across categories subject to ad valorem tariffs.

Proposition 9. *Under an optimal tariff code and across categories subject to ad valorem tariffs, the tariff rate is lower in categories with a higher unit value of consumption, $\bar{v}_j = \mathbb{E}_j[v^{1-\sigma}]/\mathbb{E}_j[v^{-\sigma}]$.*

This result contrasts with the classic finding that a *uniform* ad valorem tariff is optimal in a frictionless environment. In an environment with verification costs, total costs rise with the number of imported units that need verification. As a result, the government prefers a non-uniform ad valorem tariff in order to tilt consumption toward higher-value categories requiring less verification.

Finally, we establish that higher-value goods, appropriately defined, are more likely to receive ad valorem tariffs. Formally, we say that two categories j and k are *scale-ordered* if $F_k(v) = F_j(v/\alpha)$ for some $\alpha \in (0, \infty)$ and all v. In order words, the distribution of values in category k is a scaled version of the distribution in category j. Scale-ordered categories

exhibit the same proportional dispersion around their means but may differ in their average values.

Proposition 10. *Suppose that two categories are scale-ordered. If, under an optimal tariff code, the two categories use different tariff regimes, then the low-value category uses a specific tariff.*

Intuitively, the costs of administering an ad valorem tariff rise in the number of units which require verification. Since fewer units are imported in high-value categories, administrative costs are lowest in these categories and an ad valorem tariff becomes more attractive. This force is not the only determinant of the optimal regime, because the proportional dispersion of values in a category impacts the distortion under a specific tariff. In scale-ordered categories, dispersion is held fixed and the impact of verification costs can be isolated.

3.4 Improvements in State Capacity

The United States invested heavily in state capacity throughout the 19th century. Ex ante, it is plausible that these investments effectively led to declines in either the costs of splitting (c_S) or the verification costs (c_v). In this section, we show that these two channels have opposite predictions for how the optimal tariff code changes as state capacity improves. In particular, we will consider how the optimal tariff changes within particular categories. It will be useful to define the quasi-revenue raised for a category j as

$$R_j \equiv T_j / P_j^{1-\sigma},$$

where

$$P_j^{1-\sigma} = \mathbb{E}_j[(v+t_j)^{1-\sigma}], \quad T_j = t_j \cdot \mathbb{E}_j[(v+t_j)^{-\sigma}]$$

for every category which is assigned a specific tariff t_j, while

$$P_j^{1-\sigma} = (1+\tau_j)^{1-\sigma} \cdot \mathbb{E}_j[v^{1-\sigma}], \quad T_j = \frac{\tau_j \cdot \mathbb{E}_j[v^{1-\sigma}] - \mathbf{1}\{\tau_j > 0\} \cdot \frac{c_v}{\kappa} \cdot \mathbb{E}_j[v^{-\sigma}]}{(1+\tau_j)^{\sigma}}$$

for every category which is assigned an ad valorem tariff τ_j.

To formalize the splitting cost, let Ω index the space of goods and $\mathcal{P}$ denote a partition of the space of goods into tariff categories. Let

$$K(\mathcal{P}) \equiv |\mathcal{P}| - 1$$

denote the number of splits embodied in the partition, normalized so that the coarsest partition $\{\Omega\}$ has zero splitting cost. For each category $j \in \mathcal{P}$, let $P_j^*(R_j)$ denote the

minimum price index contribution attainable in category j when that category raises quasi-revenue R_j, allowing the planner to choose the tariff regime and rate optimally within the category.

The planner chooses the partition $\mathcal{P}$ and the vector of quasi-revenues $\{R_j\}_{j\in\mathcal{P}}$ to solve

$$\max_{\mathcal{P},\,\{R_j\}_{j\in\mathcal{P}}} \sum_{j\in\mathcal{P}} \mu_j P_j^*(R_j)^{1-\sigma} \tag{1}$$

subject to

$$\sum_{j\in\mathcal{P}} \mu_j P_j^*(R_j)^{1-\sigma}(R_j - \bar{R}(\mathcal{P})) \geq 0,$$

where $\bar{R}(\mathcal{P}) \equiv R + K(\mathcal{P}) \cdot c_S$.

3.4.1 Declines in c_S

As c_S falls, increasingly fine distinctions between goods become worth making. We consider the gain from allowing two groups of goods to be assigned separate tariff regimes and rates rather than forcing them to share a common tariff treatment.

Proposition 11. *Fix c_v and consider a candidate split of a category into two groups of goods, j and k, holding fixed the rest of the tariff code. Suppose that, when $c_S = 0$, allowing j and k to be assigned separate tariff regimes and rates strictly lowers the minimum attainable price index relative to forcing them to share a common tariff regime and rate. Then there exists a unique finite cutoff $\bar{c}_{S,jk}(c_v) > 0$ such that the split is optimal if $c_S < \bar{c}_{S,jk}(c_v)$, pooling is optimal if $c_S > \bar{c}_{S,jk}(c_v)$, and the planner is indifferent when $c_S = \bar{c}_{S,jk}(c_v)$.*

For any candidate split that generates a strictly positive gain in the absence of splitting costs, there is a well-defined threshold value of c_S below which the split is worthwhile and above which it is not. Thus, as splitting costs fall, any distinction with strictly positive underlying gains is eventually adopted. Proposition 6 implies that such gains are generic: except under knife-edge conditions on the value distributions, forcing genuinely different goods to share a common tariff regime and rate is suboptimal.

We can apply the logic of Proposition 7 to forecast tariff patterns as state capacity allows goods to be increasingly disaggregated. We define a *taxonomy* of goods to be a sequence of finite partitions $\{\mathcal{P}_n\}_{n=1,2,\ldots}$ of Ω such that each $\mathcal{P}_{n+1}$ is a strict refinement of $\mathcal{P}_n$. Each partition defines a categorization of goods, with the government able to customize tariff regimes and rates across but not within categories. As goods become disaggregated along the taxonomy, the government can design increasingly complex tariff codes. We define a *nest* of a taxonomy to be a sequence $\{\pi_n\}_{n=1,2,\ldots}$ such that $\pi_n \in \mathcal{P}_n$ and $\pi_{n+1} \subset \pi_n$ for each

n. Each nest tracks a sequence of increasingly fine categories, with each category along the nest refining the previous one.

Corollary 1. *Fix any taxonomy of goods and any nest along which values become homogenized. Then the optimal tariff code eventually imposes a specific tariff on goods in the nest.*

Complex tariff codes permit the creation of relatively homogeneous categories in which specific tariffs are optimal.

In practice, policymakers often categorize imports using physical characteristics which are imperfectly correlated with price (Grant, 2023). For instance, the United States historically assigned tariffs to spirits by proof, understanding that higher proofs had higher prices. Corollary 1 shows that complexity leads to specific tariffs even when policymakers cannot directly categorize based on unit values, so long as the physical characteristics used to categorize goods are sufficiently strong predictors of unit value.

3.4.2 Declines in c_v

Declines in verification costs have the opposite implication. Holding fixed a category and the quasi-revenue to be raised from it, lowering c_v naturally makes ad valorem tariffs more attractive.

Proposition 12. *Fix a category j and a quasi-revenue goal $R_j \in (0,1)$. Let $P^*_{S,j}(R_j)$ be the price index under the specific tariff that raises quasi-revenue R_j, and let $P^*_{AV,j}(R_j; c_v)$ be the corresponding price index under an ad valorem tariff. While $P^*_{S,j}(R_j)$ is independent of c_v, $P^*_{AV,j}(R_j; c_v)$ is strictly increasing in c_v. Consequently, there exists a cutoff $\bar{c}_{v,j}(R_j) \in [0, \infty]$ such that the optimal single-category regime is ad valorem whenever $c_v < \bar{c}_{v,j}(R_j)$, specific whenever $c_v > \bar{c}_{v,j}(R_j)$, and the planner is indifferent only at equality.*

As c_v falls, some categories that previously used specific tariffs switch to ad valorem tariffs. The only reason to prefer a specific tariff over an ad valorem tariff for a given category is that ad valorem taxation requires costly verification. Once that wedge becomes small enough, the benefit of avoiding the relative-price distortions induced by a specific tariff dominates.

Lower verification costs also reduce the gains from splitting goods into separate categories. As c_v falls, these wedges between gross and net revenue are compressed across categories, and so the benefit from tailoring tariff regimes and rates to different groups of goods shrinks.

Proposition 13. *Fix $c_S > 0$ and consider any candidate split of a category into two groups of goods, j and k. Then there exists $\underline{c}_{v,jk}(c_S) > 0$ such that, whenever $c_v < \underline{c}_{v,jk}(c_S)$, it is strictly optimal to keep j and k pooled rather than to split them.*

In the limit as $c_v \to 0$, the frictionless benchmark is restored: the optimal tariff is uniform and ad valorem, so splitting goods generates no first-order benefit. Once a positive splitting cost must be paid to maintain distinct categories, that split is no longer worthwhile. By continuity, the same is true for all sufficiently small verification costs. Thus, if state capacity improvements primarily lower verification costs, the tariff code should become simpler and more ad valorem rather than more complex and more specific.

3.4.3 Summary of Model Predictions

Our model of tariff code design is built on the assumptions that unscrupulous importers may shade down their declared values, but that it is too costly for the government to partition imports into no-variance categories. It delivers several key testable predictions on how the presence of verification and splitting costs shape the design and effects of the tariff code.

1. Switching shipments from specific to ad valorem tariff rates will lower reported unit values, even conditional on the initial ad valorem equivalent. (Proposition 3)

2. Specific tariffs will be assessed on categories with relatively homogeneous value distributions (Proposition 7).

3. Specific tariffs will also be assessed on categories with relatively low tariff burdens (Proposition 8).

4. Among goods that are assessed ad valorem tariffs, cheaper goods will be assessed higher duties. (Proposition 9).

5. Specific tariffs will tend to be assessed on cheaper goods (Proposition 10).

Our model also generates tests for inferring if improvements in state capacity affect splitting or verification costs, as they have contrasting predictions for the change in tariff design.

6. As c_S falls, more candidate splits become worthwhile. As a result, the tariff code becomes more disaggregated, with more categories and more scope for distinct tariff regimes and rates (Proposition 11). Conversely, as c_v falls, the gains from splitting shrink. For sufficiently low verification costs, any given candidate split becomes unprofitable, so the tariff code becomes simpler and more uniform (Proposition 13).

7. More disaggregated tariff codes create relatively homogeneous categories in which specific tariffs are optimal. As a result, declines in c_S tend to increase the use of specific tariffs (Corollary 1). Conversely, as c_v falls, ad valorem tariffs become more attractive

within a given category and quasi-revenue goal. Thus some categories that previously used specific tariffs switch to ad valorem tariffs (Proposition 12).

In the next section, we first test the cross-sectional predictions of the model, to validate that limited state capacity shapes the design of tariffs. We then turn to showing how investments in state capacity change the optimal design of tariffs, in order to show that the evidence is consistent with declines in c_S.

4 Empirical Results

In this section, we describe our data, and test the predictions of the model. We start by considering cross-sectional implications of limited state capacity, which are at the product level, as the predictions describe which types of products will have specific or ad valorem tariffs. We then turn to describing the evolution of the tariff code as a whole, which captures if on aggregate the splitting or verification costs are falling.

4.1 Historical Data

There was no formal classification system for imports during this period. Tariff acts instead listed goods in statutory prose, with each tariff line applying to a verbal description such as "all woolen manufactures." We refer to each such line of text in a tariff bill as a *label*. A central difficulty is that, across tariff acts, labels are related many to many: some define a narrow set of imports, while others are much broader.

As a result, for our empirical analysis we define *goods*: harmonized product categories that can be consistently followed across tariff acts. Specifically, a good is defined as a set of varieties such that (i) over our sample all varieties in the set face the same tariff; and (ii) the set is materially distinct from any other set that follows the same sequence of tariffs over that period. Within each good there may nevertheless be many latent *varieties*, which may affect equilibrium prices but not the tariff rate. For instance, a good may be "high-quality woolen flannels": while high-quality woolen flannels of different colors may have different values, they all share the same tariff line in every year.

Intuitively, a good is the smallest product category that can be assigned a distinct tariff history in our data. Appendix Table A.1 illustrates this procedure for flannels, and Figure A.1 shows the statutory language for woolen manufactures in 1828. A key feature of the data is that some labels cover only one good, while others cover many. Thus there is variation within tariff acts in how many goods each label refers to, and variation over time within goods in how many other goods share the same label. Appendix A describes the full matching procedure, examples, and validation exercises.

In the aftermath of the 1846 Walker Tariff, when *all* specific tariffs were converted to ad valorem, subsequent Treasury reports and letters to Treasury officers highlighted increases

in misreporting. The 1849 *Annual Report of the Treasury Secretary of the United States* documented information on the 1843-1849 prices and quantities for 13 goods that initially had specific tariffs and then transitioned to ad valorem.[17] Explicitly, this information was collected to quantitatively document the decline in unit values, using what we would now call an event study design. For a control group, we use all of the goods that initially did not have a specific tariff but nevertheless had values and quantities consistently recorded in the *Commerce and Navigation* tables.[18]

We link the tariff bills to 1843-1849 *Commerce and Navigation of the United States*. This allows us to compare the unit values of goods with initially specific tariffs listed 1849 *Annual Report* to unit values of goods that were not initially specific.[19] We also use the data to calculate ad valorem equivalents for a wide range of goods, allowing us to evaluate Prediction 3 of the model, on how tariff burdens predict tariff type.

A key force in the model is the price homogeneity of the *varieties* within a particular tariff line. We do not directly observe the quantities and values by shipments in the historical data, so we cannot directly measure price dispersion. As a result, in order to proxy for within-good dispersion, we follow a large literature in the spirit of Rauch (1999) and classify goods as homogeneous if they are commodities. To create our measure of commodities, we digitized a list of commodities from the 1863-64 *Executive Documents* printed by the House of Representatives.[20]

4.2 Empirical Strategy

Our main estimating equation is of the form

$$Y_{it} = \beta T_{it} + \Lambda_{it} + \gamma_t + \gamma_i + \epsilon_{it}, \tag{2}$$

where Y_{it} is the outcome for good i. In addition to the covariate of interest, T_{it}, we may include other potentially time varying controls Λ_{it}, as well as, when feasible, time or good fixed effects. Standard errors are clustered by good. For the analysis on historical tariffs, the good is defined in Appendix A, though for our analysis on imports the unit of observation is

[17]The goods were English beer, Scottish beer, brandy, cigars, claret, grain spirits, Madeira, other red wine, port, sherry, Sicilian wine, West India spirits, and white wine.

[18]Those imports are teas and coffees imported from their place of production (free before and after the reform), teas and coffees not imported from their place of production (20% before and after the reform), and unmanufactured wool. The tariff for unmanufactured wool was complicated. Before 1846, the tariff depended on the price: If the wool was seven cents or under per pound, the duty was 5%; otherwise the duty was of three cents per pound plus 30%. The average ad valorem equivalent tariff before 1846 was 38%. After 1846, all unmanufactured wool had an ad valorem tariff of 30%.

[19]Unfortunately, quantities were rarely reported for goods with ad valorem tariffs, so we only consistently have information on unit values for five imports without specific tariffs

[20]We also show our results are robust to using Rauch (1999)'s modern classification for if a good is traded on an organized exchange has a reference-price.

what is listed in the import tables (which typically covers multiple goods from the perspective of the tariff bills).[21]

For our country-level analysis, we estimate the following equation:

$$y_c = \beta X_c + \epsilon_c, \tag{3}$$

where y_c is the outcome for country c. X_c represents characteristic at the country level, which is the level of Customs house capacity. We calculate robust standard errors, and show a variety of robustness checks in Appendix B.

4.3 Prediction 1: Evidence for Misvaluation

To show causal evidence that reported unit values are lower under ad valorem vs specific tariffs, as in Prediction 1, we study changes around the Walker Tariff. Our estimating equation is a relatively standard difference-in-differences regression, augmented with controls for ad valorem equivalents to condition on Alchian and Allen (1964) effects:

$$\begin{aligned} Y_{it} = \beta\, &\text{Specific}_i \times \text{Post-1846}_t \\ &+ \gamma_1\, \text{Post-1846}_t \times \text{AVE}_{1842,i} + \gamma_2\, \text{Specific}_i \times \text{Post-1846}_t \times \text{AVE}_{1842,i} \\ &+ \gamma_3\, \text{Post-1846}_t \times \text{AVE}_{1846,i} + \gamma_4\, \text{Specific}_i \times \text{Post-1846}_t \times \text{AVE}_{1846,i} \\ &+ \gamma_i + \gamma_t + \epsilon_{it}. \end{aligned} \tag{4}$$

where Y_{it} is the reported unit value, Specific_i measures if good i had a specific tariff pre-1846. To control for Alchian and Allen (1964)-type effects, we additionally control for Post times the ad valorem equivalents (under the 1842 and 1846 regime), interacted with initially having a specific tariff. Each observation t is an import table. To estimate elasticities, we use Poisson Pseudo Maximum Likelihood (PPML) regressions (Silva and Tenreyro, 2006). We also estimate event study regressions, where we estimate a separate coefficient for Specific_i for each year.

Table 1 shows the effect of switching from specific to ad valorem tariffs: Unit values collapse, falling by around 50 percent. Figure A.2 plots the event study, showing that relative prices were fairly stable until the policy change.[22]

[21] Across all good-level regressions, we only include goods with specific or ad valorem tariffs, for instance, dropping those on the free list.

[22] A feature of the Alchian and Allen (1964) effect is that we would expect values to weakly rise after switching from specific to ad valorem tariffs, as the effective price of the tariff line falls. However, in Table A.3 we show that total value weakly falls for the goods that switch from specific to ad valorem tariffs.

4.3.1 Prediction 2: Homogeneity and Specific Tariffs

A key prediction of the model is specific tariffs are assessed on relatively homogeneous tariff distributions. We test this using the structure of the tariff bills. For some bills, some goods are covered by singleton labels: ones that only cover one god. Table 2 Panel A shows that these narrow labels are more likely to have specific tariffs. Columns 1-3 pool across all years in our data. Relative to the baseline regression in Column 1, Column 2 adds year by STIC (3 digit) fixed effects, and Column 3 uses within-good variation in the narrowness of their labels by including good fixed effects. Column 4 instead only includes 1842, the final tariff bill in the sample. Across all specifications, singleton labels are around 10 percentage points more likely to be specific (the baseline mean in the whole sample is about 10 percent, and was 50 percent in 1842).

As an alternative, we also test Prediction 2 using properties of the goods themselves. Table 2 Panel B shows that goods listed as commodities are around 20 percentage points more likely to have specific tariffs. The result is stable to including year by STIC (2 digit) fixed effects, or only including 1842.

4.3.2 Predictions 3, 4, and 5: Revenue and Specific Tariffs

An important feature of our environment is that policymakers wish to avoid paying enforcement costs when the revenue from a particular shipment is low. This force leads to several distinct predictions that we can test in the historical data.

Prediction 3 shows that imports with lower ad valorem equivalents are more likely to be specific. For imports from 1843 through December 1846, we can calculate ad valorem equivalents for the imports with specific tariffs, and compare them to the rates for the goods with ad valorem tariffs. Table 3 Panel A shows that goods with ad valorem equivalents below 5% (roughly the fifth percentile), 15%, and 25% (roughly the median) are disproportionally more likely to be specific tariffs, as goods with the lowest burden are around 25 percentage points more likely to be specific. Table 3 Panel B shows that our result is robust to looking within labels, by including fixed effects for the good's label in 1832, the last major tariff bill before 1842. Consistent with our theory, when a label is divided, the good with the low tariff burden is the one more likely to be given a specific tariff.

Prediction 4 shows that, conditional on having an ad valorem tariff, imports with lower unit values should have higher tariff rates. We can test this prediction for the set of goods with specific tariffs in the 1842 bill, all of which were switched to ad valorem in the 1846 Walker Tariff. Table 4 shows that a one standard deviation higher unit value is associated with around a 1 percentage point lower ad valorem rate. We observe this pattern both when only considering unit values reported in years under the 1842 regime (when the goods had specific tariffs), in the years under the 1846 regime (when the goods had ad valorem tariffs),

or when including all years in our analysis.

Prediction 5 shows that goods with low unit values are more likely to have specific tariffs. Unfortunately, testing this prediction with regressions on 19th century data is difficult, as under the 1842 regime unit values were rarely reported for goods with ad valorem tariffs. However, it is well understood that cheaper goods within particular categories were more likely to get specific tariffs (Irwin, 2017). In particular, the minimum tariffs discussed in Section 2.2 exactly fit the logic of the model: The cheaper varieties of a particular type of import (such as cotton cloths worth less than 25 cents a square yard in 1816) paid what was understood to be effectively a specific tariff, as the tariff bill was a function only of the quantity (Taussig, 1910).

4.4 The Evolution of Tariffs

We now turn to showing how tariffs in the United States evolved, in order to evaluate if the changes were driven by falls in splitting or verification costs.

4.4.1 Prediction 6: Complexity over Time

The model shows that decreases to c_S or c_v have opposite implications for how the complexity of the tariff code evolves with increased Customs capacity.

Figure 3 shows that tariff legislation in the United States became increasingly complex over time. Panel A shows the number of goods that had been defined by each year. That is to say, had we stopped our analysis in a particular year, how many categories of imports would have had their own unique path of tariffs. The number of distinctly defined goods initially grew modestly, starting with the 105 labels in 1789. In the aftermath of the professionalization and expansion of Customs workers in 1818, there was a more than 25 percent increase in the number of goods listed. There were 1395 distinct goods defined by the end of the sample period.

Alongside the increase in goods, the applied tariff code itself became increasingly complex. Figure 3 Panel B shows that the distinct tariff rates in each year tripled to around 150 over our sample period. However, it is worth noting that in the aftermath of the 1832-33 Nullification Crisis, the tariff code was simplified, lowering the number of distinct tariff rates by a sixth, increasing again only in the 1840s.

4.4.2 Prediction 6: Specificity over Time

The model also shows that decreases to c_S or c_v have opposite implications for how the share of goods with specific tariffs changes with increased Customs capacity.

Historically, the increasing complexity of the tariff code was broadly accompanied by a shift toward specific tariffs. Figure 3 Panel C shows that, in 1789, approximately one-tenth of goods had specific tariffs and, by the 1840s, half of all goods had specific tariffs. There

was a sharp rise in the specific tariff share following the increase in tariff complexity after 1818. Conversely, when the tariff code simplified in the 1830s, the share of specific tariffs fell by a third, rising again only in the 1840s alongside the increased complexity of the tariff code.

Overall, these results all point to changes in c_S (and not c_v) were driving policy changes. These results also reflect the qualitative changes in US Customs in this time period. Even during the large expansion in Customs employment through the 1840s, there were only 24 total appraisers by the end of our sample.

4.5 Empirical Results: The Modern Era

We supplement our historical analysis with data on modern tariffs. First, we use data on American imports 1980-1985, from the US Census in the Annual Import Data Bank.[23] From 1980 to 1985, quantities, values, and (estimated) tariff revenue for imports were recorded by exporter at the 7-digit level of the Tariff Schedules of the United States Annotated (TSUS).[24] The key value of this source is that we can measure unit values and ad valorem equivalents for all imports (and, unlike the cross-country data, we do not need to concord different datasets in order to merge tariffs to ad valorem equivalents). This allows us to calculate a direct measure of dispersion of prices within a tariff label: Within each 5-digit code, we calculate the standard deviation of (ln) unit values across imports for each 7-digit code by exporter.

We also use data on current tariff rates, using information from the World Trade Organization (WTO)'s Integrated Database (IDB). We focus on the applied Most Favored Nation (MFN) rates in the most recent year available for each country.[25] Tariffs are recorded at the level of a *tariff line*. Each tariff line is a 6 to 10 digit code, with the first 6 digits harmonized across countries according to the World Customs Organization's Harmonized System (HS). The trailing digits are country specific—for example, the United States uses the HS10 system maintained by the USITC, while the EU maintains the 8 digit Combined Nomenclature. Importantly, the database provides a classification on the nature of each duty, so that we may classify duties by whether or not they are ad valorem.[26]

We obtain ad valorem equivalents for non ad valorem tariffs from UN Trade and Development's (UNCTAD's) Trade Analysis and Information System (TRAINS). Data from

[23]See Feenstra (1996), Schott (2008), and Greenland et al. (2025a) for more detail. To avoid measurement issues, we use Column 1 tariffs.

[24]The tariff schedule was disaggregated to the 5-digit level at the time (Acosta and Cox, 2023; Greenland et al., 2025a).

[25]We use MFN rates in the modern data to avoid measurement issues, see Teti (2024) for more discussion of the data.

[26]There are 5 categories of tariff: Ad valorem, Specific, Compound, Mixed, and Other. Our main analysis focuses solely on tariffs that are either explicitly ad valorem or specific.

TRAINS are also available at the most detailed tariff line level for each country. We merge ad valorem equivalents into our primary WTO tariff data using tariff line codes.

We show that the cross-sectional predictions of the model also predict which types of goods have specific tariffs. We can also test our comparative static predictions of the effect of decreasing enforcement costs using a direct measure cross-country differences in customs house capacity. In particular, we use trade misreporting indices derived by Farhad et al. (2024). These indices quantify the extent of trade misreporting by comparing each countries' reports to their trading partners. The logic of using the data is that more capable customs houses are better at measuring trade flows. Our main analysis uses both a standardized overall trade misreporting index and an export misreporting index, where lower values indicate less misreporting. We use both measures because export misreporting is a measure of capacity that is not directly endogenous to the applied tariffs. We use the most recent year available for each country in the database as our measure of bureaucratic customs capacity.

4.5.1 Revenue, Homogeneity and Specific Tariffs: Evidence from the 1980s United States

A key advantage of the 1980s US import statistics is we have information on values and quantities for almost all imports, uniquely allowing us to directly test Prediction 5: that cheaper goods are more likely to have specific tariffs. Table 5 Panel A shows that doubling the unit values leads to around a two percentage point decrease in the likelihood of specific tariffs. The unit of analysis is TSUS 5-digit codes, and the results are robust to controlling for 4-digit fixed effects.

The 1980 tariff code is also consistent with the model's other predictions for which goods have specific tariffs. Table 5 Panel B tests Prediction 2, that more variance makes specific tariffs less attractive. Instead of using discrete measures of homogeneity, we can use a direct measure in this setting, the dispersion of log prices within each 5 digit TSUS code across (7 digit) varieties. A one standard deviation increase is associated with around a 10 percentage point decrease in the probability of a specific tariff across all goods, and around 2-4 percentage points within 4-digit codes. Table 5 Panel C tests Prediction 3, showing that higher ad valorem equivalents are around 15 percentage points less likely to be specific tariffs.[27]

[27]We did not test Prediction 4 in the 1980s data, as Acosta and Cox (2024) already document that cheaper goods have higher ad valorem rates in this time period. It is worth noting that Acosta and Cox (2024) have a different explanation than the theory we present: They find that in the 20th century, the negative correlation between unit values and ad valorem rates emerged in the 1950s, and they argue that protectionism was a driving force.

4.5.2 Revenue, Homogeneity and Specific Tariffs: Evidence Across Countries

We now turn to replicating and extending our tests of the model's predictions for the modern era, comparing tariff regimes across countries. For studying showing how tariff types vary across goods, we use the same regression specification as in the historical data, Equation (2), where the unit of observation is a good.

Table 6 Panel A tests Prediction 2, that price homogeneity makes specific tariffs more attractive. Homogeneous goods are about 0.8 percentage points more likely to be specific. Although the coefficient is lower than in our historical analysis, specific tariffs are also currently less common, covering around 2 percent of global tariffs. While we do not observe how the tariff bills are written and therefore lack a direct modern analogue to singleton labels, we can take advantage of the modern tariff hierarchy by measuring whether an import has the same tariff rate as all other imports within its HS 4-digit category. Non-grouped imports are around one percentage point more likely to have specific tariffs. We also find that the interaction of the two, homogeneity and not being grouped, predicts specificity.

Table 6 Panel B tests Prediction 3 that lower ad valorem equivalent tariffs are more likely to be specific. Indeed, we find that goods with low (below 5%) burdens are around five percentage points more likely to be specific. Figure A.3 visualizes the effects of ad valorem equivalents and state capacity. The figure has two panels: one for OECD countries and one for non-OECD countries. Each panel shows histograms of ad valorem equivalent rates, separately for goods facing specific and ad valorem tariffs. In both groups, goods with the lowest ad valorem equivalent imports are typically assigned specific tariffs. There are almost no goods with ad valorem tariffs below 5%, but many with specific tariffs below that equivalent rate.[28]

4.5.3 The Role of Improved Capacity: Evidence Across Countries

We now turn to exploring how state capacity predicts the overall structure of the tariff code, using simple bivariate cross-country regressions, where the outcomes are features of each country's tariff code and the independent variable is the measure how effectively each country keeps track of its trade flows (Farhad et al., 2024).

Table 7 Panel A shows, consistent with Prediction 6, that countries with less capability have coarser partitions in the tariff code: They both have fewer tariffs, and have fewer HS 6-digit codes with variation in their tariffs. Consistent with Prediction 7, Panel B shows that these countries have a lower share of specific tariffs, either at the level of the tariff line or grouping to HS 6-digit level. Overall, a one standard deviation increase in customs house

[28] Another pattern that likely reflects an endogenous response to state capacity is that non-OECD countries exhibit substantial heaping in their ad valorem tariff rates, especially at values ending in 5 or 0. Hamilton (1795) encouraged heaping, writing "inconvenient fractions... serve to perplex the calculation of the duties."

misreporting lowers the share of tariff lines with specific tariffs by around two percentage points. As with the historical evidence, the evidence in the modern data is consistent with countries with higher state capacity having lower splitting costs.

4.6 Alternative Explanations

In this section, we discuss some alternative ways of thinking about the economic environment, and explain why we think our modeling choices are justified by the data.

An alternative justification for specific tariffs is they stabilize prices, as their ad valorem equivalent is negatively correlated with a good's unit value (Lampe, 2020). While 19th century policymakers were aware of this feature (Woodbury, 1835), it is rarely mentioned in policy documents as a motivation for specific tariffs. Furthermore, this insurance-like mechanism seems less relevant in the 19th century, as policymakers argued that Congress could hold fixed effective duties by updating specific tariffs as prices adjusted (Burrows, 1894). While we do not observe measures of price volatility over time in the 19th century, we find little evidence that this mechanism matters for policies in the 1980s: Table A.2 shows that, in the 1980s, goods with more price variation over time were not disproportionally likely to have specific tariffs.

Furthermore, our model abstracts somewhat from misclassification. Though unrealistic, we assume that once c_S has been paid, there is perfect enforcement of tariffs across shipments.[29] Even in the modern era, firms evade tariffs by miscoding goods (Fisman and Wei, 2004).[30] In reality, importers can misclassify goods with a positive probability, potentially increasing with the complexity of the tariff code. The key force we emphasize is that investments in capacity reduce this probability.

Fisman and Wei (2004) find that evasion increases with the tariff rate, a pattern that is not a clear prediction of our model. While we have limited data, we do not find evidence for this relationship in our setting. Figure A.4 plots reported unit values of unmanufactured wool in the 1840s—the sole good for which we have measures of unit prices, ad valorem duties, and a change in those duties. Even as the duty changed in 1846, there was no systematic change in its reported unit price. This experience is consistent with the views of contemporary Treasury officials, who thought that misvaluation was "inherent" to ad valorem tariffs, regardless of the rate (Manning, 1885).

One potential explanation for the increasing richness of the tariff code in the 19th century

[29]Historical Customs officials acknowledged that misclassification or "false weights and measures" occurred, but argued these were easier to detect than misvaluation and "not practiced to any great extent" (Walker, 1845; Burrows, 1894).

[30]Misclassification is not limited to developing countries. In 2024, Ford paid a $365 million fine for allegedly misclassifying cargo vans by installing "sham rear seats and other temporary features to make the vans appear to be passenger vehicles" (Shepardson, 2024).

was the Industrial Revolution: Over time, more goods were created. There was also a rise in industrial policy motivations for tariffs, some of which were specific in order to protect relatively cheap and low quality American products (Irwin, 2017). In Tables A.4 and A.5, we show our results are robust to only including products that are less sensitive to these concerns. Panel A of the tables shows our results are robust when only considering non-manufactured goods.[31]

Many of the tariffs motivated by industrial policy charged different tariffs for similar goods of different prices, such as cheap and expensive wool (Irwin and Temin, 2001). Panel B of the tables shows our results are similar if we drop all goods that ever have different tariffs for varieties with different prices. Panel C drops all goods whose industry was mentioned in Hamilton (1791)'s *Report on Manufactures* (Irwin, 2004; Sylla, 2024).[32]

5 Discussion

States endogenously respond to their capabilities. We show how this phenomenon generates patterns of tariff setting. In particular, high-capacity customs houses are able to have a more disaggregated tariff code. A complex tariff code is particularly suited to specific tariffs, especially for homogeneous goods and those with low levels of protection. We show that our theory both predicts the historical evolution of American tariffs and modern patterns. Tariffs are currently an issue of widespread contemporary debate, and our results have implications for these ongoing discussions.

Until recently, the United States imposed no tariffs on low-value imports intended for consumption (Fajgelbaum and Khandelwal, 2025). Most countries maintain some form of *de minimis* exemption, as the administrative costs of collecting revenue on such shipments typically outweigh the fiscal benefits. In February 2025, the United States initially eliminated the exemption for goods originating in China, but was forced to reverse the decision shortly thereafter when Customs authorities became overwhelmed (Lawder et al., 2025). Like their 19th century counterparts, policymakers quickly recognized how to avoid wasting costly enforcement resources on low-revenue shipments. In May 2025, the exemption was permanently removed with a specific component: Importers could pay $100 per package (Tobin and Chang, 2025).

[31] Our findings on the development of complex taxonomies are not driven by differences in product composition, either historically or today. In the 19th century, we restrict the sample to non-manufactured imports and show in Figure A.5 that the tariff code became progressively more complex and specific even within that constrained set. In the modern cross-country data, we limit the sample to goods that are broadly universally imported, and show in Table A.6 that the positive relationship between capacity and tariff complexity and specificity remains. Specifically, we limit the sample to goods imported by all of the twenty (non-OPEC) countries with the highest levels of misreported trade.

[32] Manufactured goods are around half of the goods, and our results are not robust to dramatically shrinking the sample by both dropping them and also only considering 1842.

Recent technological advancements are increasing the capacity of customs houses around the world (Budimirovic et al., 2022), and improving tax collection more broadly (Dzansi et al., 2025). These technologies are particularly effective at preventing misclassifications (Davies et al., 2024). Our results suggest that, in order to fully take advantage of these new tools, they should be paired with increasingly complex tariff schedules. Our theory makes clear how to shape these more complex schedules to minimize deadweight loss while maintaining government revenue.

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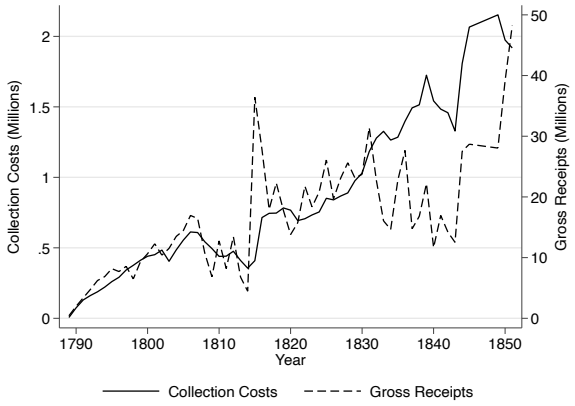
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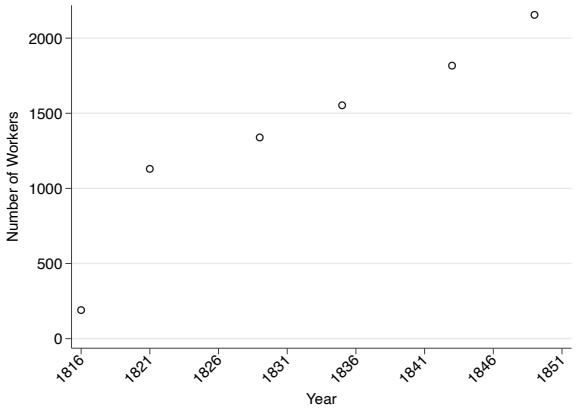
Young, Edward, *Special Report on the Customs-Tariff Legislation of the United States, with Appendixes*, Washington: Government Printing Office, 1877.

Figure 1: The Expansion of the Customs House

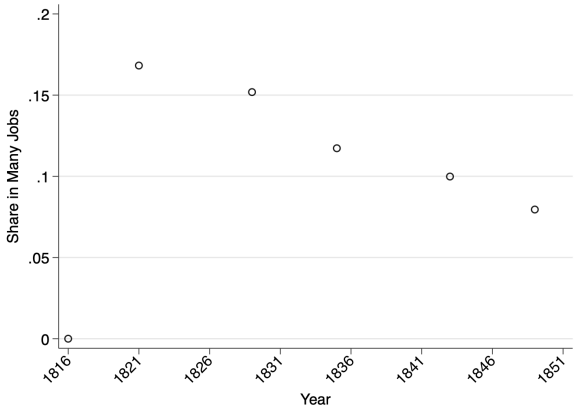
Panel A: Customs Over Time



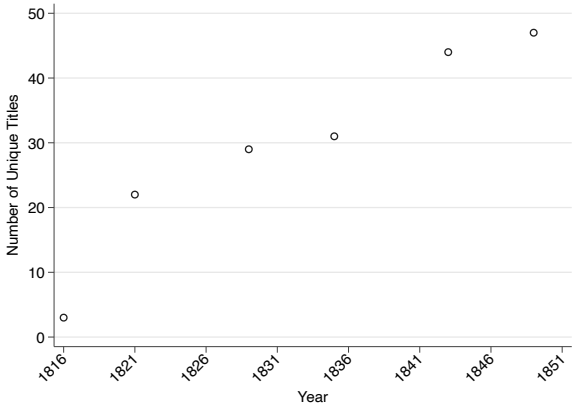
Panel B: Customs Workers Over Time



Panel C: Share of Employees with Many Jobs



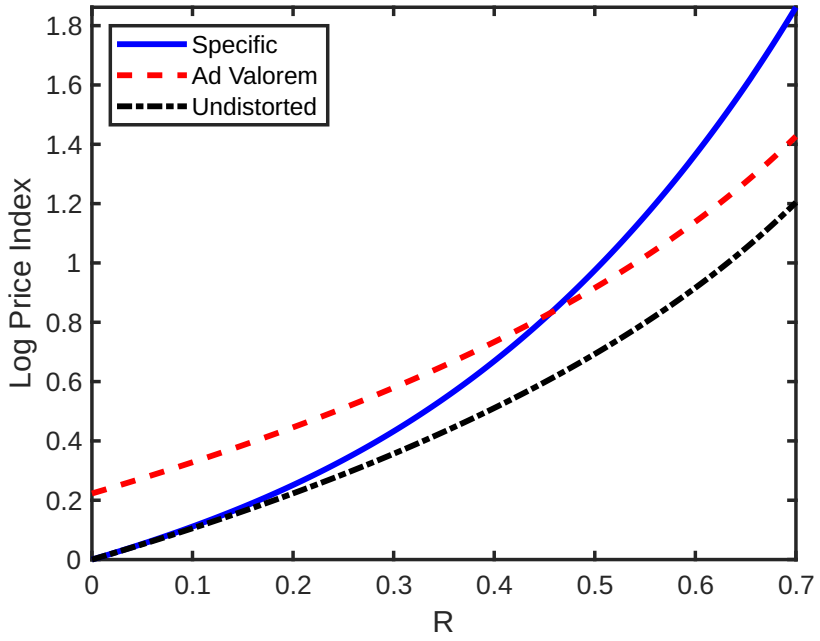
Panel D: Customs Occupations Over Time



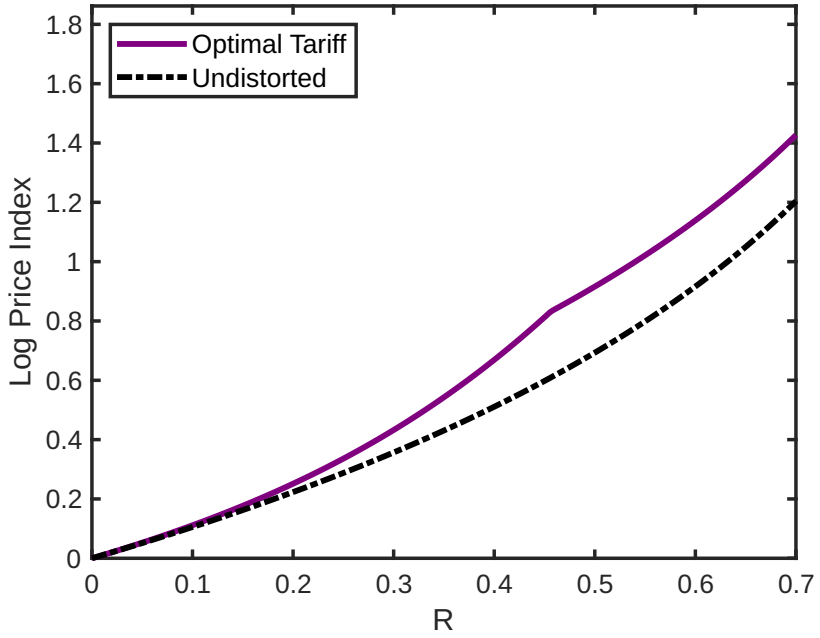
Notes: This figure shows the expansion of Customs over time. Panel A shows gross Customs revenue and collection costs (in nominal dollars). Panel B shows the number of workers at the Customs Houses. Panel C shows the share of Customs workers who are listed as having multiple distinct jobs. Panel D shows the number of distinct occupations at Customs houses over time, where we only include occupations that appear in at least two different houses. Source: *Commerce and Navigation of the United States* and *Annual Reports of the Secretary of the Treasury on the State of the Finances.*

Figure 2: Revenue and Price Index Distortions for Different Tariffs

Panel A: Specific, Ad Valorem, and Undistorted Ad Valorem



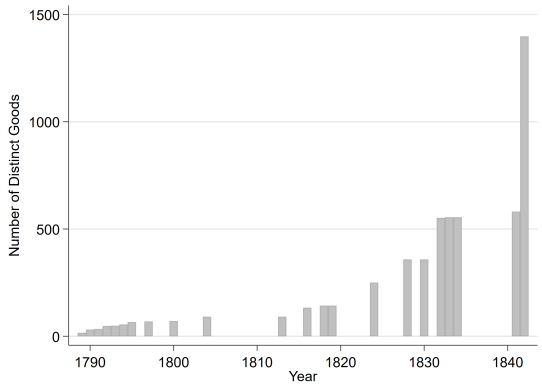
Panel B: Optimal Tariff and Ad Valorem



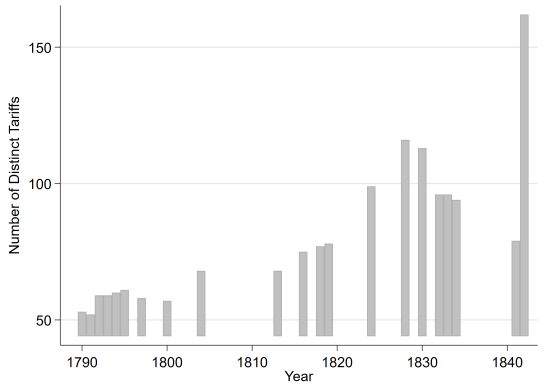
Notes: This figure shows how the price index changes with the share of expenditure collected as tariff income (net of any verification costs). The first panel plots how the price index responds with specific tariffs (in solid blue), ad valorem tariffs with enforcement costs (dashed red), and perfectly and freely enforced ad valorem tariffs (black dot dashed). The second panel compares the undistorted ad valorem to the lower envelope of specific and ad valorem tariffs with enforcement costs (in solid purple).

Figure 3: Increasing Tariff Disaggregation Over Time

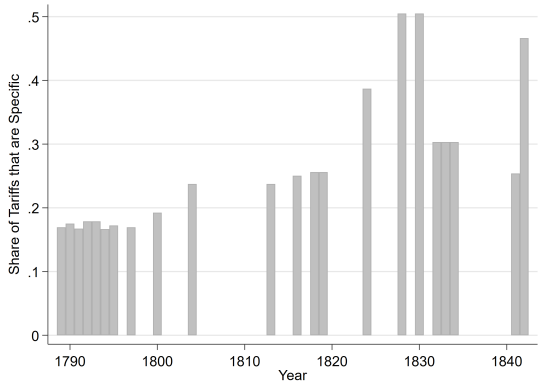
Panel A: Number of Goods Defined by Each Year



Panel B: Number of Distinct Tariffs Over Time



Panel C: Share of Goods with Specific Tariffs Over Time



Notes: This figure plots the evolution of the complexity of the American tariff code over time. Panel A plots the number of goods defined for each year t. The set of goods expands over time. A good is defined as a set of varieties such that: (i) in every year from 1789 through t, all varieties in the set face the same tariff; and (ii) the set is physically distinct from any other set that follows the same sequence of tariffs over the time period. Panel B plots the number of distinct tariff rates that are in effect for each year. Panel C plots the share of all goods that have a specific tariff. Source: *Tariff Acts of the United States.*

Table 1: Tariff Type and Reported Unit Values

	(1)	(2)	(3)	(4)
Post ×	-0.56	-0.56	-0.53	-0.53
Specific in 1842	(0.18)	(0.18)	(0.15)	(0.15)
Include Wool		✓		✓
Full Years Only			✓	✓
Number Of Goods	17	18	17	18
Number Of Observations	133	141	84	89

Notes: This table shows the effect of switching from specific to ad valorem tariffs on reported unit values. The outcome for all regressions is reported unit values. We use the initially-specific goods listed in the 1849 Annual Report of the Secretary of the Treasury for 1843–1849, and compare them to the goods without specific tariffs for which unit values were reported (two types of coffee, two types of tea, and wool). Because under the 1842 regime different types of raw wools had different tariffs, they are a bit unusual. To show this shift isn't driving out results, the odd columns exclude them from the control group. Columns 3 and 4 show results only for the import statistics with 12 months of reporting (dropping 1843 and two reports for 1847, one for each tariff regime). All regressions include good and year fixed effects, as well as Post-1846 interacted with both the ad valorem equivalent implied by the 1842 tariff schedule and the ad valorem equivalent 1846 schedule, allowing these effects to differ for initially-specific goods. Standard errors are clustered by good. Source: *Commerce and Navigation of the United States* and *Annual Reports of the Secretary of the Treasury on the State of the Finances.*

Table 2: Homogeneity Predicts Specific Tariffs

Panel A. Singletons

	(1)	(2)	(3)	(4)
Singleton Label	0.062	0.089	0.095	0.14
	(0.0097)	(0.010)	(0.011)	(0.029)
Mean Outcome	0.11	0.11	0.11	0.50
Number of Goods	1395	1349	1384	1290
Number of Observations	28126	27237	28115	1290
Specification	Year FE	Year × SITC FE	Year & Good FE	Only 1842

Panel B. Commodities

	(1)	(2)	(3)
Homogeneous	0.12	0.22	0.27
	(0.0092)	(0.046)	(0.033)
Mean Outcome	0.11	0.11	0.50
Number of Goods	1395	1387	1290
Number of Observations	28126	27944	1290
Specification	Year FE	Year × SITC FE	Only 1842

Notes: This table shows how price dispersion affects if a good has a specific tariff. Each good is included only in the years in which it is covered by a tariff and it has either a specific or ad valorem tariff. Each observation is a good-by-year. The outcome for all regressions is if the good has a specific tariff. In Panel A, the independent variable is if the label for the good is a singleton (only covers one good). In Panel B, the independent variable is if the good was listed as a commodity by *The Executive Documents* of the House of Representatives. All regressions control for year. Column 2 additionally controls for year interacted with SITC classifications (three digit in Panel A, and two digit in Panel B, as three digit absorbs most of the variation in commodity classifications). Column 3 in Panel A controls for good fixed effects (which are colinear with the measure of being a commodity). Column 4 in Panel A, and Column 3 in Panel B, only include 1842. All regressions cluster by good. Source: *Tariff Acts of the United States.*

Table 3: Low AVEs Predict Specific Tariffs

Panel A. Baseline Specification

	(1)	(2)	(3)
AVE < 5	0.25	0.22	0.24
	(0.074)	(0.11)	(0.076)
$5 <$ AVE < 15	0.18	0.11	0.15
	(0.064)	(0.085)	(0.059)
$15 <$ AVE < 25	0.081	0.017	0.054
	(0.046)	(0.059)	(0.039)
Mean Outcome	0.680	0.420	0.569
Number of Goods	759	522	1210
Number of Observations	969	728	1697
Tariff Regime	1842	1846	Both

Panel B. Within 1832 Labels

	(1)	(2)	(3)
AVE < 5	0.15	0.17	0.17
	(0.087)	(0.13)	(0.056)
$5 <$ AVE < 15	0.14	0.13	0.12
	(0.064)	(0.088)	(0.051)
$15 <$ AVE < 25	0.062	-0.11	0.011
	(0.047)	(0.051)	(0.033)
Mean Outcome	0.750	0.612	0.694
Number of Goods	711	469	1169
Number of Observations	917	662	1650
Tariff Regime	1842	1846	Both

Notes: This table shows the share of imports with specific tariffs, below each ad valorem equivalent. Across all columns the outcome is whether the good had a specific tariff in 1842, and the key independent variables are dummies for the ad valorem equivalent level. Panel A presents the baseline specification, while Panel B adds fixed effects for the 1832 classification label of the good (and only includes imports that share an 1832 classification label with another import). Regressions are clustered by good and include year fixed effects. The sample is restricted to goods below the maximum ad valorem rate in 1842 (50 percent). Source: *Commerce and Navigation of the United States* and *Tariff Acts of the United States*.

Table 4: Lower Unit Values Predict Higher Ad Valorem Tariffs

	(1)	(2)	(3)
Unit Value (Standardized)	-1.32	-0.61	-0.88
	(0.32)	(0.28)	(0.28)
Mean Outcome	28.285	28.018	28.179
Number of Goods	854	405	1163
Number of Observations	1069	605	1674
Tariff Regime	1842	1846	Both

Notes: This table shows the relationship between unit values and ad valorem duties. The outcome in all regressions is the ad valorem rate for the import after 1846. The sample is the goods with specific tariffs in the 1842 tariff bill. All regressions additionally control for each good's 1842 ad valorem equivalent. Column 1 includes only observations from the 1842 tariff regime, Column 2 only from the 1846 tariff regime, and Column 3 includes all observations. Results clustered by good. Source: *Commerce and Navigation of the United States* and *Tariff Acts of the United States*.

Table 5: 1980s American Imports: Drivers of Specificity

Panel A. Unit Values

	(1)	(2)	(3)	(4)
ln(Unit Values)	-0.028	-0.011	-0.031	-0.014
	(0.0020)	(0.0025)	(0.0019)	(0.0039)
Mean Outcome	0.20	0.20	0.20	0.20
Number of Goods	4248	4217	4248	3537
Number of Observations	18459	18428	4288	3577
4-Digit FEs		✓		✓
Sample	Annual	Annual	Pooled	Pooled

Panel B. Price Dispersion Across Exporters

	(1)	(2)	(3)	(4)
Price Dispersion	-0.12	-0.016	-0.14	-0.038
	(0.0081)	(0.0047)	(0.010)	(0.011)
Mean Outcome	0.19	0.19	0.19	0.19
Number of Goods	4109	4071	4183	3470
Number of Observations	17442	17404	4219	3506
4-Digit FEs		✓		✓
Sample	Annual	Annual	Pooled	Pooled

Panel C. Ad Valorem Equivalents

	(1)	(2)	(3)	(4)
ln(Ad Valorem Equivalent)	-0.15	-0.10	-0.15	-0.11
	(0.0060)	(0.0076)	(0.0067)	(0.012)
Mean Outcome	0.17	0.17	0.17	0.17
Number of Goods	4872	4842	4872	4147
Number of Observations	21419	21389	4910	4185
4-Digit FEs		✓		✓
Sample	Annual	Annual	Pooled	Pooled

Notes: The outcome in this table is if the import has a specific tariff. Each observation is a TSUS 5-digit import. Columns 1 and 2 include each good by year separately, and Columns 3 and 4 average across years within goods. Columns 2 and 4 additionally include fixed effects for each 4-digit TSUS code. All regressions clustered by 5-digit TSUS code. Panel A considers the unit values of the goods (the value divided by the quantity). Panel B considers the dispersion of unit values across shipments, as described in the text. Panel C considers the ad valorem equivalents (the tariff revenue divided by the value). Source: US Census Annual Import Data Bank (IDB).

Table 6: Modern Low AVEs and Homogeneous Goods Predict Specificity

Panel A. Homogeneity

	Specific Tariff			
	(1)	(2)	(3)	(4)
Homogeneous	0.0079		0.0083	0.0022
	(0.001)		(0.001)	(0.001)
Non-Grouped		0.011	0.011	0.0044
		(0.001)	(0.001)	(0.001)
Homogeneous ×				0.017
Non-Grouped				(0.003)
Mean Outcome	0.017	0.017	0.017	0.017
Number of Observations	801016	801016	801016	801016

Panel B. Ad Valorem Equivalents

	Specific Tariff		
	(1)	(2)	(3)
AVE < 5	0.045	0.044	0.033
	(0.003)	(0.003)	(0.004)
Homogeneous		0.0071	0.0052
		(0.001)	(0.001)
AVE < 5 ×			0.023
Homogeneous			(0.005)
Mean Outcome	0.017	0.017	0.017
Number of Observations	801016	801016	801016

Notes: This table shows modern predictors of specific tariffs. Each panel includes coefficients from three predictors, one of which is always if the good is homogeneous. Panel A considers if the good is non-grouped, while Panel B considers the tariff burden, calculated as an indictor for the ad valorem equivalent being below 5%. Each panel also shows the interaction of the two variables. Each observation is a tariff line, and the outcome is if the tariff is specific. Homogeneous goods are those that are sold on an organized exchange or have a reference price, following the conservative classification of Rauch (1999). Non-grouped goods are those that do not share the same tariff with all of the other tariff lines within the same HS 4-digit code. All regressions include importer fixed effects, and standard errors are clustered by HS 6-digit code. We use the most recently available data for each country. Source: WTO Integrated Database and UN Trade Analysis Information System.

Table 7: Modern Customs House Capacity Predicts More Complicated Tariffs and More Specific Tariffs

Panel A. Tariff Complexity

	ln(Number of Distinct Tariff Rates)		Share of HS 6-digit Codes with Variation in Tariffs	
	(1)	(2)	(3)	(4)
Overall Export Misreporting Index	-0.41		-0.012	
	(0.094)		(0.0055)	
Overall Trade Misreporting Index		-0.46		-0.014
		(0.10)		(0.0060)
Mean Outcome	3.04	3.04	0.073	0.073
Number of Observations	125	125	125	125

Panel B. Specific Tariffs

	Share of Tariff Lines with Specific Tariffs		Average of HS 6-digit Share with Specific Tariffs	
	(1)	(2)	(3)	(4)
Overall Export Misreporting Index	-0.018		-0.016	
	(0.0079)		(0.0079)	
Overall Trade Misreporting Index		-0.019		-0.017
		(0.0091)		(0.0091)
Mean Outcome	0.035	0.035	0.029	0.029
Number of Observations	125	125	125	125

Notes: This table shows the relationship between modern Customs house capacity and the tariff code. Customs house capacity is measured with an (normalized) index of each country's agreement with its trading partners, following Farhad et al. (2024), where the first row considers only exports and the second row considers all trade flows. Panel A considers measures of the complexity of the tariff code: the (ln) number of distinct tariff rates, and the share of HS 6-digit codes with variation in tariffs. Panel B considers the specificity of the tariff code. The outcome in Columns 1 and 2 is the share of tariff lines that are specific. Columns 3 and 4 take the unweighted average tariff lines within each HS-6 that are specific, and then take the average across all HS-6 codes. Each observation is a country in its most recently available data, and we consider MFN tariff rates. Robust standard errors reported in parenthesis. Source: WTO Integrated Database.

Online Appendix for Tariffs and State Capacity: A Specific Example

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March 2026

A Data

In this section, we describe in detail how we cleaned the data sources used in the paper.

A.1 Historical Tariff Bills

Our primary source of data is the 1789-1846 tariff bills themselves, which we harmonize over time. Creating and applying concordances is an inescapable aspect of modern empirical research for trade economists (Pierce and Schott, 2012; Fort and Klimek, 2018).[33]

Because there was no formal classification system for goods during this period, these tariff bills present additional challenges for data construction: In addition to concording tariffs over time, we also need to define our unit of observation. In particular, we define a *good* as the set of shipments that (a) in any particular year have exactly one tariff; and (b) across all years have different tariffs from any potentially observationally similar shipments.

To define the set of goods, we first parse the tariff bills into *labels*, where a label is the individual string that is attached to a tariff line. We match labels across years. Matching labels is complicated by the fact that it is many-to-many: Each label potentially matches with many goods, and while each good only has one label in a given year, over time its label may change (though not every good is mentioned in every tariff bill). In order to define a consistent set of goods with unique tariff lines, we take the finest *intersection* across labels.

We think that this notion of a good is the correct unit of analysis. Broadly, it reflects a current line in a tariff code: It is the unit of observation which describes a tariff within a broad category of object. Second, the tariff code even kept track of imports once they had been disaggregated, even if their tariffs were later combined. For instance, in 1842 there are three different tariffs for different kinds of olive oil. The 1846 tariff bill explicitly includes

[33]Matching physical goods to their tariff classification is also difficult in practice. For instance, the Customs Broker License Examination has a pass rate of around 10-25 percent (Customs and Protection, 2024). Bilateral tariff rates are also often measured with error (Teti, 2024).

"olive oil in casks, other than salad oil, olive salad oil, and all other olive oil, not otherwise provided for," even though they all get given the same tariff rate.

It is important to emphasize that, while a good is the smallest object that appears in the tariff code, each good is nevertheless comprised of many latent *varieties*, the distinct physical shipments which comprise a good. Some differences across varieties within a good may be anodyne, such as blue and red flannels. The key force for tariff policy is that the varieties within a good may have different prices. For instance, in 1846 the three different types of olive oils presumably had different prices, though they broadly shared a label. [34]

Appendix Table A.1 illustrates how we match labels to create goods, using the example of cotton and wool flannels. Ultimately, there are twelve different flannel goods, distinguished by their material, price, and coloring. Panel A shows the dynamics for wool flannels. In 1789 and 1790, they are not disaggregated at all, and are covered by the label "all other goods." In 1791 and 1794, there are no labels that would cover woolen flannels, so their tariffs remain unchanged. In 1816, there is a tariff for all "wool manufactures." In 1824, there is a tariff for woolen manufactures that is somewhat complicated, but flannels are exempt from the complications so they all pay the same rate. The 1828 bill splits woolen manufactures into five groups by their price per square yard. Had we stopped our analysis in 1828, we would not consider there to be any woolen flannel goods in particular, as any woolen flannel import would have the same history of tariffs as many other woolen manufactures. But that would obscure further developments. In 1832 (and 1842) all woolen flannels received the same tariff. This change means that, starting from 1832, the woolen flannels all have a different path of tariffs from the other woolen manufacturers. Ultimately, in our dataset we have five different woolen flannel goods.

Panel B shows the process for cotton flannels, which has a similar logic. The linking for the cotton flannels was complicated by the minimum tariffs, which imposed a minimum price. As the minimum cutoff changed (and 1842 introduced different tariffs for colored and uncolored cotton manufactures), new partitions were effectively created. For instance, the cutoff was 20 cents a square yard in 1816, and 25 cents a square yard in 1824. This creates three groups: less than 20 cents, over 25 cents, and between 20 and 25 cents.

Note that linking the cotton and flannel labels requires external knowledge. There is never a tariff for "cotton flannels:" the reason why we link the "flannels" and "cotton manufacturers" labels is that we know what flannels are. Ultimately, there are are seven cotton flannel goods.

[34] Another example is all "refined sugars," which have a common tariff in our time period. While we therefore consider them to be one good, refined sugars with different "Dutch Standard" color classifications had different prices. Indeed, in 1862 (after our sample ends), the tariff code introduced four distinct tariffs for different types of refined sugars.

We repeat a similar process for all labels in all of the tariff bills. For each label, we find its matches in the other tariff bills. While most labels get more disaggregated over time, the flannels example shows that the process can be nonlinear. In our analysis, when we consider if a good is a singleton or not, we use the number of goods that currently are sharing the same label.

Process of Linking All of the matches we created were done by hand. We describe the process below.

Broadly, we split the labels into three types. First, there are *everything* tariffs, which apply to all imports that are not explicitly enumerated in a tariff bill. Second, there are *general* tariffs, which apply to a broad set of imports (such as all "cotton manufactures"). Finally, there are *narrow* labels, which broadly apply to a small number of goods (such as "flannels"). The distinction between general and narrow labels is not important for any of our final analysis. Many narrow labels do affect more than one good, for instance we classify the 1832 "flannels" tariff as narrow even though there are many flannel goods. The distinction is relevant only because it affects how we process and harmonize the tariff lines.

We started with a list of all goods provided in the appendix to the 1832 tariff bill. We then merged all of the narrow labels in each year to the goods in the list. Some narrow labels had no match, as the 1832 list was not complete. If a label had no matches, we added new goods to the list. For our regression analysis on the tariff bills we completed this analysis through 1842, though we also linked the 1846 tariffs. This process required many passes: Every time we added a new entry because of a novel label, we needed to match it to any potential labels in previous years.

The language in the bills was inconsistent - multiple different labels mean the same thing, and the language was sometimes anachronistic. We were not surprised by tariffs for "quicksilver" or "brimstone," but we admit that we were all a little surprised to find a tariff in 1846 for "dragon's blood." We did many passes of the list, in order to make sure that we consistently linked synonyms.

Once we had the full preliminary set of goods through 1842, we turned to the general tariffs. First, we categorized the general tariffs. The general tariffs fell into the following categories: brass; bronze; carpet; copper; cotton; dye; flax; fruits; all glass; framed glass; silvered glass; gold; grass, straw, etc.; hemp; iron; iron and brass wire; lead; leather; linen; marble; millinery; nuts; oil; other; paper; pastes, tinctures, etc.; pearl; pewter; plants; raisins; raw hides, furs, and skins; salt; silk; silver; steel; tin; wood; wool; and worsted. The general tariffs sometimes had exemptions (such as woolen manufactures other than flannel), which we also kept track of.

One complication with the general tariffs is that they sometimes were associated with particular prices (such as the minimum tariffs, for instance the cotton manufactures less than 25 cents a square yard). For instance, Figure A.1 shows that there were five different tariffs for wool manufactures, depending on their price. We kept track of these prices separately. Ultimately, our list of general tariffs was defined by category, price, and year. Unfortunately, we could only keep track of nominal prices, not real prices.

For our preliminary list of goods, we then noted if they fell into any of those categories. Many of the goods matched to multiple categories, which required further processing.

When goods matched to multiple categories, sometimes there was a clear hierarchy, where one category was the default. In particular, when headings intersect, the more targeted (use-based) category is chosen over broader material-based labels. For instance, consider cotton bonnets. In a year with both a general tariff for "millinery" and "cotton manufactures", only the former would apply: There is no such thing as a cotton manufactured bonnet that is not millinery. But some years would have a cotton manufactures tariff but not a millinery tariff, in which case the cotton general tariff would apply. Thankfully, no good had more than one potential high-priority label. For each good, we created a list of high-priority categories and low-priority categories.

Other times when a good matched to multiple categories, we would consider both of them as equally important. For instance flannels could be either cotton or wool. As a result, we split the "flannel" entry in our preliminary set of goods into two: cotton flannels and woolen flannels. We then further split the flannel categories by price, as described in Appendix Table A.1.[35]

We then merged the lists. First, we took a many-to-many merge between the preliminary list of goods and the general tariffs (many to many because some preliminary goods matched to multiple categories, and all of the general tariffs matched to multiple preliminary goods). This created a long list of goods.

We then undertook the following steps for all of the labels in each tariff bill:

1. If a good was associated with a narrow label, then that was its assigned label and tariff for that bill.

2. If a good was not yet associated with a tariff, we then checked if it had a high-priority general match (making sure that it was not exempt). If so, we assigned the good that label and tariff.

[35]Another example of unranked categories are for carpets. Some carpets, such as "Wilton carpets" are definitely made of wool. Others, such as "Aubusson carpets," though typically wool, could also be made of silk, for example `https://archive.md/WhuXk`. As a result, we have one good for Wilton carpets in our final dataset, and two for Aubusson carpets.

3. If a good was still not yet associated with a tariff, we then checked if it had a low-priority general match (again making sure that it was not exempt). If so, we assigned the good that label and tariff.

4. If the good was still not yet associated with a tariff, and the bill had an everything tariff, then we assigned the good that label and tariff.[36]

When harmonizing the goods to the labels, there are two main concerns: making a false match or missing a valid one. False matches are relatively straightforward to identify: We constructed a comprehensive two-column list of every good–label pair and manually verified that each combination was sensible. Incomplete matches are more difficult to detect, since the space of potential matches is large. To address this, we merged the list of goods to SITC Revision 2 codes. For each tariff bill, we then identified all labels that matched any good within each 3-digit SITC heading. We then verified that we had not missed any additional potential matches between these labels and any other good within the same heading.

Deduplication Another complication arises because multiple labels in the same tariff bill may refer to what we ultimately consider to be one good, because the labels are not very different. For instance, ales, beers, ciders, and porters (in bottles) are often all explicitly and separately mentioned in the tariff bills, so for many tariff bills we parse four distinct labels, one for each drink. However, they all always have the same tariff rate. Because we think they are also physically similar, we consider them to jointly be one good. This deduplication approach requires some judgment calls. For instance, while we group ales and beers, we do not group "mats of straw and grass" and "milk of roses" (a cosmetic product made from rosewater and almond oil), even though the latter two always share a tariff. This is because we consider them to be physically different.[37]

For our main dataset, we merge labels if we think that a reasonable person would consider the labels to capture similar concepts. In robustness exercises, we consider stricter approaches.

[36] We had to do these steps in chronological order, as some everything tariffs applied to all goods that currently were paying a particular rate. For instance, the 1832 tariff bill had an everything tariff of 15 percent for "articles, all not herein specified either as free - or as liable to a different duty, and which, by the existing laws, pay an ad valorem duty higher than 15." So first we had to determine what each good's tariff was until 1832, and if it was not explicitly mentioned in the 1832 bill and otherwise would have had a high ad valorem duty, we knew that its rate was lowered to 15 percent.

[37] The nature of what exactly distinguishes goods is a philosophical question (for instance, beers are brewed but ciders are not, so it might be defensible to consider them different goods, and indeed they do not share an HS code in the modern classification.). The set of goods is likely a function of the economic environment (Grant, 2023). We think that a principled approach is to consider goods as distinguished by their nature and by their tariff.

Other deduplication was more straightforward. When we merged goods to their categories, sometimes those categories were not binding, for instance if the good had a narrow label in every tariff bill. As a result, while conceptually the good could be made of different things, its construction was not relevant for tariffs, and so we dropped those essentially duplicated goods. Ultimately, for our baseline analysis we consider 1,395 goods.

A.1.1 Classification of Commodities

For our main analysis, our notion of if a good is a commodity comes from a table in the 1864 *The Executive Documents* of the House of Representatives, which in the Report on the Finances includes prices for a range of goods in New York.[38] From our perspective, the list appears incomplete, even by 19th century standards. For instance, it includes several but not all kinds of sugar, some but not all kinds of tea, and entries for wheat, rye, oats, and corn but not barley (which was also widely traded on the Chicago Board of Trade by the 1850s). As a result, we classify a good as a commodity if it is similar to an entry explicitly enumerated in the Congressional list.[39]

We also use Rauch (1999)'s classification. In order to merge the historical goods to the modern classification, we hand-link the historical tariffs to the SITC Revision 2 classification, which is typically possible at the 3 or 4 digit level. Rauch (1999)'s measure is available for that classification, so no further concordances were needed. A few goods link to different SITC codes. When goods can plausibly match to multiple SITC codes, we treat them as homogeneous if any of the codes are labeled as homogeneous.

In the late 18th and early 19th century, actual organized exchanges and reference prices were rare for the goods classified as homogenous by Rauch (1999)'s measure, as these markets were not fully developed (Taylor, 1917; Banner, 1998; Dunlavy, 2024). While we therefore use contemporenously documented commodities as our main measure, we think the Rauch (1999) is reasonable as well. What matters from the perspective of the model is not that there is a *known* price, but that there is little price variation. We think a reasonable logic is that these goods were plausibly homogeneous during our sample period, even if their prices were not as formally documented.

In addition to classifying if the goods were commodities, we also manually kept track of if a good was manufactured, which we use for robustness checks.

[38] Congress does not use the word "commodity" to describe the goods contained in the list, but the *The Merchants & Bankers' Almanac* includes a similar list and does call the entries commodities. We use the goods reported for 1842.

[39] The categories are breadstuffs, candles, coal, coffee, copper, cotton, fish, fruit, furs, glass, gunpowder, hides, hops, indigo, iron, lead, leather, liquors, molasses, nails, naval stores, oils, paints, provisions, rice, salt, seeds, sheetings, soap, spices, spirits, sugars, tallow, teas, tobacco, whalebone, wine, wool, and zinc.

A.1.2 Alternative Panels of Tariffs

Over the 19th century, the US government created several tables covering the tariffs during our sample period (U.S. Congress, 1832; Walker, 1845; United States Treasury Department, 1888). These government documents highlight the difficulties of keeping track of goods, and for several reasons we cannot use them for our primary analysis. First, the documents have mistakes, where the actual bill imposes one import duty but the later-compiled list records something else. Second, these retrospective documents are often incomplete: They do not report the duty for every enumerated good. The incompleteness is probably due to a mix of error and the fact that it is difficult to list all the imports, since there are many and some are relatively complicated. We found that they were particularly likely to incompletely describe the minimum tariffs, and rarely did a good job with the general tariffs such as "manufactures of wool".

The heart of our model is that policymakers understood the difficulty of keeping track of, and implementing, a complex tariff code. Indeed, the authors of the 1888 Treasury report discuss the "great labor in its preparation" in the *Foreign Commerce and Navigation of the United States*, noting themselves that it was "almost" accurate.

Occasionally, Customs officials would compile the set of current tariffs, as this was not typically a document officially provided by the government (Jones, 1835, 1854). These lists were much more user-friendly than the tariff bills (for instance, they listed goods in alphabetical order), but unfortunately they do not provide the complete linking of tariffs across years.

A.2 Statistics on Imports

Beginning in the early 1820s, import data by good became available in the *Commerce and Navigation of the United States*, published by the U.S. Treasury Department (initially titled the *Annual Report on Commerce and Navigation*). We digitized the editions from 1843 through 1849.[40] Most of the tables cover full years (ending on June 30), though 1843 covers nine months, and 1847 is split in two, one for imports under the 1842 regime (until December 1846) and the other for imports under the 1846 regime (until June 30, 1847).

We merged the import statistics to the tariff bills by hand. The import statistics were typically more aggregated than the bills, so most observations linked the multiple goods.

In addition to using this resource for checking our work,[41] we also use the resource to calculate ad valorem equivalents for the specific tariffs. First, we calculate the implied tariff

[40] The coverage of the *Commerce and Navigation of the United States* improved over time (though even in the 1840s, it only covered imports for around half of the goods).

[41] While the reports do not include the tariff rate, they do say if a good had a specific, ad valorem, or free tariff.

revenue by multiplying the total imported quantity by the imports specific tariff (calculated as the unweighted average of the goods that match to each import). We then divide the implied tariff revenue by the total value of imports.[42] Total import values are always reported. Quantities, and therefore unit values, are consistently available for goods with specific tariffs and for some goods with ad valorem tariffs that historically had specific tariffs. Important for our purposes, around half of the goods with specific tariffs in 1842 continue to have import quantities reported after they switched to ad valorem tariffs in 1846. We collected additional data on tariff collections, Customs costs, and other government revenues from the *Annual Reports of the Treasury Secretary of the United States*.

We tried to create a panel from the import data, but unfortunately the imports were broadly inconsistently defined and incompletely reported. While in each year we can match imports to goods, matching the imports to each other did not work well: Creating time-consistent observations required a lot of aggregation, due to the inconsistent reporting. The resulting observations did not seem very reliable, for instance there was a lot of price variation within most import groupings within a given tariff regime. Due to these data quality issues, we mostly focus on cross-sectional analysis. Indeed, for the analysis on unit values in the 1849 *Annual Report*, Treasury officials went directly to Customs houses in order to compile their data, instead of relying only on the *Commerce and Navigation of the United States*.

A.3 Statistics on Customs House Operations

Beginning in 1816, Congress mandated the Secretary of State to construct a list "containing correct lists of all the officers and agents, civil, military, and naval, in the service of the United States, made up to the last day of September, of each year in which a new Congress is to assemble, [to] be compiled and printed." These lists became *The Official Register of the United States*. We digitized records for Customs, the Light Houses, the Revenue Cutters, and the Marine Hospital for 1816, 1821, 1829, 1835, 1843, and 1849 editions.[43]

The organization of each book changes slightly over time. For example, in 1816, officials

[42] Calculated ad valorem equivalents for specific tariffs can be difficult to interpret, as the ex-ante rate (as a function of all potential imports) and the ex-post rate (as a function of the goods that are actually imported) are typically different (Bouët et al., 2008; Greenland et al., 2025a). In our setting, the theoretically correct object to measure is the ex-post measure, which is what can be calculated in the data. As in modern data, we find some ad valorem equivalents that are extremely high (Teti, 2020). For all of our analysis, we drop goods with burdens higher than the highest ad valorem tariff. It is an interesting question as to why there are such high specific tariffs, be it mismeasurement, political economy forces, or something else, which we leave to future research as it is outside the scope of our model.

[43] In early editions, all of these operations were listed under Customs. The original Customs houses were also involved in the operations of the Revenue Cutters, the predecessor to the Coast Guard, which acted to prevent smuggling, the Light Houses, and the Marine Hospital. These tasks were separated from the Customs houses over time, and are not closely related to duties collection, so we do not focus on these departments though we still digitized their worker registers to ensure comparability over time.

are separated by their title (e.g., all Collectors are listed, followed by Surveyors, and so forth). Later employees are organized by Customs districts, and then by districts and department (e.g., collections, appraisal, etc.). Despite these small changes, the information is consistent: name, occupation(s), port and district, place of birth, and compensation. Figure A.6 provides an example of how the data is organized.

The only change we make from the raw data is cleaning occupational titles. In order to economize on space, the publishers of The Register made use of shorthand that was neither consistent within years nor across years. We decoded this short hand manually. For example we replace, "W." "We'r", "Wr." with Weigher.[44]

In presenting our results on occupational titles, we rely on several different classifications for robustness. In the raw data, the number of occupational titles rises dramatically over time. Much of this is driven by the New York Customs House giving particularly narrow titles. For our main analysis, we only include occupation titles mentioned by at least two houses. We present two robust sets of occupation titles. In the first, we take a more lenient classification and keep all titles. In the second, we only focus on core tasks and remove all clerks, bookkeepers, etc. Here the expansion is driven by the introduction of appraisers, examiners, a separation of proving and marking, as well as the growth of hierarchy in these roles (e.g., "assistant appraisers").

A.4 Modern Cross-Country Tariff Data

We use the WTO's IDB tariff data to construct four country-level measures. First, we measure the (ln) number of distinct tariff rates for each country. A tariff rate is considered distinct if it differs from others, regardless of whether it is ad valorem or specific. For example, 4 percent and 10 percent (both ad valorem) and 1.4 cents/kg and 4.4 cents/kg (both specific) represent four distinct tariff rates. Second, we compute the share of HS six-digit codes with variation in tariff duties for each country. If all tariff lines within an HS six-digit category (i.e., tariff lines sharing the same first six digits) have the same tariff rate, then the category has no variation. If at least two distinct tariff rates exist within the category, we classify it as having variation. We use these two measures to capture tariff complexity.

We also have two measures of specificity. The first is a direct average across tariff lines: the share of tariff lines with a specific tariff in each country. The second is the average across HS6 codes: For each HS six-digit category, we compute the share of lines with a specific tariff, and then take the average of these shares across categories within each country. The two

[44]The other change is the string 'do' was used for ditto. With multiple job titles, it is difficult to interpret what is shared across workers. Typically "do" was written multiple times, presumably when multiple job titles were shared. As a result, we followed the rule that we copied all job titles that were in alignment with the "do" (or, if only one "do" was used and it was unaligned, we assumed that also meant to copy the whole title.

measures are related: The latter downweights categories with many tariff lines and gives equal weight to each HS6 group.

For our analysis at the tariff line level, we construct four indicators. These include whether: (a) a tariff line has a specific tariff; (b) its ad valorem equivalent (or the duty rate, if ad valorem) falls below a certain threshold – 5 percent in the main analysis; (c) it is classified as homogeneous according to the Rauch (1999)'s classification; and (d) it is "non-grouped." The non-grouped indicator equals one if not all products within the HS four-digit category to which the tariff line belongs in that country share the same duty rate.

A.5 American Imports, 1981-1985

The data in the IDB include (estimates) of total duties collected, the rate provision, as well as quantities and values. We are grateful to Andrew Greenland for pointing us to this source, and we followed the approach in Greenland et al. (2025a) as much as possible.[45] We only include imports where the rate provision has a second digit of 1, which implies that the tariff is MFN normal trade relations. We further consider specific tariffs (first digit of the rate provision code is 2) and ad valorem tariffs (first digit of 3).

Each observation in the resulting data is the triplet of a year by seven digit TSUS code by exporter. One complication for calculating the unit values is that many products report different types of units across different exporters. For each row, we calculate unit values by dividing the value by the quantity, assuming that the unit reported in the data corresponds to the size of the package that would be inspected for each shipment in the model. We then calculate the total value weighted average unit value, either within each year or for the entire dataset. We calculate ad valorem equivalents by dividing total (estimated) tariff revenue by the total value.

B Robustness Exercises

In this section, we show that our results are broadly robust to alternative empirical approaches, including different cuts of the data, and different measures of homogeneity.

B.1 Historical Context

Many occupations appear in only one Customs house. In our main analysis, we include all of the occupation titles that are present in at least two houses. Figure A.7 shows a similar pattern of increasing occupations for alternative measures of Customs house sophistication, either including all occupations or only those involving core tasks. We discuss different classifications of occupational titles in Appendix A.3.

[45] One reason for starting in 1981 is that Greenland et al. (2025a) note that the data quality in 1980 was particularly low.

A key mechanism in the model is that complexity allows for the state to create relatively narrowly defined labels, which in turn have specific tariffs. We find this pattern empirically, as the tariff labels were disproportionally narrow. Figure A.8 Panel A shows that initially, even when there were very few labels, many targeted narrow sets of imports that would never be further disaggregated. Over subsequent decades, labels became increasingly specialized. By 1842, half of labels applied exclusively to individual goods. Panel B shows a similar pattern for tariff rates.

B.2 Homogeneity and Specific Tariffs

We undertake a variety of robustness checks for Table 2.

When considering the mapping between labels in goods, we consider in our primary analysis if the label is a singleton: if a good shares its label with nothing else. Table A.7 shows our results are similar if instead we consider labels that are no more than 5 (or 10) goods.

In our main analysis, we digitize a 19th century Congressional list of commodities. However, that list was not necessarily intended to be a comprehensive list of all commodities. Table A.8 shows our results are robust to using Rauch (1999)'s modern measure of if a good is homogeneous, which was designed to be comprehensive.

One concern with using a commodity classification for this type of analysis comes from Broda and Weinstein (2006), who point out that we will characterize a good as homogeneous even when it includes multiple distinct (and known) varieties with varying prices. Their example is that "tea" is categorized as a commodity by Rauch (1999), but in practice includes many varieties. A similar issue arises using our 19th century commodity classification: The import bills distinguish 18 types of tea, all of which are listed as commodities. However, in some years there are only two labels for tea, which therefore include a more price heterogeneity than a single commodity would. Table A.9 shows that while singleton labels and homogeneous goods are each more likely to receive specific tariffs, goods that meet both criteria are broadly likely to do so.

First, our baseline regressions include no additional controls or weights. However, a good's tariff burden may be an important driver of its tariff type (as described in Proposition 8). In Panel A of Tables A.10 and A.11, we control for the 1842 ad valorem equivalent tariff for all goods for which we have import data.

Many of our goods are narrowly defined, and so likely reflect a small fraction of imports. In Panel B of Tables A.10 and A.11, we weight the regressions by the inverse of the number of goods within each three-digit SITC classification, so as to raise the importance of relatively more distinct goods for our analysis. Our results are robust to these changes.

The data for Table 2 are unbalanced for two reasons. First, we exclude goods in those

years in which they appear on the free list, as they have neither a specific nor ad valorem tariff in those years. Panel A of Tables A.12 and A.13 show our results are robust to only including goods which are never on the free list. Second, each observation is a good by tariff bill. However, some tariff bills are relatively minor, affecting a small share of goods. Panel B of Tables A.12 and A.13 show that our results are robust to limiting the sample to major tariff bills (those that describe at least half of the goods).[46]

As described in Appendix A, our definition of a good requires some judgment to distinguish between physically distinct imports that nevertheless share a path of tariffs. Tables A.14 and A.15 show our results are robust to alternative approaches, both a strict classification where we group together goods that are even plausibly similar, or an extremely strict classification where we group together all goods with the same path of tariffs, regardless of any physical similarity.

B.3 Revenue and Specific Tariffs

Theoretically, we predict that unit values are not misreported under specific tariffs, and they are shaded down with ad valorem tariffs, which if anything would push against finding that cheaper goods have specific tariffs. Table A.16 shows the pattern that, conditional on having an ad valorem tariff, imports with lower unit values should have higher tariff rates is slightly stronger when weighting by the total value of imports by good.

B.4 Modern Cross Country Analysis

Table 7 shows that, using our mismeasurement-based classification, more capable customs houses have systematically different tariff schedules. We can use alternative measures as well. Figure A.9 shows that wealthier countries in terms of per capita GDP also have more distinct tariff rates. Table A.17 show our results are robust to instead using measures of Bureaucracy Quality from the International Country Risk Guide, which cover broad state capacity, not necessarily that of the Customs houses specifically. See also Betz (2019).

Table 6 Panel A shows that lower tariffs are more likely to be specific, using a 5% ad valorem equivalent cutoff. Table A.18 shows similar results using cutoffs of 2.5% or 10%. In current cross-country tariffs, 10% is around the median ad valorem equivalent, 5% is around the 10th percentile, and 2.5% is around the 5th percentile.

Table 6 Panel B shows that price homogeneity makes specific tariffs more attractive. Rauch (1999) provides both a conservative and liberal classification to account for ambiguities in product categorization. The conservative version minimizes the number of products classified as low dispersion, while the liberal one maximizes them. Our main analysis uses the conservative classifications. In our main results we use the conservative version, and

[46] Those bills are in 1789, 1790, 1792, 1794, 1816, 1824, 1832, and 1842.

Table A.19 shows our results are similar using the liberal definition of homogeneous.

A natural concern is if our modern results are independent of the historical ones, or if they are simply a function of hysteresis in the tariff code Acosta and Cox (2024). To rule out this explanation, in Table A.20 we show our results are similar if we use only sectors that do not appear in the historical tariff code.[47]

B.5 Analysis of the 1980s United States

An alternative driver of tariffs is lobbying Grossman and Helpman (1994). One potential driver of differential lobbying is the concentration of imports, as potentially importers with a larger share of the market are able to lobby more. In order to evaluate this concern, we measure the HHI of imports by origin within each 5 digit code. In Table A.21, we show our results are similar on the drivers of specificity in the 1980s are similar when we only include goods with an HHI below .5, which is roughly the median.

We can also visualize the drivers of specific tariffs in the 1980s. Figure A.10 shows a lowess curves predicting the share of specific tariffs against the unit value. The share with specific tariffs monotonically falls as unit values increase. Figure A.11 plots the patterns in Table 5 Panels A and B. In particular, Figure A.11 shows a heatmap of prices and ad valorem equivalents. Consistent with the theory and the regression analysis, cheap goods and those with low levels are both more likely to have specific tariffs. Their interaction matters as well, as cheap goods with low levels of protection are particularly likely to have specific tariffs.

C Proofs

C.1 Proof of Proposition 1

Existence and form of the equilibrium is immediate from the fact that reports do not impact payments. In equilibrium, the consumption of imports of each value is proportional to $(v+t)^{-\sigma}$ under CES preferences. Since we have normalized consumer income to 1, equilibrium consumptions must be

$$q_S(v;t) = \frac{(v+t)^{-\sigma}}{\mathbb{E}[(v+t)^{1-\sigma}]}.$$

Net tariff income is therefore $\Pi_S(t) = t \cdot \mathbb{E}[q_S(v;t)]$.

C.2 Proof of Proposition 2

Suppose first that $\tau < c_v/(\kappa \cdot \bar{v})$. In any monotone equilibrium, there must exist a threshold $v^* \in \mathbb{R}_+ \cup \{\infty\}$ such that $\rho(v) = 0$ iff $v < v^*$. (Whether v^* is included is immaterial except when $v^* = 0$. In that case, condition on $v \leq v^*$.) Since all importers reporting zero face

[47] Specifically, we use all three digit sectors that do not have a label only for that sector, at any point in our period. Sectors that we include in this analysis include synthetic fibers, petroleum products, and electric machines. There were a few sectors that did not have a disaggregated tariff but by our judgment did exist in the 19th century, such as rice, and we exclude those as well.

the same net ad valorem tariff rate $\kappa \cdot \phi(0)$, relative prices for goods with values on $[0, v^*]$ are undistorted. The government therefore believes that the conditional density of values is $q(v \mid 0)$ on $[0, v^*]$ and 0 elsewhere, where

$$q(v \mid 0) = \frac{v^{-\sigma} \cdot f(v)}{\int_0^{v^*} v^{-\sigma}\, dF(v)}$$

is the fraction of imported goods of value below v^* which have value v. Hence the government's expected payoff from verifying a report of 0 is

$$\kappa \cdot \tau \cdot \int_0^{v^*} v \cdot q(v \mid 0)\, dv - c = \kappa \cdot \tau \cdot \frac{\mathbb{E}[v^{1-\sigma} \mid v < v^*]}{\mathbb{E}[v^{-\sigma} \mid v < v^*]} - c.$$

This expression must be negative, since the right-hand size is increasing in v^* and equals $\kappa \cdot \tau \cdot \bar{v} - c < 0$ when $v^* = \infty$. It is therefore uniquely optimal for the government not to verify a report of zero no matter the value of v^*. It must then be uniquely optimal for all importers to report zero value, since any other report incurs a positive expected tariff payment. Hence, $\phi(0) = 0$ and $\rho(v) = 0$ for all v in any monotone equilibrium. Further, there exists an equilibrium with the property that $\phi(v') = 0$ for all v', which can be supported by the off-path belief that $v' = v$ whenever $v' > 0$.

Now suppose that $\tau > c_v/(\kappa \cdot \bar{v})$. We first verify that the stated strategies can be supported as an equilibrium. For off-path reports $v' \in (0, v^*)$, let the government believe that $v = v' + c_v/(\kappa \cdot \tau)$ with probability 1. In that case, for each report $v' > 0$ the government believes that the importer's value is v, and its payoff is $\tau \cdot v - c_v/\kappa$ whether it verifies or not. Meanwhile, for the report $v' = 0$ the government believes that the conditional density of values is $q(v \mid 0)$ on $[0, v^*]$ and 0 elsewhere, where $q(v \mid 0)$ is as defined above. Hence the government's expected payoff from verifying the importer's report is

$$\kappa \cdot \tau \cdot \int_0^{v^*} v \cdot q(v \mid 0)\, dv - c = \kappa \cdot \tau \cdot \frac{\mathbb{E}[v^{1-\sigma} \mid v < v^*]}{\mathbb{E}[v^{-\sigma} \mid v < v^*]} - c = 0.$$

For every report v', the government is therefore indifferent regarding verification and willing to choose $\phi(v') = 1/\kappa$. Meanwhile, for any value v and report v', the importer's expected tariff payment is $T(v, v') = \tau \cdot v$, and so the importer is indifferent over all reports. In particular, the stated reporting policy is optimal.

Since each importer is indifferent over all reports, their expected tariff payment can be calculated assuming no underreporting, yielding $T_{AV}(v; \tau) = \tau \cdot v$. Meanwhile, since the government is indifferent over verification following every report, its net income can be

calculated assuming it never verifies reports, yielding

$$\Pi_{AV}(\tau) = \int_{v^*}^{\infty} (\tau \cdot v - c_v/\kappa) \cdot Q(v;\tau)\, dF(v),$$

where

$$Q(v;\tau) \equiv (1+\tau)^{-1} \cdot \frac{v^{-\sigma}}{\mathbb{E}[v^{1-\sigma}]}$$

is the quantity of imports of each value. Now, the equation characterizing v^* can be rearranged to read

$$\int_{0}^{v^*} (\tau \cdot v - c_v/\kappa) \cdot Q(v;\tau)\, dF(v) = 0.$$

Hence

$$\Pi_{AV}(\tau) = \int_{0}^{\infty} (\tau \cdot v - c_v/\kappa) \cdot Q(v;\tau)\, dF(v),$$

which simplifies to the expression in the proposition statement.

We now establish on-path uniqueness within the class of monotone equilibria. Fix a monotone equilibrium (ρ, ϕ). We first show that $\phi(\rho(v)) < 1$ for every v. Suppose by way of contradiction that $\phi(\rho(v)) = 1$ for some v. Let $v' = \rho(v)$. Then $T(v, v') < T(v, v)$ unless $v' = v$. Equilibrium therefore requires that $\rho(v) = v$, and further that $\rho(v'') \neq v$ for every $v'' \neq v$. But in that case, the government places probability 1 on the importer's report being truthful following a report of v, in which case verification is not optimal, contradicting $\phi(\rho(v)) = \phi(v) = 1$.

We next establish that $\phi(v') > 0$ for every v'. Suppose by way of contradiction that $\phi(v') = 0$ for some v'. Then $T(v, v') < T(v, v'')$ for every $v \geq v'' > v'$, implying that $\rho(v) \leq v'$ for every v. Now, if $\rho(\infty) = 0$, then every importer reports no value and the effective ad valorem tariff on each unit is $\kappa \cdot \tau \cdot \phi(0)$. Relative prices are therefore undistorted, and so the expected value of an imported unit is $\mathbb{E}[v^{1-\sigma}]/\mathbb{E}[v^{-\sigma}] > c_v/(\kappa \cdot \tau)$. In other words, verification is strictly optimal when $v' = 0$, contradicting $\phi(\rho(v)) < 1$ for every v. So $\rho(\infty) > 0$, meaning that $\rho(v) > 0$ for sufficiently large v. Monotonicity of the equilibrium implies that, for all such v, in equilibrium the importer places probability 1 on the importer's value being v following a report of $\rho(v)$. Since further $\rho(v) \leq v'$ for all v, we eventually have

$$\kappa \cdot \tau \cdot (v - \rho(v)) > c$$

for sufficiently large v. In other words, verification is strictly optimal for the reports of importers with large values, contradicting $\phi(\rho(v)) < 1$ for all v.

Since $\phi(\rho(v)) \in (0, 1)$ for every v, it must be that the government is indifferent over

verification whenever $\rho(v) > 0$. Additionally, monotonicity of the equilibrium implies that the government believes that the importer's value is v with probability 1 whenever $v' = \rho(v) > 0$. In other words,

$$\kappa \cdot \tau \cdot (v - \rho(v)) = c$$

must hold whenever $\rho(v) > 0$. Equivalently,

$$\rho(v) = v - c_v/(\kappa \cdot \tau)$$

whenever $\rho(v) > 0$. Monotonicity of the equilibrium therefore implies existence of a cutoff v^* such that

$$\rho(v) = \begin{cases} 0, & v < v^* \\ v - c_v/(\kappa \cdot \tau), & v \geq v^* \end{cases}$$

Since the government must additionally be indifferent over verification when $\rho(v) = 0$, and since the conditional density of values given a report of 0 is $q(v \mid 0)$ no matter the choice of v^* and $\phi(0)$, the cutoff v^* is uniquely pinned down by the condition reported in the proposition statement.

Finally, we establish that $\phi(\rho(v)) = 1/\kappa$ for each v. (For $v' \in (0, v^*)$ the choice of $\phi(v')$ is off-path and does not impact outcomes.) If $\phi(\rho(v)) > 1/\kappa$ for some $v > 0$, then $T(v, \rho(v)) < \tau \cdot v$, contradicting the optimality of $v' = \rho(v)$. Hence $\phi(\rho(v)) \leq 1/\kappa$ for every $v > 0$. And since $\rho(0) = \rho(v^*/2)$, this inequality also holds at $v = 0$. Now, suppose that $\phi(\rho(v)) < 1/\kappa$ for some v. Then for every $v' > \max\{v^*, \rho(v)\}$ we have

$$T(v', \rho(v)) = \tau \cdot \Big(\rho(v) + \phi(\rho(v)) \cdot \kappa \cdot (v' - \rho(v))\Big) = \tau \cdot \Big(v' - (1 - \phi(\rho(v)) \cdot \kappa) \cdot (v' - \rho(v))\Big)$$

while

$$T(v', \rho(v')) = \tau \cdot \Big(v' - (1 - \phi(\rho(v')) \cdot \kappa) \cdot \frac{c_v}{\kappa \cdot \tau}\Big).$$

Hence

$$T(v', \rho(v')) - T(v', \rho(v)) = \tau \cdot (1 - \phi(\rho(v)) \cdot \kappa) \cdot (v' - \rho(v)) - (\phi(\rho(v')) \cdot \kappa - 1) \cdot \frac{c_v}{\kappa}.$$

Since $\phi(\rho(v')) \leq 1/\kappa$ for all v' and $1 - \phi(\rho(v)) \cdot \kappa > 0$, this expression is positive for sufficiently large v', contradicting the optimality of $v' = \rho(v')$. So it must be that $\phi(\rho(v)) = 1/\kappa$ for every v.

C.3 Proof of Lemma 1

The expression for net tariff income obtained in Proposition 1 can be rearranged to read

$$\Pi_S(t)^{-1} = 1 + \int \frac{v}{t} \cdot \frac{(v/t+1)^{-\sigma} f(v)}{\int (v'/t+1)^{-\sigma} f(v')\, dv'}\, dv.$$

Making the substitution $v = t \cdot \hat{v}$ in the integrals appearing in this expression yields

$$\Pi_S(t)^{-1} = 1 + \int \hat{v}\, dG(\hat{v}; t),$$

where $G(\hat{v}; t)$ is the distribution function defined by the density

$$g(\hat{v}; t) \equiv \frac{(\hat{v}+1)^{-\sigma} f(t \cdot \hat{v})}{\int (\hat{v}'+1)^{-\sigma} f(t \cdot \hat{v}')\, d\hat{v}'}.$$

Suppose that g exhibits the strict monotone likelihood ratio property (SMLRP) in $\hat{v}$ with respect to $-t$. Then $G(\cdot; t')$ strictly first-order stochastically dominates $G(\cdot; t)$ for $t' < t$, implying that $\Pi_S(t')^{-1} > \Pi_S(t)^{-1}$ for $t' < t$. In other words, Π_S is increasing and Assumption 1 holds.

The SMLRP property requires that

$$\frac{g(\hat{v}'; t')}{g(\hat{v}; t')} > \frac{g(\hat{v}'; t)}{g(\hat{v}; t)}$$

for every $\hat{v}' > \hat{v}$ and $t' < t$. Since

$$\frac{g(\hat{v}'; t)}{g(\hat{v}; t)} = \left(\frac{\hat{v}'+1}{\hat{v}+1}\right)^{\sigma} \cdot \frac{f(t \cdot \hat{v}')}{f(t \cdot \hat{v})},$$

it is sufficient that

$$\frac{\partial}{\partial t} \log\left(\frac{f(t \cdot \hat{v}')}{f(t \cdot \hat{v})}\right) = t^{-1} \cdot (\zeta(t \cdot \hat{v}') - \zeta(t \cdot \hat{v})) < 0$$

for all t and $\hat{v}' > \hat{v}$, where $\zeta(v) = v \cdot f'(v)/f(v)$. The desired result therefore follows if ζ is decreasing everywhere.

For the lognormal distribution,

$$\zeta(v) = \frac{\mu - \log v}{\sigma^2} - 1.$$

For the generalized Gamma distribution with scale parameter $\alpha > 0$ and shape parameters

$\beta > 0$ and $\gamma > 0$,

$$\zeta(v) = \beta - 1 - \gamma \cdot \left(\frac{v}{\alpha}\right)^{\gamma}.$$

For the inverse Gamma distribution with shape parameter $\alpha > 0$ and scale parameter $\beta > 0$,

$$\zeta(v) = -1 - \alpha + \frac{\beta}{v}.$$

For the Lomax distribution with shape parameter $\alpha > 0$ and scale parameter $\lambda > 0$,

$$\zeta(v) = -(\alpha + 1) \cdot \frac{v}{v + \lambda}.$$

For the log-logistic distribution with shape parameter $\gamma > 0$ and scale parameter $\sigma > 0$,

$$\zeta(v) = -1 - \gamma + \frac{2\gamma}{1 + (v/\sigma)^{\gamma}}.$$

In all of these cases, ζ is everywhere decreasing in v.

C.4 Proof of Proposition 3

The reported unit value under a specific tariff t is

$$\frac{\int_0^\infty v(v+t)^{-\sigma}\, dF(v)}{\int_0^\infty (v+t)^{-\sigma}\, dF(v)}.$$

The reported unit value under the ad valorem tariff is

$$\frac{\int_0^\infty v^{1-\sigma}\, dF(v)}{\int_0^\infty v^{-\sigma}\, dF(v)} - \frac{c_v}{\kappa \cdot \tau} = \bar{v} - \frac{c_v}{\kappa \cdot \tau}.$$

Hence the change in the log reported unit value is

$$\log\left(\bar{v} - \frac{c_v}{\kappa \cdot \tau}\right) - \log\left(\frac{\int_0^\infty v(v+t)^{-\sigma}\, dF(v)}{\int_0^\infty (v+t)^{-\sigma}\, dF(v)}\right).$$

Adding and subtracting $\log \bar{v}$ gives

$$\log\left(1 - \frac{c_v}{\kappa \cdot \tau \cdot \bar{v}}\right) + \left[\log \bar{v} - \log\left(\frac{\int_0^\infty v(v+t)^{-\sigma}\, dF(v)}{\int_0^\infty (v+t)^{-\sigma}\, dF(v)}\right)\right].$$

It remains to obtain a first-order approximation to the bracketed term. Differentiating

the reported unit value under the specific tariff at $t = 0$ yields

$$\begin{aligned}
&\frac{d}{dt}\left(\frac{\int_0^\infty v(v+t)^{-\sigma}\,dF(v)}{\int_0^\infty (v+t)^{-\sigma}\,dF(v)}\right)\Bigg|_{t=0} \\
&= \frac{-\sigma\left(\int_0^\infty v(v+t)^{-\sigma-1}\,dF(v)\right)\left(\int_0^\infty (v+t)^{-\sigma}\,dF(v)\right) + \sigma\left(\int_0^\infty v(v+t)^{-\sigma}\,dF(v)\right)\left(\int_0^\infty (v+t)^{-\sigma-1}\,dF(v)\right)}{\left(\int_0^\infty (v+t)^{-\sigma}\,dF(v)\right)^2}\Bigg|_{t=} \\
&= \frac{-\sigma\left(\int_0^\infty v^{-\sigma}\,dF(v)\right)^2 + \sigma\left(\int_0^\infty v^{1-\sigma}\,dF(v)\right)\left(\int_0^\infty v^{-\sigma-1}\,dF(v)\right)}{\left(\int_0^\infty v^{-\sigma}\,dF(v)\right)^2} \\
&= \sigma\left(\frac{\left(\int_0^\infty v^{1-\sigma}\,dF(v)\right)\left(\int_0^\infty v^{-\sigma-1}\,dF(v)\right)}{\left(\int_0^\infty v^{-\sigma}\,dF(v)\right)^2} - 1\right).
\end{aligned}$$

Since

$$\frac{\int_0^\infty v(v+t)^{-\sigma}\,dF(v)}{\int_0^\infty (v+t)^{-\sigma}\,dF(v)}\Bigg|_{t=0} = \frac{\int_0^\infty v^{1-\sigma}\,dF(v)}{\int_0^\infty v^{-\sigma}\,dF(v)} = \bar{v},$$

it follows that

$$\frac{\int_0^\infty v(v+t)^{-\sigma}\,dF(v)}{\int_0^\infty (v+t)^{-\sigma}\,dF(v)} = \bar{v} + \sigma\left(\frac{\left(\int_0^\infty v^{1-\sigma}\,dF(v)\right)\left(\int_0^\infty v^{-\sigma-1}\,dF(v)\right)}{\left(\int_0^\infty v^{-\sigma}\,dF(v)\right)^2} - 1\right)\cdot t + o(t).$$

Therefore

$$\begin{aligned}
\log\bar{v} - \log\left(\frac{\int_0^\infty v(v+t)^{-\sigma}\,dF(v)}{\int_0^\infty (v+t)^{-\sigma}\,dF(v)}\right) &= -\log\left(1 + \frac{\sigma\left(\frac{\left(\int_0^\infty v^{1-\sigma}\,dF(v)\right)\left(\int_0^\infty v^{-\sigma-1}\,dF(v)\right)}{\left(\int_0^\infty v^{-\sigma}\,dF(v)\right)^2} - 1\right)\cdot t}{\bar{v}} + o(t)\right) \\
&= -\frac{\sigma\left(\frac{\left(\int_0^\infty v^{1-\sigma}\,dF(v)\right)\left(\int_0^\infty v^{-\sigma-1}\,dF(v)\right)}{\left(\int_0^\infty v^{-\sigma}\,dF(v)\right)^2} - 1\right)\cdot t}{\bar{v}} + o(t).
\end{aligned}$$

Finally, by the definition of τ,

$$\tau = \frac{t\cdot\int_0^\infty (v+t)^{-\sigma}\,dF(v)}{\int_0^\infty v(v+t)^{-\sigma}\,dF(v)} = \frac{t}{\frac{\int_0^\infty v(v+t)^{-\sigma}\,dF(v)}{\int_0^\infty (v+t)^{-\sigma}\,dF(v)}} = \frac{t}{\bar{v}} + o(t),$$

and so

$$\frac{t}{\bar{v}} = \tau + o(\tau).$$

Plugging in gives

$$\log \bar{v} - \log\left(\frac{\int_0^\infty v(v+t)^{-\sigma}\,dF(v)}{\int_0^\infty (v+t)^{-\sigma}\,dF(v)}\right) = -\sigma\left(\frac{\left(\int_0^\infty v^{1-\sigma}\,dF(v)\right)\left(\int_0^\infty v^{-\sigma-1}\,dF(v)\right)}{\left(\int_0^\infty v^{-\sigma}\,dF(v)\right)^2} - 1\right)\cdot\tau + o(\tau).$$

C.5 Proof of Proposition 4

Consider first a specific tariff. Since $\mathbb{E}[v] < \infty$ and $\mathbb{E}[v^{-\sigma-1}] < \infty$, it must be that $\mathbb{E}[v^{-\sigma}] < \infty$ and $\mathbb{E}[v^{1-\sigma}] < \infty$. The dominated convergence theorem therefore ensures that $\mathbb{E}[(v+t)^{-\sigma}]$ and $\mathbb{E}[(v+t)^{1-\sigma}]$ are continuous in t, and hence so is $\Pi_S(t)$. Assumption 1 further ensures that Π_S is monotone. And $\Pi_S(0) = 0$ while

$$\lim_{t\to\infty} \Pi_S(t) = \lim_{t\to\infty} \frac{\mathbb{E}[(v/t+1)^{-\sigma}]}{\mathbb{E}[(v/t+1)^{1-\sigma}]} = 1$$

by the monotone convergence theorem. The stated properties of t^* follow immediately.

Now consider an ad valorem tariff. Then for each $R \in (0,1)$, the tariff $\tau^*(R)$ which satisfies $\Pi_{AV}(\tau^*(R)) = R$ can be characterized by solving

$$R = \frac{\tau}{1+\tau} - \frac{c_v/(\kappa\cdot\bar{v})}{1+\tau},$$

yielding the unique solution

$$\tau^*(R) = \frac{R + c_v/(\kappa\cdot\bar{v})}{1-R}.$$

It is immediate that this solution satisfies the stated properties.

C.6 Proof of Proposition 5

The price indices under a specific and ad valorem tariff are

$$P_S(t) = \left(\mathbb{E}\left[(v+t)^{1-\sigma}\right]\right)^{1/(1-\sigma)}, \quad P_{AV}(t) = (1+\tau)\cdot\left(\mathbb{E}[v^{1-\sigma}]\right)^{1/(1-\sigma)}.$$

Hence $P_S^*(R) = P_S(t^*(R))$ while $P_{AV}^*(R) = P_{AV}(\tau^*(R))$ for every $R \in (0,1)$. The dominated convergence theorem ensures that P_S is continuous in t, and it is immediate that P_{AV} is continuous in τ. The first result of the proposition then follows immediately the fact that $t^*(0+) = 0$ while $\tau^*(0+) > 0$.

We next establish that τ^* and t^* are differentiable and obtain implicit expressions for their derivatives. The explicit expression for τ^* obtained in the proof of Proposition 4 verifies that it is differentiable with derivative

$$\frac{d\tau^*}{dR} = \frac{1 + c_v/(\kappa\cdot\bar{v})}{(1-R)^2}.$$

Meanwhile, t^* solves the equation $\Pi_S(t^*(R)) = R$. In other words, t^* is the inverse of Π_S. We wish to invoke the inverse function theorem, which requires establishing that Π_S is continuously differentiable. The assumptions $\mathbb{E}[v^{-\sigma-1}] < \infty$ and $\mathbb{E}[v^{-\sigma}] < \infty$ ensure that the Leibniz integral rule applies and

$$\frac{d}{dt}\mathbb{E}[(v+t)^{-\sigma}] = -\sigma \cdot \mathbb{E}[(v+t)^{-\sigma-1}], \quad \frac{d}{dt}\mathbb{E}[(v+t)^{1-\sigma}] = (1-\sigma) \cdot \mathbb{E}[(v+t)^{-\sigma}].$$

Hence Π_S is differentiable and

$$\Pi_S'(t) = \frac{\Pi_S(t)}{t} \cdot \left(1 - \sigma \cdot W(t) + (\sigma - 1) \cdot \Pi_S(t)\right),$$

where

$$W(t) \equiv t \cdot \frac{\mathbb{E}[(v+t)^{-\sigma-1}]}{\mathbb{E}[(v+t)^{-\sigma}]}.$$

The dominated convergence theorem ensures that Π_S' is continuous. Assumption 1 ensures further that $\Pi_S'(t) \geq 0$. Whenever the derivative is positive, the inverse function theorem implies that t^* is differentiable and

$$\frac{dt^*}{dR} = \frac{1}{\Pi_S'(t^*(R))}.$$

Meanwhile, whenever $\Pi_S'(t^*(R)) = 0$, the identity $\Pi_S(t^*(R)) = R$ combined with the monotonicity of t^* require that $dt^*/dR = \infty$.

We next obtain expressions for the derivatives of P_S^* and P_{AV}^*. By similar arguments to those used to establish differentaibility of Π_S, it can be shown that P_S is differentiable everywhere and

$$P_S'(t) = P_S(t) \cdot \frac{\mathbb{E}[(v+t)^{-\sigma}]}{\mathbb{E}[(v+t)^{1-\sigma}]} = P_S(t) \cdot \frac{\Pi_S(t)}{t}.$$

Then by the chain rule,

$$\frac{dP_S^*}{dR} = P_S'(t^*(R)) \cdot \frac{dt^*}{dR} = \frac{P_S^*(R)}{1 - \sigma \cdot W^*(R) + (\sigma - 1) \cdot R},$$

where $W^*(R) \equiv W(t^*(R))$. This expression remains valid when $\Pi_S'(t^*(R)) = 0$, i.e., whenever $W^*(R) = \sigma^{-1} + (1 - \sigma^{-1}) \cdot R$, if it is taken to be ∞ at such points. Meanwhile, we have straightforwardly

$$\frac{dP_{AV}^*}{dR} = P_{AV}'(\tau^*(R)) \cdot \frac{d\tau^*}{dR} = \frac{P_{AV}^*(R)}{1 + \tau^*(R)} \cdot \frac{1 + c_v/(\kappa \cdot \bar{v})}{(1-R)^2} = \frac{P_{AV}^*(R)}{1-R}.$$

We now compare these two derivatives. The Cauchy-Schwarz inequality implies that

$$\mathbb{E}[(v+t)^{-\sigma-1}] \cdot \mathbb{E}[(v+t)^{1-\sigma}] > \left(\mathbb{E}[(v+t)^{-\sigma}]\right)^2$$

and therefore

$$W(t) > t \cdot \frac{\mathbb{E}[(v+t)^{-\sigma}]}{\mathbb{E}[(v+t)^{1-\sigma}]} = \Pi_S(t)$$

for all $t > 0$. Hence $W^*(R) > R$ and

$$\frac{1}{P_S^*(R)} \frac{dP_S^*}{dR} > \frac{1}{P_{AV}^*(R)} \frac{dP_{AV}^*}{dR}$$

for all $R > 0$, establishing the second result from the proposition statement.

The results so far establish that the ratio P_S^*/P_R^* is increasing in R and initially below 1. It remains only to establish whether it crosses 1. Write the ratio as

$$\frac{P_S^*(R)}{P_{AV}^*(R)} = \frac{(\mathbb{E}[(v+t^*(R))^{1-\sigma}])^{1/(1-\sigma)} \cdot (1-R)}{(1+c_v/(\kappa \cdot \bar{v})) \cdot (\mathbb{E}[v^{1-\sigma}])^{1/(1-\sigma)}}.$$

Letting

$$\Phi(t) \equiv (\mathbb{E}[(v+t)^{1-\sigma}])^{1/(1-\sigma)} \cdot (1 - \Pi_s(t)),$$

the ratio may be equivalently written

$$\frac{P_S^*(R)}{P_{AV}^*(R)} = \frac{\Phi(t^*(R))}{(1+c_v/(\kappa \cdot \bar{v})) \cdot (\mathbb{E}[v^{1-\sigma}])^{1/(1-\sigma)}}.$$

Since t^* is increasing, it must be that Φ is as well, and so the ratio crosses 1 for some R iff

$$\Phi(\infty) > (1+c_v/(\kappa \cdot \bar{v})) \cdot (\mathbb{E}[v^{1-\sigma}])^{1/(1-\sigma)}.$$

Writing Φ as

$$\Phi(t) = (\mathbb{E}[(v/t+1)^{1-\sigma}])^{\sigma/(1-\sigma)} \cdot \mathbb{E}[v(v/t+1)^{-\sigma}]$$

allows the limit $t \to \infty$ to be evaluated using the monotone convergence theorem, yielding $\Phi(\infty) = \mathbb{E}[v]$. Hence a crossing point exists iff

$$\mathbb{E}[v] > (1+c_v/(\kappa \cdot \bar{v})) \cdot (\mathbb{E}[v^{1-\sigma}])^{1/(1-\sigma)}.$$

This condition holds iff c_v is sufficiently small.

C.7 Optimal multi-category tariff codes

As a preamble to our proofs of results regarding the optimal tariff code under multiple categories, we formally state and characterize the solution to that problem.

Given a categorization $\mathcal{P}$, the aggregate price index is

$$P = \left(\sum_{j \in \mathcal{P}} \mu_j P_j^{1-\sigma} \right)^{1/(1-\sigma)}.$$

Meanwhile, aggregate tariff income (net of verification and categorization costs) is

$$\Pi = \frac{\sum_j \mu_j T_j}{\sum_{j \in \mathcal{P}} \mu_j P_j^{1-\sigma}} - K(\mathcal{P}) \cdot c_S,$$

where

$$P_j^{1-\sigma} = \mathbb{E}_j[(v + t_j)^{1-\sigma}], \quad T_j = t_j \cdot \mathbb{E}_j[(v + t_j)^{-\sigma}]$$

for every category which is assigned a specific tariff t_j, while

$$P_j^{1-\sigma} = (1 + \tau_j)^{1-\sigma} \cdot \mathbb{E}_j[v^{1-\sigma}], \quad T_j = \frac{\tau_j \cdot \mathbb{E}_j[v^{1-\sigma}] - \mathbf{1}\{\tau_j > 0\} \cdot \frac{c_v}{\kappa} \cdot \mathbb{E}_j[v^{-\sigma}]}{(1 + \tau_j)^{\sigma}}$$

for every category which is assigned an ad valorem tariff τ_j.

Let $R_j \equiv T_j / P_j^{1-\sigma}$ be the quasi-revenue in each category and $\bar{R}(\mathcal{P}) \equiv R + K(\mathcal{P}) \cdot c_S$ be tariff income gross of categorization costs. Since $\sigma > 1$, an optimal tariff code maximizes $P^{1-\sigma}$ subject to achieving gross tariff income $\bar{R}(\mathcal{P})$. In other words, the custom house's problem is

$$\max \sum_{j \in \mathcal{P}} \mu_j P_j^{1-\sigma} \quad \text{s.t.} \quad \sum_{j \in \mathcal{P}} \mu_j P_j^{1-\sigma} \cdot (R_j - \bar{R}(\mathcal{P})) \geq 0,$$

where the maximum is over categorizations and tariff codes (i.e., tariff regimes and rates for each category).

To simplify the analysis, we pass to the modified problem in which T_j is continuous at $\tau_j = 0$ under an ad valorem tariff. This modification is innocuous: If a zero ad valorem tariff were optimal in some category, there would exist another optimal tariff code involving a zero specific tariff in that category. Hence, if there exists an optimal tariff code in the original problem, there exists one which remains optimal in the modified problem. Further, we establish below (in Lemma C.2) that optimal tariff rates are positive in the modified problem. It follows that no optimal codes are excluded by passing to the modified problem.

Proposition 4 established that, for each category and tariff regime, there exists a unique

tariff rate inducing any (quasi-)revenue in $[0, 1)$. We may therefore optimize over quasi-revenues rather than tariff rates. Let $P_j^*(R_j)$ denote the price index induced by the quasi-revenue R_j in category j under the chosen tariff regime, and define . In terms of quasi-revenues, the custom house's problem is

$$\max \sum_{j \in \mathcal{P}} \mu_j P_j^*(R_j)^{1-\sigma} \quad \text{s.t.} \quad \sum_{j \in \mathcal{P}} \mu_j P_j^*(R_j)^{1-\sigma} \cdot (R_j - \bar{R}(\mathcal{P})) \geq 0,$$

where the maximum is over categorizations, tariff regimes, and quasi-revenues. To compactify the problem, we allow $R_j = 1$ to be chosen by setting $P_j^*(1)^{1-\sigma} = 0$.

Lemma C.1. *There exists an optimal tariff code for each categorization. Further, $\boldsymbol{R}^* \ll 1$ under every optimal code.*

Proof. It suffices to show that, conditional on the vector of tariff regimes, there exists an optimal vector of quasi-revenues. In that case, an optimal tariff code is one which minimizes the price index among the (finite) set of tariff regimes coupled with a set of optimal quasi-revenues.

Fixing tariff regimes, the objective and constraint are both continuous in the vector of quasi-revenues under the convention $P_j^*(1)^{1-\sigma} = 0$ and given that T_j is continuous at $\tau_j = 0$ in the modified problem. The feasible set is additionally non-empty, since the choice of $R_j = R$ for all j satisfies the constraint. Since each quasi-revenue must lie in $[0, 1]$, the feasible set is therefore compact. Hence there must exist an optimal vector of quasi-revenues.

Now, suppose that some $R_j^* = 1$ under an optimal code. That choice corresponds to $P_j(R_j^*)^{1-\sigma} = 0$. Modifying the tariff code so that $R_j = R$ leaves the constraint function unchanged and raises the objective, contradicting the presumed optimality of the original code. □

For each category, let $W_j^*(R_j) = R_j$ if the category uses an ad valorem tariff, and otherwise let $W_j^*(R_j)$ be as defined in the proof of Proposition 5.

Lemma C.2. *Under any optimal tariff code, all quasi-revenues are positive and $W_j^*(R_j^*)$ is equalized across all categories.*

Proof. Fix an optimal tariff code with quasi-revenues $\boldsymbol{R}^* \ll 1$. Suppose first that some category j is assigned a specific tariff and $\frac{dP_j^*}{dR_j}(R_j^*) = \infty$. This choice is consistent with optimality only if the same is true for all other categories; for otherwise a reduction in the price index could be achieved at no cost to revenue by slightly reducing the quasi-revenue in that category and increasing the quasi-revenue in some category satisfying $\frac{dP_j^*}{dR_j}(R_j^*) < \infty$.

Hence $W_j^*(R_j^*) = \infty$ for all categories. Further, $\Pi_S'(0) = 1/\bar{v} > 0$, and so $R_j^* > 0$ in all categories.

Going forward, we suppose that $\frac{dP_j^*}{dR_j}(R_j^*) < \infty$ for all categories. In that case, the objective and constraints are locally smooth in the quasi-revenues around the optimum. Holding fixed the pattern of tariff regimes, the optimal quasi-revenues must minimize the price index subject to the revenue constraint. Since the gradient of the constraint function is nonvanishing everywhere, there must therefore exist a Lagrange multiplier $\lambda > 0$ such that the optimal quasi-revenues $\boldsymbol{R}^*$ are a stationary point of the Lagrangian

$$\mathscr{L}(\boldsymbol{R}) \equiv \sum_{j \in \mathcal{P}} \mu_j \mathscr{L}_j(R_j),$$

where

$$\mathscr{L}_j(R_j) \equiv P_j^*(R_j)^{1-\sigma} \cdot \Big(1 + \lambda \cdot (R_j - R)\Big).$$

Differentiating $\mathscr{L}_j$ and using the expressions for dP_j^*/dR_j obtained in the proof of Proposition 5, we obtain

$$\frac{d\mathscr{L}_j}{dR_j} = \lambda \cdot P_j^*(R_j)^{1-\sigma} \cdot \frac{(\sigma - 1) \cdot (R - \lambda^{-1}) + 1 - \sigma \cdot W_j^*(R_j)}{1 - R_j - \sigma \cdot (W_j^*(R_j) - R_j)}$$

for every $R_j < 1$. (Recall that $R_j = 1$ cannot arise under an optimal tariff code.) The proof of Proposition 5 establishes that for a specific category, W_j^* is increasing, continuous, and unbounded in R_j and vanishes when $R_j = 0$. The same is trivially true for any ad valorem category. It follows that each derivative vanishes for at most one value of $R_j < 1$.

If $\lambda \leq 1/(R + 1/(1-\sigma))$, then these derivatives are negative for each category and every $R_j \in (0, 1)$, yielding a unique stationary point at $R_j = 0$ for all j. These quasi-revenues violate the constraint and so cannot correspond to an optimal code. It must therefore be that $\lambda > 1/(R + 1/(1-\sigma))$. In that case, there exists a unique $R_j \in (0, 1)$ at which each $d\mathscr{L}_j/dR_j$ crosses zero, characterized by

$$W_j^*(R_j) = \sigma^{-1} + (1 - \sigma^{-1}) \cdot (R - \lambda^{-1}).$$

Since this stationary point is unique, the quasi-revenues $\boldsymbol{R}^*$ must satisfy this identity. In particular, all quasi-revenues are positive, and $W_j^*(R_J^*)$ is equalized across categories. □

Lemma C.3. *Under an optimal tariff code with quasi-revenues $\boldsymbol{R}^*$, the tariff regime in each category j must be optimal in the single-category problem with value distribution F_j and revenue goal R_j^*.*

Proof. For each category $j \in \mathcal{P}$, let

$$E_j(\boldsymbol{R}) \equiv \frac{\mu_j P_j^*(R_j)^{1-\sigma}}{\sum_{k\in\mathcal{P}} \mu_k P_k^*(R_k)^{1-\sigma}}$$

is the representative consumer's expenditure share on goods in the category. The government's net tariff income may be written in terms of these expenditure shares as

$$\Pi(\boldsymbol{R}) = \sum_{j\in\mathcal{P}} E_j(\boldsymbol{R}) \cdot R_j.$$

Fix an optimal tariff code, and suppose that the claimed property does not hold in some category j. Then in that category, the tariff regime could be modified in order to lower P_j^* while achieving the same quasi-revenue R_j^*. Consider a further modification to the code which raises R_j to return P_j^* to its level under the original code. The resulting code preserves the original aggregate price index and expenditure shares, while raising quasi-revenue in one category. Aggregate tariff income must therefore rise, relaxing the constraint. Finally, modify the code further by slightly lowering the quasi-revenue in category j. This modification lowers the aggregate price index while continuing to satisfy the revenue goal, contradicting the presumed optimality of the original code. □

C.8 Proof of Proposition 6

Fix an optimal tariff code and any two categories, which for concreteness we refer to as 1 and 2. If the tariff regime is ad valorem in each category, then Lemma C.2 implies that $R_1^* = R_2^*$ i.e., quasi-revenues are equalized across categories. Since tariff rates and quasi-revenues are related via the expression

$$\tau_j^*(R_j) = \frac{R_j + c_v/(\kappa \cdot \bar{v}_j)}{1 - R_j},$$

it follows that optimal tariff rates cannot be equal if $\bar{v}_1 \neq \bar{v}_2$, which is the expression in the proposition statement.

Suppose instead that the tariff regime is specific in each category. An argument closely analogous to the proof of Lemma C.3 can be used to establish that the quasi-revenues in these categories must also be optimal in the 2-category problem involving categories 1 and 2, with shares $\mu_j/(\mu_1 + \mu_2)$ in each category and revenue goal

$$R^{12} = \frac{\sum_{j=1}^2 E_j^* R_j^*}{\sum_{j=1}^2 E_j^*},$$

where E_j^* are the expenditure shares in each category under the optimal code. Let t^U be

the uniform specific tariff which achieves the revenue goal in the 2-category problem. Then if the two categories are optimally assigned the same tariff, it must be that $R_1^* = R_1^U$ and $R_2^* = R_2^U$, where R_1^U and R_2^U are the quasi-revenues induced by tariff t^U. Lemma C.2 implies that these these quasi-revenues cannot be optimal unless $W_1^*(R_1^U) = W_2^*(R_2^U)$. Recalling the definition of W in the proof of Proposition 5, this condition may be equivalently written $W_1(t^U) = W_2(t^U)$, where

$$W_j(t) = t \cdot \frac{\mathbb{E}_j\left[(v+t)^{-\sigma-1}\right]}{\mathbb{E}_j\left[(v+t)^{-\sigma}\right]}.$$

Rearranging the condition $W_1(t^U) \neq W_2(t^U)$ yields the expression in the proposition statement.

C.9 Proof of Proposition 7

The proof of Proposition 5 established that it is optimal to impose a specific tariff for all revenue goals iff

$$\frac{\mathbb{E}[v_n]}{\left(\mathbb{E}[v_n^{1-\sigma}]\right)^{1/(1-\sigma)}} \leq 1 + \frac{c_v}{\kappa} \cdot \frac{\mathbb{E}[v_n^{-\sigma}]}{\mathbb{E}[v_n^{1-\sigma}]}.$$

The uniform integrability conditions of homogenization ensure that the Vitali convergence theorem apply to each expectation, so that

$$\mathbb{E}[v_n] \to \bar{v}, \quad \mathbb{E}[v_n^{1-\sigma}] \to \bar{v}^{1-\sigma}, \quad \mathbb{E}[v_n^{-\sigma}] \to \bar{v}^{-\sigma}.$$

The lhs of the previous inequality therefore converges to 1, while the rhs converges to $1 + c_v/(\kappa \cdot \bar{v}) > 1$. The inequality therefore holds for sufficiently large n.

C.10 Proof of Corollary 1

This result follows from Proposition 7 combined with Lemma C.3.

C.11 Proof of Proposition 8

Lemma C.2 established that $W_j^*(R_j^*)$ is equalized across categories under an optimal tariff code $\boldsymbol{R}^*$. Recall that $W_j^*(R_j) = R_j$ within an ad valorem category by definition, while the proof of Proposition 5 established that $W_j^*(R_j) > R_j$ within a specific category. As a result, quasi-revenues must be higher in ad valorem categories than specific categories. Since the quasi-revenue is precisely the burden of taxation within a category, the result follows.

C.12 Proof of Proposition 9

Lemma C.2 established that W_j^* is equalized across categories under an optimal tariff code. Since $W_j^*(R_j) = R_j$ within an ad valorem category, quasi-revenues are optimally equalized across ad valorem categories. In such a category, the tariff rate can be related to the quasi-

revenue via the expression

$$\tau_j^*(R_j) = \frac{R_j + c_v/(\kappa \cdot \bar{v}_j)}{1 - R_j}.$$

As a result, tariff rates are lower the higher is the unit value of consumption.

C.13 Proof of Proposition 10

Fix an optimal tariff code with quasi-revenues $\boldsymbol{R}^*$. Suppose that categories j and k are scale-ordered, with k the higher-value category. Suppose by way of contradiction that category j uses an ad valorem tariff while k uses a specific tariff under the optimal tariff code. Proposition 8 then implies that $R_j^* > R_k^*$. Additionally, Lemma C.3 implies that an ad valorem tariff must minimize P_j subject to $R_j \geq R_j^*$, while a specific tariff minimizes P_k subject to $R_k \geq R_k^*$.

To reach a contradiction, we establish that the (single-category) revenue threshold at which an ad valorem tariff becomes optimal is falling in the scale factor α. Fixing a baseline value distribution F and letting $v \sim F$, it is straightforward that the price index and tariff income under scale factor α and specific tariff $t = \alpha \cdot \bar{t}$ are

$$P_S(\bar{t}; \alpha) = \alpha \cdot \left(\mathbb{E}[(v + \bar{t})^{1-\sigma}]\right)^{1/(1-\sigma)}, \quad \Pi_S(t; \alpha) = \bar{t} \cdot \frac{\mathbb{E}[(v + \bar{t})^{-\sigma}]}{\mathbb{E}[(v + \bar{t})^{1-\sigma}]}.$$

It follows immediately that $P_S^*(R; \alpha) = \alpha \cdot P_S^*(R; 1)$. Meanwhile, the same expressions under an ad valorem tariff $\tau > 0$ are

$$P_{AV}(\tau; \alpha) = \alpha \cdot (1 + \tau) \cdot \left(\mathbb{E}[v^{1-\sigma}]\right)^{1/(1-\sigma)}, \quad \Pi_{AV}(\tau; \alpha) = \frac{\tau}{1 + \tau} - \alpha^{-1} \cdot \frac{c_v/(\kappa \cdot \bar{v})}{1 + \tau},$$

where $\bar{v} = \mathbb{E}[v^{1-\sigma}]/\mathbb{E}[v^{-\sigma}]$ is the unit value of consumption when $\alpha = 1$. Hence

$$P_{AV}^*(R; \alpha) = \alpha \cdot \frac{1 + \alpha^{-1} \cdot c_v/(\kappa \cdot \bar{v})}{1 - R} \cdot \left(\mathbb{E}[v^{1-\sigma}]\right)^{1/(1-\sigma)}.$$

Thus $P_{AV}^*/(R; \alpha)/P_S^*(R; \alpha)$ is declining in α, implying that the threshold $\overline{R}$ at which an ad valorem tariff is optimal declines in α as well.

C.14 Proof of Proposition 11

Fix c_v and hold fixed the rest of the tariff code. Let $R_{jk} \in (0, 1)$ denote the net revenue that must be raised from goods in $j \cup k$.

Let $P_{jk}^{\text{pool}}(R; c_v)$ denote the minimum attainable price index when goods in $j \cup k$ are forced to share a common tariff regime and rate and must raise net revenue R. Let $P_{jk}^{\text{split}}(R; c_v)$ denote the corresponding minimum when j and k may be assigned separate tariff regimes and rates, abstracting from the splitting cost.

By assumption,

$$P_{jk}^{\text{split}}(R_{jk}; c_v) < P_{jk}^{\text{pool}}(R_{jk}; c_v).$$

If the category is split, the government must additionally pay the fixed cost c_S. Since the government's objective is to raise revenue net of collection costs, the split code must therefore raise net revenue $R_{jk} + c_S$ from goods in $j \cup k$. Thus the relevant comparison is between

$$P_{jk}^{\text{split}}(R_{jk} + c_S; c_v) \quad \text{and} \quad P_{jk}^{\text{pool}}(R_{jk}; c_v).$$

We next claim that the function $R \mapsto P_{jk}^{\text{split}}(R; c_v)$ is continuous and strictly increasing on $(0, 1)$. To see this, fix any pattern of tariff regimes on j and k. Conditional on that regime pattern, the minimized price index is obtained by solving the two-category version of the problem studied in the appendix. By the same arguments used to establish existence of an optimal tariff code and continuity of the single-category price indices, the minimized price index under that regime pattern is continuous in R. Conditional on any fixed regime pattern, raising the required revenue R requires weakly higher quasi-revenues in at least one category, and Proposition 5 implies that the minimized price index is strictly increasing in those quasi-revenues. Hence the minimized price index under that regime pattern is strictly increasing in R. Since there are only finitely many regime patterns, $P_{jk}^{\text{split}}(R; c_v)$, which is the lower envelope across those regime patterns, is itself continuous and strictly increasing.

Further, for every regime pattern the minimized price index diverges as $R \uparrow 1$, and therefore

$$P_{jk}^{\text{split}}(R; c_v) \to \infty \qquad \text{as } R \uparrow 1.$$

Since $P_{jk}^{\text{pool}}(R_{jk}; c_v)$ is finite, the intermediate value theorem implies that there exists a unique

$$\bar{c}_{S,jk}(c_v) \in (0, 1 - R_{jk})$$

such that

$$P_{jk}^{\text{split}}(R_{jk} + \bar{c}_{S,jk}(c_v); c_v) = P_{jk}^{\text{pool}}(R_{jk}; c_v).$$

Because $P_{jk}^{\text{split}}(R; c_v)$ is strictly increasing in R, it follows that

$$P_{jk}^{\text{split}}(R_{jk} + c_S; c_v) < P_{jk}^{\text{pool}}(R_{jk}; c_v)$$

whenever $c_S < \bar{c}_{S,jk}(c_v)$, while the reverse inequality holds whenever $c_S > \bar{c}_{S,jk}(c_v)$. Hence the split is optimal below the cutoff, pooling is optimal above it, and the planner is indifferent at equality.

C.15 Proof of Proposition 12

Fix a category j and a quasi-revenue goal $R_j \in (0,1)$.

Under a specific tariff, the price index $P^*_{S,j}(R_j)$ depends only on the value distribution in category j and the quasi-revenue goal R_j. It is therefore independent of c_v.

Under an ad valorem tariff, Proposition 4 applied to category j implies that the unique tariff rate raising quasi-revenue R_j is

$$\tau^*_j(R_j) = \frac{R_j + c_v/(\kappa \cdot \bar{v}_j)}{1 - R_j}, \qquad \bar{v}_j \equiv \frac{\mathbb{E}_j[v^{1-\sigma}]}{\mathbb{E}_j[v^{-\sigma}]}.$$

Hence the associated price index is

$$P^*_{AV,j}(R_j; c_v) = (1 + \tau^*_j(R_j)) \cdot \left(\mathbb{E}_j[v^{1-\sigma}]\right)^{1/(1-\sigma)} = \frac{1 + c_v/(\kappa \cdot \bar{v}_j)}{1 - R_j} \cdot \left(\mathbb{E}_j[v^{1-\sigma}]\right)^{1/(1-\sigma)}.$$

This expression is affine, and therefore continuous and strictly increasing, in c_v.

Now define

$$D_j(c_v; R_j) \equiv P^*_{AV,j}(R_j; c_v) - P^*_{S,j}(R_j).$$

Since $P^*_{S,j}(R_j)$ is constant in c_v while $P^*_{AV,j}(R_j; c_v)$ is strictly increasing, $D_j(c_v; R_j)$ is continuous and strictly increasing in c_v.

If $D_j(c_v; R_j) \leq 0$ for every $c_v \geq 0$, set $\bar{c}_{v,j}(R_j) = \infty$. If $D_j(0; R_j) > 0$, set $\bar{c}_{v,j}(R_j) = 0$. Otherwise, by continuity and strict monotonicity there exists a unique finite $\bar{c}_{v,j}(R_j) > 0$ such that

$$D_j(\bar{c}_{v,j}(R_j); R_j) = 0.$$

In all cases, ad valorem is optimal whenever $c_v < \bar{c}_{v,j}(R_j)$, specific is optimal whenever $c_v > \bar{c}_{v,j}(R_j)$, and the planner is indifferent only at equality.

C.16 Proof of Proposition 13

Fix $c_S > 0$ and consider a candidate split of a category into two groups of goods, j and k, holding fixed the rest of the tariff code. Let $R_{jk} \in (0,1)$ denote the net revenue that must be raised from goods in $j \cup k$.

As in the proof of Proposition 11, let $P^{\text{pool}}_{jk}(R; c_v)$ denote the minimum attainable price index when j and k are forced to share a common tariff regime and rate and must raise net revenue R, and let $P^{\text{split}}_{jk}(R; c_v)$ denote the corresponding minimum when they may be assigned separate tariff regimes and rates, abstracting from the splitting cost.

We first evaluate these objects at $c_v = 0$. In the proof of Proposition 5, we established

that

$$\frac{d}{dR}\log P_S^*(R) > \frac{d}{dR}\log P_{AV}^*(R) \qquad \text{for all } R > 0.$$

When $c_v = 0$, the two price indices coincide at $R = 0$. It follows that

$$P_{AV}^*(R) < P_S^*(R) \qquad \text{for every } R > 0.$$

Thus, when verification costs are zero, ad valorem strictly dominates specific in every single-category problem with positive quasi-revenue.

Therefore, in both the pooled and split problems for goods in $j \cup k$, the minimizing tariff code at $c_v = 0$ uses ad valorem tariffs throughout. In the split problem, Lemma C.2 implies that quasi-revenues are equalized across categories. Since $W_j^*(R_j) = R_j$ in every ad valorem category, it follows that

$$R_j = R_k.$$

But aggregate net tariff income from goods in $j \cup k$ is a weighted average of these quasi-revenues, and this average must equal R_{jk}. Hence

$$R_j = R_k = R_{jk}.$$

The ad valorem rate solving the single-category problem with quasi-revenue R_{jk} and $c_v = 0$ is

$$\tau = \frac{R_{jk}}{1 - R_{jk}},$$

which is independent of the category. Thus, when $c_v = 0$, both the pooled and split problems induce the same uniform ad valorem tariff on goods in $j \cup k$, and so

$$P_{jk}^{\text{split}}(R_{jk}; 0) = P_{jk}^{\text{pool}}(R_{jk}; 0).$$

If the category is actually split, however, the government must additionally pay the fixed cost c_S. Hence the relevant comparison is between

$$P_{jk}^{\text{split}}(R_{jk} + c_S; 0) \quad \text{and} \quad P_{jk}^{\text{pool}}(R_{jk}; 0).$$

Since the function $R \mapsto P_{jk}^{\text{split}}(R; 0)$ is strictly increasing, we obtain

$$P_{jk}^{\text{split}}(R_{jk} + c_S; 0) > P_{jk}^{\text{split}}(R_{jk}; 0) = P_{jk}^{\text{pool}}(R_{jk}; 0).$$

Thus, when $c_v = 0$, pooling is strictly optimal.

Finally, by the same continuity argument used in the proof of Proposition 11, both

$$P_{jk}^{\text{split}}(R_{jk} + c_S; c_v) \quad \text{and} \quad P_{jk}^{\text{pool}}(R_{jk}; c_v)$$

are continuous in c_v. Since pooling is strictly optimal at $c_v = 0$, it remains strictly optimal for all sufficiently small positive c_v. Therefore there exists

$$\underline{c}_{v,jk}(c_S) > 0$$

such that pooling is strictly optimal whenever $c_v < \underline{c}_{v,jk}(c_S)$.

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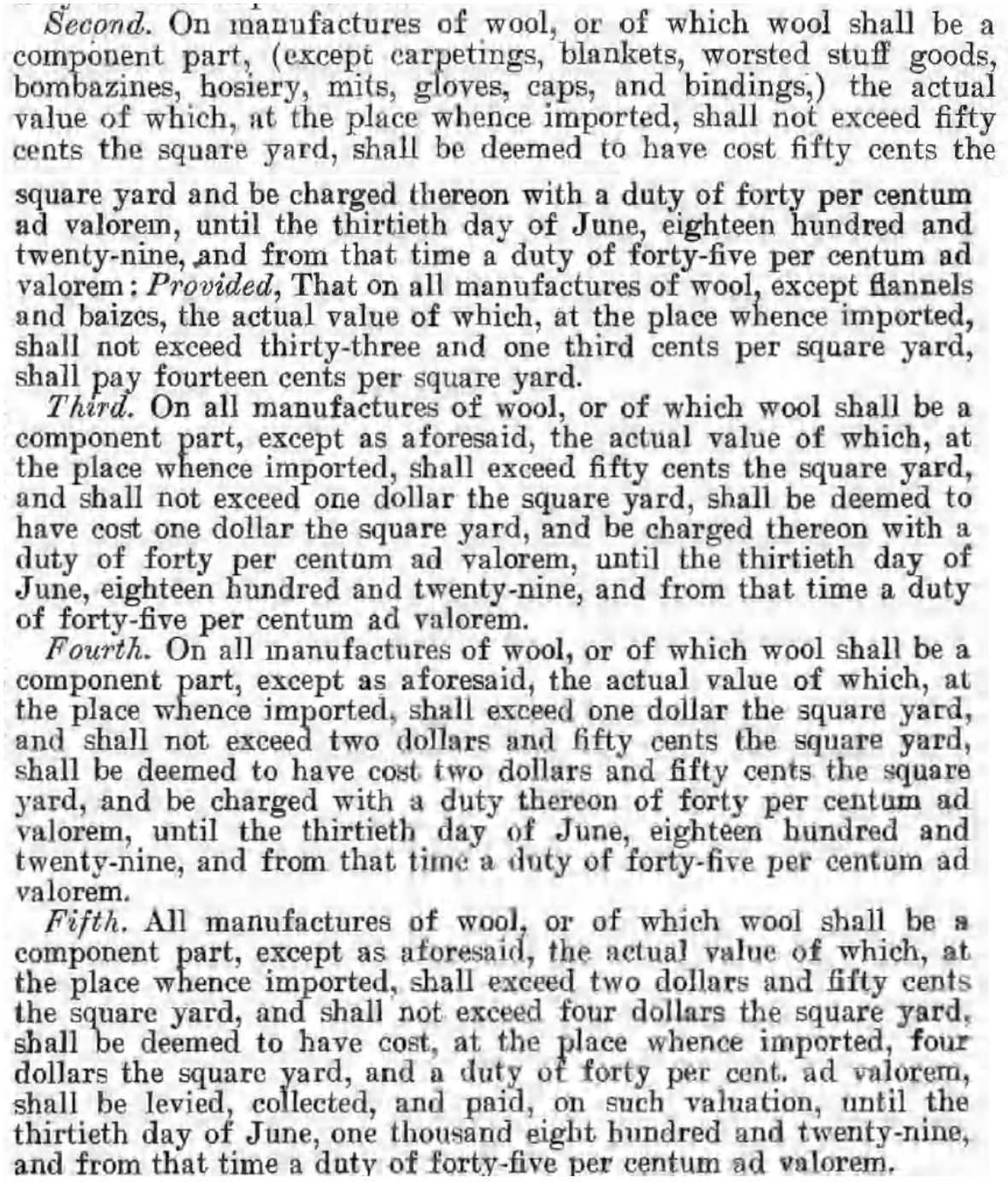
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Figure A.1: Manufactured Wool Tariffs, 1828



Second. On manufactures of wool, or of which wool shall be a component part, (except carpetings, blankets, worsted stuff goods, bombazines, hosiery, mits, gloves, caps, and bindings,) the actual value of which, at the place whence imported, shall not exceed fifty cents the square yard, shall be deemed to have cost fifty cents the square yard and be charged thereon with a duty of forty per centum ad valorem, until the thirtieth day of June, eighteen hundred and twenty-nine, and from that time a duty of forty-five per centum ad valorem: *Provided*, That on all manufactures of wool, except flannels and baizes, the actual value of which, at the place whence imported, shall not exceed thirty-three and one third cents per square yard, shall pay fourteen cents per square yard.

Third. On all manufactures of wool, or of which wool shall be a component part, except as aforesaid, the actual value of which, at the place whence imported, shall exceed fifty cents the square yard, and shall not exceed one dollar the square yard, shall be deemed to have cost one dollar the square yard, and be charged thereon with a duty of forty per centum ad valorem, until the thirtieth day of June, eighteen hundred and twenty-nine, and from that time a duty of forty-five per centum ad valorem.

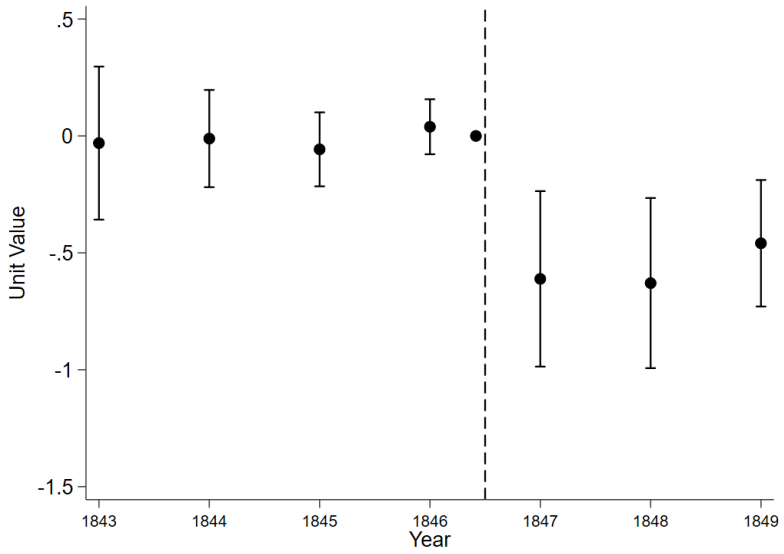
Fourth. On all manufactures of wool, or of which wool shall be a component part, except as aforesaid, the actual value of which, at the place whence imported, shall exceed one dollar the square yard, and shall not exceed two dollars and fifty cents the square yard, shall be deemed to have cost two dollars and fifty cents the square yard, and be charged with a duty thereon of forty per centum ad valorem, until the thirtieth day of June, eighteen hundred and twenty-nine, and from that time a duty of forty-five per centum ad valorem.

Fifth. All manufactures of wool, or of which wool shall be a component part, except as aforesaid, the actual value of which, at the place whence imported, shall exceed two dollars and fifty cents the square yard, and shall not exceed four dollars the square yard, shall be deemed to have cost, at the place whence imported, four dollars the square yard, and a duty of forty per cent. ad valorem, shall be levied, collected, and paid, on such valuation, until the thirtieth day of June, one thousand eight hundred and twenty-nine, and from that time a duty of forty-five per centum ad valorem.

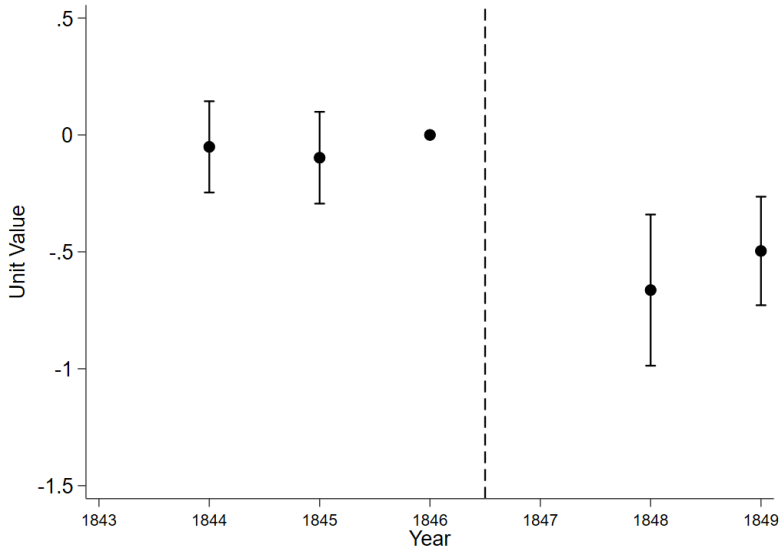
Notes: This figure shows the language of the May 19, 1828 Tariff bill, relating to manufactured wool.

Figure A.2: Unit Values: Event Study Around Removing All Specific Tariffs

Panel A: Full Sample



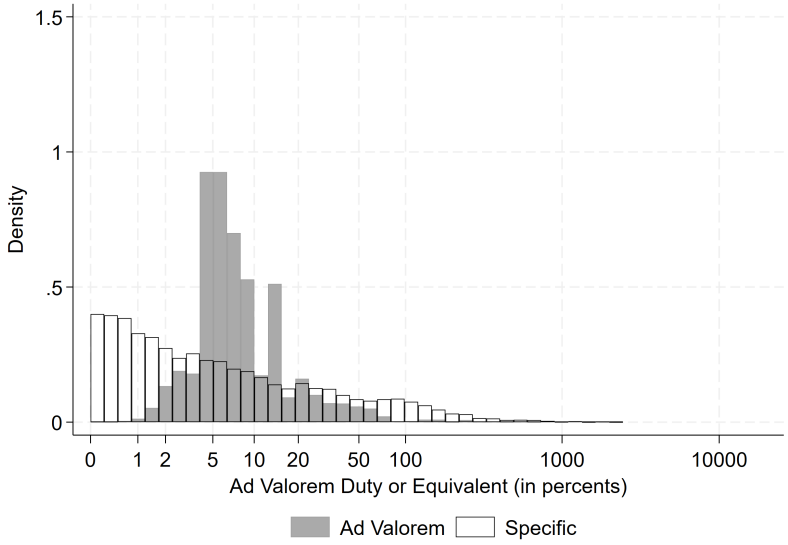
Panel B: Full Years Only



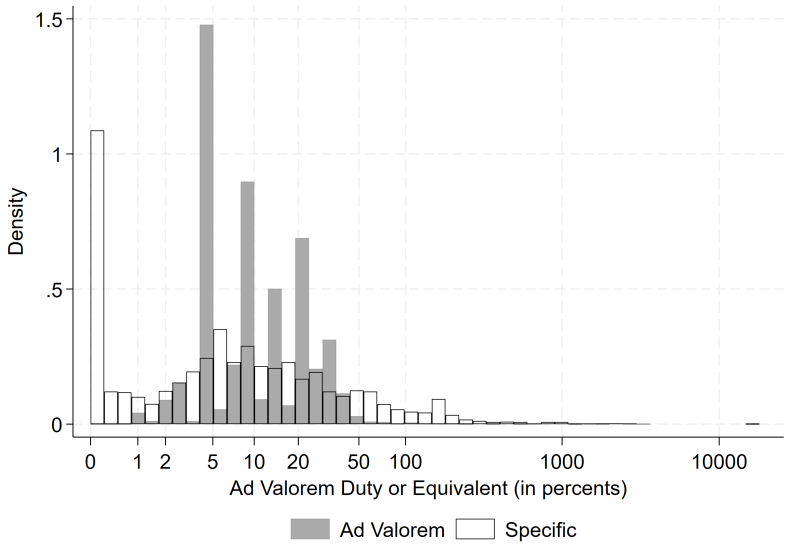
Notes: This figure plots the coefficients of a regression comparing the unit values for the initially-specific goods listed in the 1849 Annual Report of the Treasury of the Secretary for 1843–1849 relative to the goods without specific tariffs for which unit values were consistently reported (two types of coffee, two types of tea, and wool). The vertical line represents the implementation of the Walker Tariff in 1846, which removed all specific tariffs. Panel A shows data from all of the import statistics 1843–1849, and Panel B shows data only for the import statistics with 12 months of reporting (dropping 1843 and two reports for 1847, one for each tariff regime). Results clustered by good. Data: *Commerce and Navigation of the United States.*

Figure A.3: Modern Distribution of Tariff Rates by Tariff Type

Panel A: OECD



Panel B: Non-OECD



Notes: This figure plots distribution of ad valorem equivalent tariff rates by specific and ad valorem tariffs. Panel A plots the distributions for countries in the OECD, and Panel B plots the distributions for countries not in the OECD. We only consider specific and ad valorem tariffs (dropping goods on the free list, and dropping extremely large ad valorem equivalent rates, where ln(ave)¿10). All countries are included in their most recent year. Source: WTO Integrated Database and UN Trade Analysis Information System.

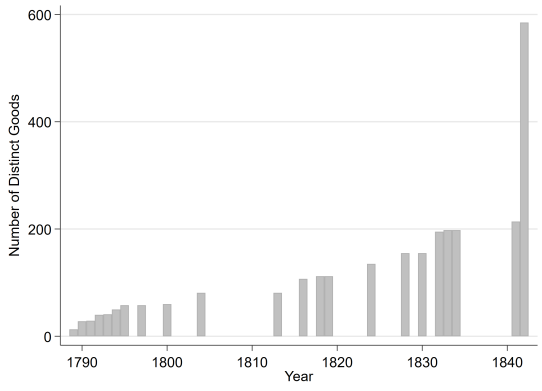
Figure A.4: Unit Values for Wool



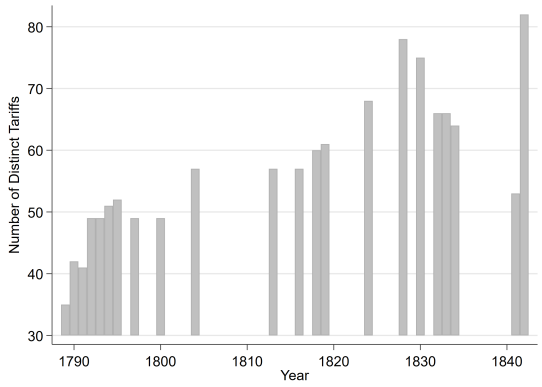
Notes: This figure plots the average reported unit values for unmanufactured wool. Before 1846, there were two tariffs, depending on the price: if the wool was seven cents or under per pound, the duy was 5%; otherwise the duty was of three cents per pound plus 30%. The average ad valorem equivalent tariff was 38%. After 1846, all unmanufactured wool had an ad valorem tariff of 30%. Data: *Commerce and Navigation of the United States* and *Tariff Acts of the United States*

Figure A.5: Increasing Tariff Complexity Over Time, Non-Manufactured Goods

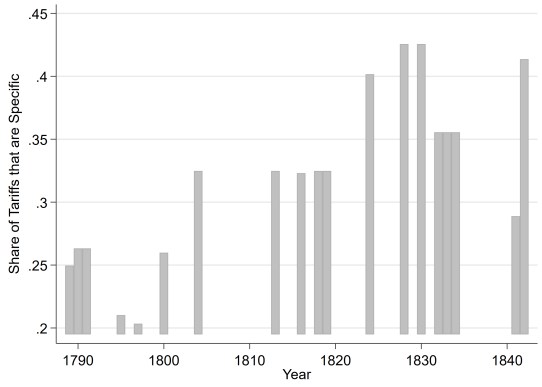
Panel A: Number of Goods Defined by Each Year



Panel B: Number of Distinct Tariffs Over Time

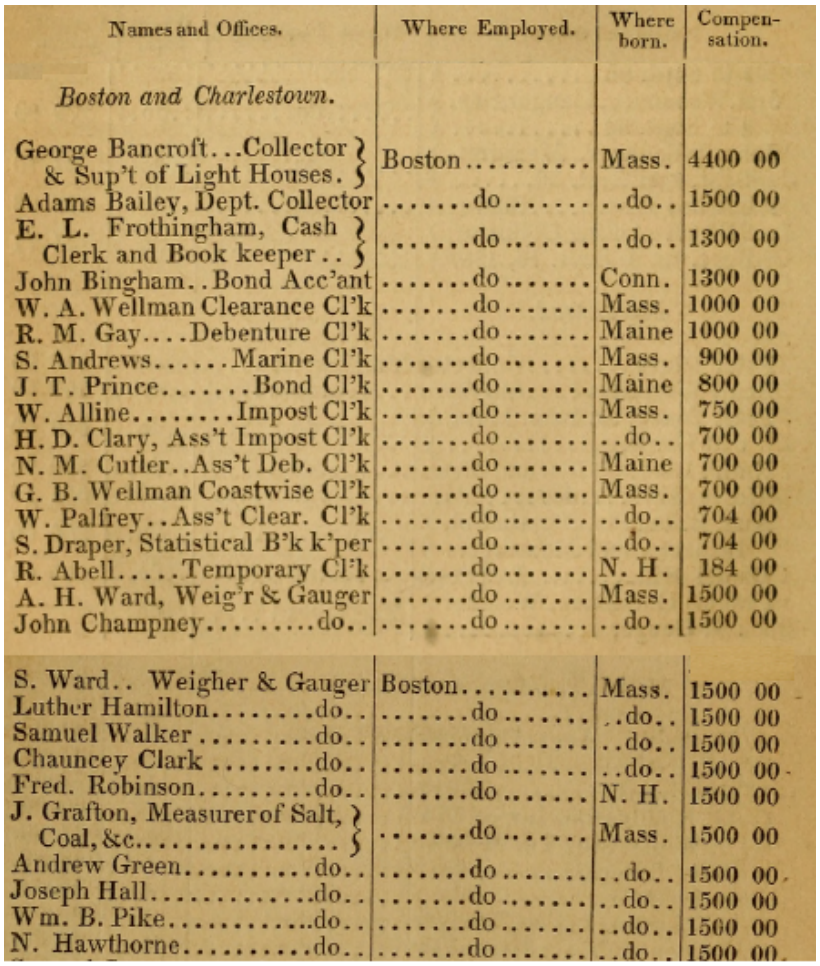


Panel C: Share of Goods with Specific Tariffs Over Time



Notes: This figure plots the evolution of the complexity of the American tariff code over time. In this figure, we limit the sample to goods that are not manufactured. Panel A plots the number of goods defined for each year t. The set of goods expands over time. A good is defined as a set of varieties such that: (i) in every year from 1789 through t, all varieties in the set face the same tariff; and (ii) the set is physically distinct from any other set that follows the same sequence of tariffs over the time period. Panel B plots the number of distinct tariffs that are in effect for each year. Panel C plots the share of goods that have a specific tariff. Source: *Tariff Acts of the United States*.

Figure A.6: Directory of Customs Officials in Boston, 1839

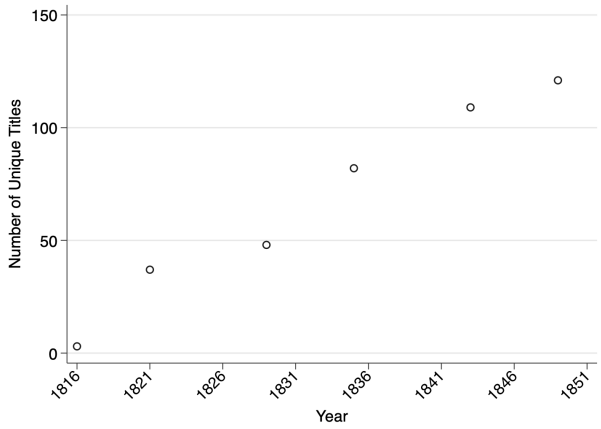


Names and Offices.	Where Employed.	Where born.	Compensation.
Boston and Charlestown.			
George Bancroft...Collector & Sup't of Light Houses.	Boston.....	Mass.	4400 00
Adams Bailey, Dept. Collector	.....do.....	..do..	1500 00
E. L. Frothingham, Cash Clerk and Book keeper..	.....do.....	..do..	1300 00
John Bingham..Bond Acc'ant	.....do.....	Conn.	1300 00
W. A. Wellman Clearance Cl'k	.....do.....	Mass.	1000 00
R. M. Gay....Debenture Cl'k	.....do.....	Maine	1000 00
S. Andrews.....Marine Cl'k	.....do.....	Mass.	900 00
J. T. Prince.....Bond Cl'k	.....do.....	Maine	800 00
W. Alline.....Impost Cl'k	.....do.....	Mass.	750 00
H. D. Clary, Ass't Impost Cl'k	.....do.....	..do..	700 00
N. M. Cutler..Ass't Deb. Cl'k	.....do.....	Maine	700 00
G. B. Wellman Coastwise Cl'k	.....do.....	Mass.	700 00
W. Palfrey..Ass't Clear. Cl'k	.....do.....	..do..	704 00
S. Draper, Statistical B'k k'per	.....do.....	..do..	704 00
R. Abell.....Temporary Cl'k	.....do.....	N. H.	184 00
A. H. Ward, Weig'r & Gauger	.....do.....	Mass.	1500 00
John Champney.....do..	.....do.....	..do..	1500 00
S. Ward.. Weigher & Gauger	Boston.....	Mass.	1500 00
Luther Hamilton.....do..	.....do.....	..do..	1500 00
Samuel Walker.....do..	.....do.....	..do..	1500 00
Chauncey Clark.....do..	.....do.....	..do..	1500 00
Fred. Robinson.....do..	.....do.....	N. H.	1500 00
J. Grafton, Measurer of Salt, Coal, &c.....	.....do.....	Mass.	1500 00
Andrew Green.....do..	.....do.....	..do..	1500 00
Joseph Hall.....do..	.....do.....	..do..	1500 00
Wm. B. Pike.....do..	.....do.....	..do..	1500 00
N. Hawthorne.....do..	.....do.....	..do..	1500 00

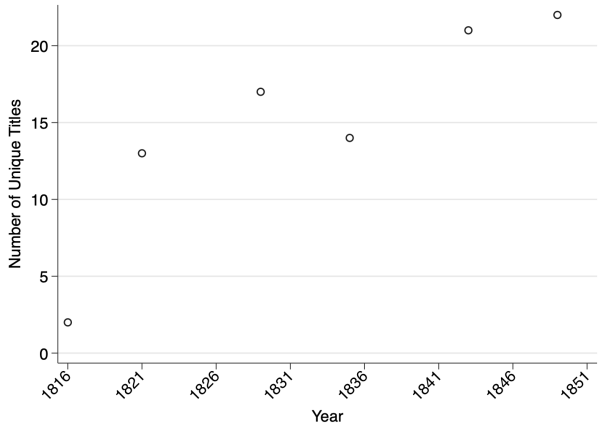
Notes: This figure shows excerpted scans from the 1839 *Official Register of the United States*, showing some of the officials in the Boston Customs House. Many had prominent careers beyond Customs. George Bancroft, the Collector and Superintendent of Light Houses, was also a historian and politician. Nathaniel Hawthorne, a Measurer of Salt & Coal, was also a writer.

Figure A.7: Alternative Measures of Customs House Expansion

Panel A: All Customs Occupations Over Time

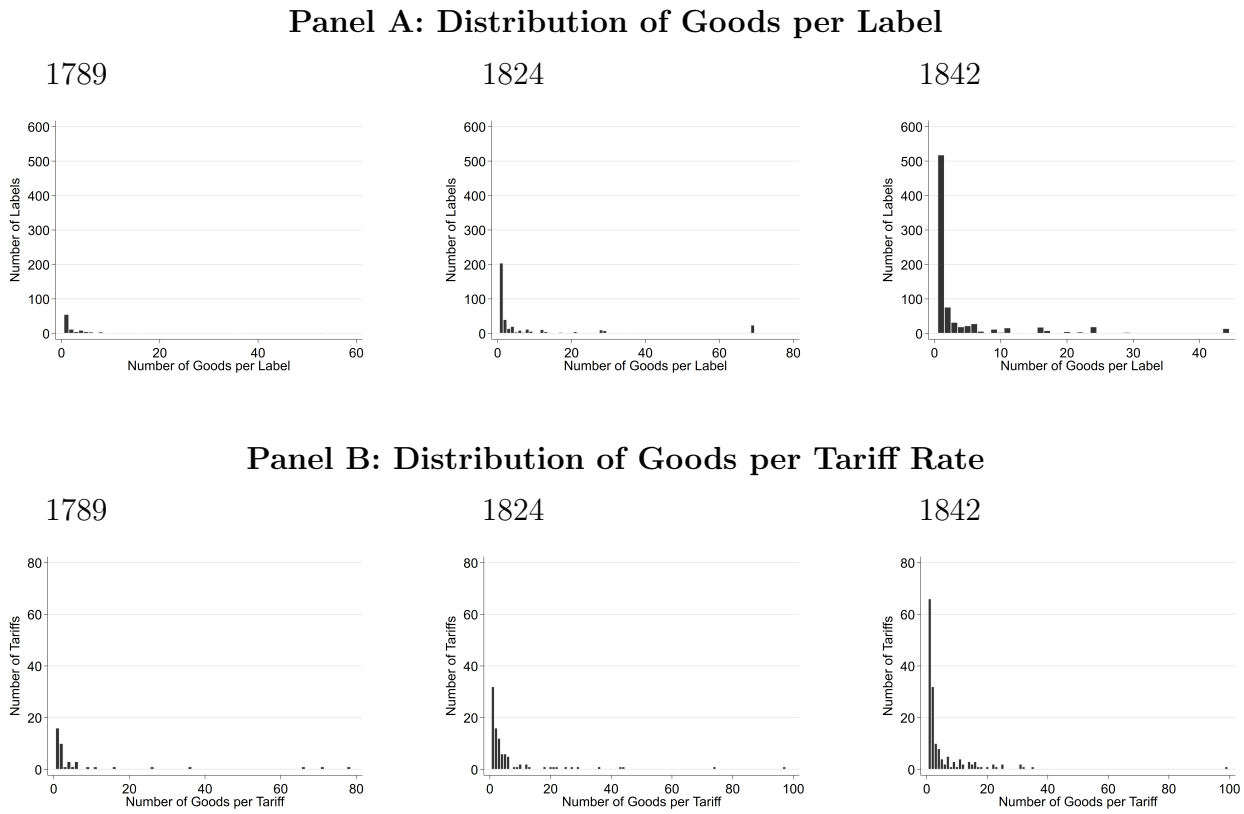


Panel B: Core Customs Occupations Over Time



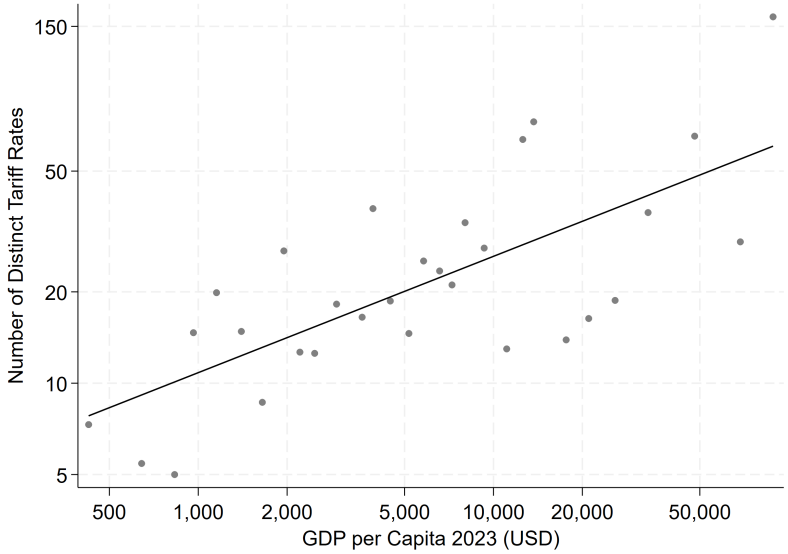
Notes: This figure plot the number of distinct occupational titles at the Customs house. Panel A includes any distinct occupational title. Panel B only focuses on core tasks: those engaged in collections, inspections, quantification, appraisal/examination, marking, and proving.

Figure A.8: Concentration of Groupings Over Time



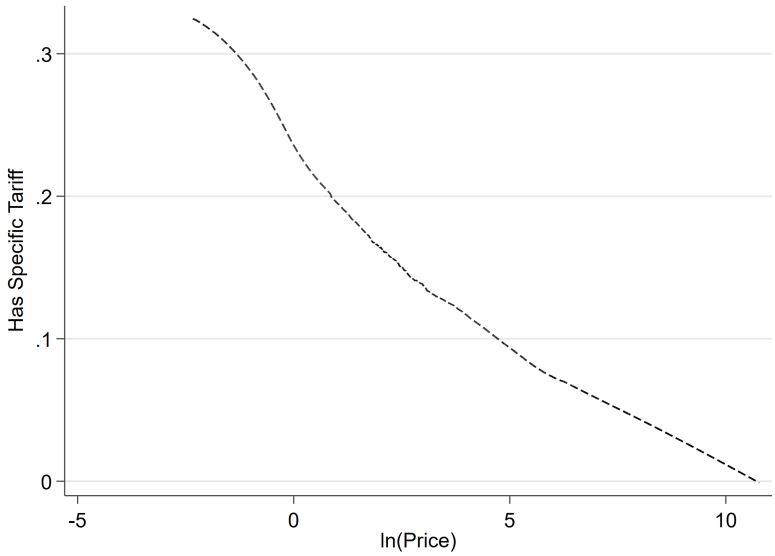
Notes: This figure plots the evolution of the disaggregation of the American tariff code over time, by plotting the number of goods associated with each grouping. Panel A shows the distribution of how many goods are associated with each label, and Panel B shows the distribution of how many goods are associated with each tariff rate, in 1789, 1824, and 1842. In 1789, there are 920 goods with the same label and tariff ("All other goods, wares, and merchandise," with a 5% tariff), which are not shown in the graphs. Source: *Tariff Acts of the United States*.

Figure A.9: Development and Distinct Tariff Rates



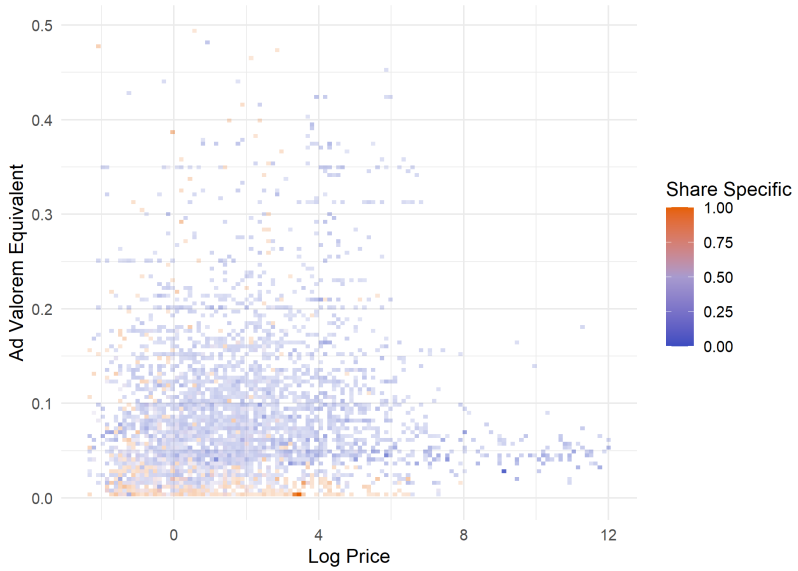
Notes: This figure shows a binscatter of the relationship between modern development and the complexity of the tariff code. Source: WTO Integrated Database and WDI.

Figure A.10: 1980s American Imports: Lowess of Unit Values and Specificity



Notes: This figure shows the relationship between unit values, ad valorem equivalents, and specific in American imports 1980-1985. The independent variable is ln(Price) and the outcome is if an import has a specific tariff. We only include imports whose ad valorem equivalent tariff is below the maximum ad valorem rate, and we trim unit values at the 1% extremes. Ad valorem equivalents are imputed using the Census' estimated collected tariffs. Each observation is a TSUS 5-digit import, averaged across all years. Source: US Census Annual Import Data Bank (IDB).

Figure A.11: 1980s American Imports: Heatmap of Unit Values, Ad Valorem Equivalents, and Specificity



Notes: This figure shows the relationship between unit values, ad valorem equivalents, and specificity in American imports 1980-1985. Ad valorem equivalents are imputed using the Census' estimated collected tariffs. Each observation is a TSUS 5-digit import, averaged across all years. Orange bins have a higher share of specific tariffs, blue bins have a higher share of ad valorem tariffs, and more opaque bins have more imports (in dollars). Source: US Census Annual Import Data Bank (IDB).

Table A.1: Schematic of Moving from Label to Goods

Panel A. Wool Flannels

Year	Wool Flannels < $0.50	Wool Flannels $0.50–1.00	Wool Flannels $1.00–2.00	Wool Flannels $2.00–4.00	Wool Flannels > $4.00
1789	All other goods				
1790	All other goods				
1791					
1794					
1816	Wool Manufactures				
1824	Wool Manufactures Over 33 1/3 cents a square yard and all Woolen Flannels				
1828	Wool Mfg: < $0.50	$0.50–1.00	$1.00–2.00	$2.00–4.00	>$4.00
1832	Flannels				
1842	Flannels, not cotton				

Panel B. Cotton Flannels

Year	Cotton Flannel, uncolored < $0.20	Cotton Flannel, uncolored $0.20–0.25	Cotton Flannel, colored < $0.25	Cotton Flannel, uncolored $0.25–0.30	Cotton Flannel, colored $0.25–0.30	Cotton Flannel, $0.30–0.35	Cotton Flannel, ≥ $0.35
1789	All other goods						
1790	All other goods						
1791	Cotton Manufactures						
1794	Cotton Manufactures						
1816	Cotton Manufactures < $0.25			Cotton Manufactures			
1824	Cotton Manufactures < $0.30					Cotton Manufactures	
1828	Cotton Cloth < $0.35						
1832	Flannels						
1842	Cotton Mfg uncolored < $0.20	Cotton Mfg other	Cotton Mfg colored < $0.30	Cotton Mfg other	Cotton Mfg colored < $0.30	Cotton Mfg other	Cotton Mfg other

Notes: This table shows how we created twelve flannel goods from the various relevant labels that appeared in the *Tariff Acts of the United States*, 1789–1842. The labels shown are broadly the text that appears in the bills themselves (though we compressed the language, for space). See Figure A.1 for examples of the labels that appeared in 1828 related to manufactures of wool. We manually linked the text of the bills in order to create *intersections*: each good has a unique path of tariffs. Every label links to at least one good in every year, and every good links to no more than one tariff rate. The horizontal solid lines imply that the good is associated with a new label, while the horizontal dashed lines imply that the old label (and tariff) continues to apply. All prices refer to dollars per square yard. We only include years in which at least one flannel good is implicated.

Table A.2: 1980s American Imports: Specificity and Price Dispersion Across Time

	(1)	(2)
Price Dispersion Over Time	-0.032	0.0035
	(0.011)	(0.0099)
Mean Outcome	0.20	0.20
Number of Goods	3908	3194
Number of Observations	3917	3203
4-Digit FEs		✓
Sample	Pooled	Pooled

Notes: This table shows the relationship between price dispersion across time in American imports 1980-1985 and tariff specificity. Each observation is a TSUS 5-digit import, and the outcome is if it has a specific tariff. Price dispersion is calculated as the dispersion of the log (within-year-average) price of the good across time. Columns 2 additionally includes fixed effects for each 4-digit TSUS code. All regressions clustered by 5 digit TSUS code. Source: US Census Annual Import Data Bank (IDB).

Table A.3: Tariff Type, Ad Valorem Equivalents and Reported Total Values

	(1)	(2)	(3)	(4)
Post ×	-0.24	-0.24	0.035	0.035
Specific in 1842	(0.15)	(0.15)	(0.071)	(0.071)
Include Wool		✓		✓
Full Years Only			✓	✓
Number Of Goods	17	18	17	18
Number Of Observations	133	141	84	89

Notes: This table shows the effect of switching from specific to ad valorem tariffs, and on changing the ad valorem equivalent, on reported total values. We use the initially-specific goods listed in the 1849 Annual Report of the Secretary of the Treasury for 1843–1849, and compare them to the goods without specific tariffs for which unit values were reported (two types of coffee, two types of tea, and wool). Because pre-1846 wools of different values had different tariffs, the odd columns exclude them from the control group. Columns 3 and 4 show results only for the import statistics with 12 months of reporting (dropping 1843 and two reports for 1847, one for each tariff regime). The change in the ad valorem equivalent for each good-year is calculated as its ad valorem tariff under 1846 regime minus the ad valorem equivalent that the good would have faced under the 1842 tariff bill. All regressions include good and year fixed effects, and standard errors clustered by good. Source: *Commerce and Navigation of the United States* and *Annual Reports of the Secretary of the Treasury on the State of the Finances.*

Table A.4: Singleton Labels Predict Specific Tariffs, Robustness to Potential Industrial Policy

Panel A. Non-Manufactured Goods

	(1)	(2)	(3)	(4)
Singleton Label	0.067	0.080	0.11	0.066
	(0.013)	(0.014)	(0.014)	(0.045)
Mean Outcome	0.12	0.12	0.12	0.49
Number of Goods	584	531	573	491
Number of Observations	10530	9471	10519	491
Specification	Year FE	Year × SITC FE	Year & Good FE	Only 1842

Panel B. Goods Without Splits By Price

	(1)	(2)	(3)	(4)
Singleton Label	0.078	0.087	0.11	0.25
	(0.010)	(0.010)	(0.011)	(0.034)
Mean Outcome	0.11	0.11	0.11	0.48
Number of Goods	901	856	890	802
Number of Observations	17346	16413	17335	802
Specification	Year FE	Year × SITC FE	Year & Good FE	Only 1842

Panel C. Industries Not Mentioned in Hamilton (1791)

	(1)	(2)	(3)	(4)
Singleton Label	0.033	0.072	0.085	-0.0015
	(0.014)	(0.013)	(0.013)	(0.046)
Mean Outcome	0.11	0.11	0.11	0.42
Number of Goods	543	505	540	456
Number of Observations	10161	9369	10158	456
Specification	Year FE	Year × SITC FE	Year & Good FE	Only 1842

Notes: This table shows the relationship between the aggregation in the tariff code and if a good has a specific tariff. The sample in Panel A is only goods that are not manufactured. Panel B drops all goods that ever have a different tariff as a function of their price (such as unmanufactured wool in 1842, which has a different tariff depending on if it is valued at above or below seven cents a pound). Panel C drops all goods whose industry was mentioned in Hamilton (1791) *Report on Manufactures*. Each good is included only in the years in which it is covered by a tariff and it has either a specific or ad valorem tariff. Each observation is a good-by-year. The outcome for all regressions is if the good has a specific tariff, and the independent variable is if the label for the good is a singleton (only covers one good). All regressions control for year. Column 2 additionally controls for year interacted with three digit SITC classifications. Column 3 controls for good fixed effects. Column 4 only includes 1842. All regressions cluster by good. Source: *Tariff Acts of the United States* and *Commerce and Navigation of the United States*.

Table A.5: Homogeneity Predicts Specific Tariffs, Robustness to Potential Industrial Policy

Panel A. Non-Manufactured Goods

	(1)	(2)	(3)
Homogeneous	0.17	0.14	0.44
	(0.010)	(0.049)	(0.041)
Mean Outcome	0.12	0.12	0.49
Number of Goods	584	575	491
Number of Observations	10530	10317	491
Specification	Year FE	Year × SITC FE	Only 1842

Panel B. Goods Without Splits By Price

	(1)	(2)	(3)
Homogeneous	0.15	0.22	0.34
	(0.0095)	(0.046)	(0.036)
Mean Outcome	0.11	0.11	0.48
Number of Goods	901	893	802
Number of Observations	17346	17153	802
Specification	Year FE	Year × SITC FE	Only 1842

Panel C. Industries Not Mentioned in Hamilton (1791)

	(1)	(2)	(3)
Homogeneous	0.18	0.15	0.52
	(0.011)	(0.060)	(0.041)
Mean Outcome	0.11	0.11	0.42
Number of Goods	543	528	456
Number of Observations	10161	9862	456
Specification	Year FE	Year × SITC FE	Only 1842

Notes: This table shows the relationship between price dispersion across varieties of a good and if it has a specific tariff. The sample in Panel A is only goods that are not manufactured. Panel B drops all goods that ever have a different tariff as a function of their price (such as unmanufactured wool in 1842, which has a different tariff depending on if it is valued at above or below seven cents a pound). Panel C drops all goods whose industry was mentioned in Hamilton (1791) *Report on Manufactures*. Each good is included only in the years in which it is covered by a tariff and it has either a specific or ad valorem tariff. Each observation is a good-by-year. The outcome for all regressions is if the good has a specific tariff, and the independent variable is if the good (in the modern era) is sold on an organized exchange or has a reference price, following the conservative classification of Rauch (1999). All regressions control for year. Column 2 additionally controls for year interacted with two digit SITC classifications. Column 3 only includes 1842. All regressions cluster by good. Source: *Tariff Acts of the United States*.

Table A.6: Modern Customs House Capacity Predicts More Complicated Tariffs and More Specific Tariffs, Only For Broadly-Traded Goods

Panel A. Tariff Complexity

	ln(Number of Distinct Tariff Rates)		Share of HS 6-digit Codes with Variation in Tariffs	
	(1)	(2)	(3)	(4)
Overall Export Misreporting Index	-0.35		-0.018	
	(0.085)		(0.0086)	
Overall Trade Misreporting Index		-0.40		-0.019
		(0.093)		(0.0094)
Mean Outcome	2.85	2.85	0.13	0.13
Number of Observations	125	125	125	125

Panel B. Specific Tariffs

	Share of Tariff Lines with Specific Tariffs		Average of HS 6-digit Share with Specific Tariffs	
	(1)	(2)	(3)	(4)
Overall Export Misreporting Index	-0.020		-0.017	
	(0.0081)		(0.0078)	
Overall Trade Misreporting Index		-0.020		-0.018
		(0.0093)		(0.0090)
Mean Outcome	0.043	0.043	0.034	0.034
Number of Observations	125	125	125	125

Notes: This table shows the relationship between modern Customs house capacity and the tariff code. Customs house capacity is measured with an (normalized) index of each country's agreement with its trading partners, following Farhad et al. (2024), where the first row considers only export and the second row considers all trade flows. For all results, we only consider goods that are imported by *all* of the 20 (non-OPEC) countries with the worst scores on the exporting measure. Panel A considers measures of the complexity of the tariff code: the (ln) number of distinct tariff rates, and the share of HS 6-digit codes with variation in tariffs. Panel B considers the specificity of the tariff code. The outcome in Columns 1 and 2 is the share of tariff lines that are specific. Columns 3 and 4 take the unweighted average tariff lines within each HS-6 that are specific, and then take the average across all HS-6 codes. Each observation is a country in its most recently available data, and we consider MFN tariff rates. Robust standard errors reported in parenthesis. Source: WTO Integrated Database.

Table A.7: Narrow Labels Predict Specific Tariffs

Panel A. ≤ 5 goods in Label

	(1)	(2)	(3)	(4)
≤ 5 goods in Label	0.091	0.082	0.088	0.067
	(0.0070)	(0.0067)	(0.0077)	(0.028)
Mean Outcome	0.11	0.11	0.11	0.50
Number of Goods	1395	1349	1384	1290
Number of Observations	28126	27237	28115	1290
Specification	Year FE	Year × SITC FE	Year & Good FE	Only 1842

Panel B. ≤ 10 goods in Label

	(1)	(2)	(3)	(4)
≤ 10 goods in Label	0.098	0.087	0.088	0.17
	(0.0062)	(0.0057)	(0.0065)	(0.030)
Mean Outcome	0.11	0.11	0.11	0.50
Number of Goods	1395	1349	1384	1290
Number of Observations	28126	27237	28115	1290
Specification	Year FE	Year × SITC FE	Year & Good FE	Only 1842

Notes: This table shows the relationship between the aggregation in the tariff code and if a good has a specific tariff. Panel A considers labels covering 5 or fewer goods, and Panel B considers labels covering 10 or fewer goods. Each good is included only in the years in which it is covered by a tariff and it has either a specific or ad valorem tariff. Each observation is a good-by-year. The outcome for all regressions is if the good has a specific tariff, and the independent variable is if the label for the good is relatively disaggregated, as defined in the panel heading. All regressions control for year. Column 2 additionally controls for year interacted with three digit SITC classifications. Column 3 controls for good fixed effects. Column 4 only includes 1842. All regressions cluster by good. Source: *Tariff Acts of the United States* and *Commerce and Navigation of the United States*.

Table A.8: Homogeneity Predicts Specific Tariffs, Alternative Definition of Homogeneous

	(1)	(2)	(3)
Homogeneous	0.081	0.13	0.12
	(0.0086)	(0.031)	(0.032)
Mean Outcome	0.11	0.11	0.50
Number of Goods	1395	1387	1290
Number of Observations	28126	27944	1290
Specification	Year FE	Year × SITC FE	Only 1842

Notes: This table shows the relationship between price dispersion across varieties of a good and if it has a specific tariff. Each good is included only in the years in which it is covered by a tariff and it has either a specific or ad valorem tariff. Each observation is a good-by-year. The outcome for all regressions is if the good has a specific tariff, and the independent variable is if the good (in the modern era) is sold on an organized exchange or has a reference price, following the classification of Rauch (1999). All regressions control for year. Column 2 additionally controls for year interacted with two digit SITC classifications. Column 3 only includes 1842. All regressions cluster by good. Source: *Tariff Acts of the United States*.

Table A.9: Singleton & Homogeneous Labels Predict Specific Tariffs

	(1)	(2)	(3)
Singleton Label	0.037	0.18	0.12
	(0.012)	(0.033)	(0.033)
Homogeneous	0.12	0.10	0.28
	(0.011)	(0.040)	(0.046)
Homogeneous & Singleton Label	-0.0086	0.24	-0.061
	(0.019)	(0.052)	(0.067)
Mean Outcome	0.11	0.11	0.50
Number of Goods	1395	1387	1290
Number of Observations	28126	27944	1290
Specification	Year FE	Year × SITC FE	Only 1842

Notes: This table shows the relationship between the aggregation in the tariff code, price dispersion across varieties of a good, and if a good has a specific tariff. Each good is included only in the years in which it is covered by a tariff and it has either a specific or ad valorem tariff. Each observation is a good-by-year. The outcome for all regressions is if the good has a specific tariff, and the independent variables are if the label for the good is a singleton (only covers one good), if the good is listed as a commodity in the *The Executive Documents* of the House of Representatives, and their interaction. All regressions control for year. Column 2 additionally controls for year interacted with two digit SITC classifications. Column 3 only includes 1842. All regressions cluster by good. Source: *Tariff Acts of the United States*.

Table A.10: Singleton Labels Predict Specific Tariffs, Robustness to Specification

Panel A. Controlling for 1842 Ad Valorem Equivalent

	(1)	(2)	(3)	(4)
Singleton Label	0.065	0.077	0.14	0.17
	(0.012)	(0.015)	(0.015)	(0.033)
Mean Outcome	0.15	0.15	0.15	0.87
Number of Goods	680	635	674	650
Number of Observations	13957	13025	13951	650
Specification	Year FE	Year × SITC FE	Year & Good FE	Only 1842

Panel B. Weighting by SITC

	(1)	(2)	(3)	(4)
Singleton Label	0.12	0.099	0.14	0.32
	(0.017)	(0.011)	(0.016)	(0.049)
Mean Outcome	0.081	0.081	0.081	0.44
Number of Goods	1395	1349	1384	1290
Number of Observations	28126	27237	28115	1290
Specification	Year FE	Year × SITC FE	Year & Good FE	Only 1842

Notes: This table shows the relationship between the aggregation in the tariff code and if a good has a specific tariff. Panel A additionally controls for the 1842 ad valorem equivalent, for the goods reported in the import statistics. Panel B weights by the inverse of the number of goods within each three-digit SITC classification. Each good is included only in the years in which it is covered by a tariff and it has either a specific or ad valorem tariff. Each observation is a good-by-year. The outcome for all regressions is if the good has a specific tariff, and the independent variable is if the label for the good is a singleton (only covers one good). All regressions control for year. Column 2 additionally controls for year interacted with three digit SITC classifications. Column 3 controls for good fixed effects. Column 4 only includes 1842. All regressions cluster by good. Source: *Tariff Acts of the United States* and *Commerce and Navigation of the United States*.

Table A.11: Homogeneity Predicts Specific Tariffs, Robustness to Specification

Panel A. Controlling for 1842 Ad Valorem Equivalent

	(1)	(2)	(3)
Homogeneous	0.12	0.27	0.26
	(0.011)	(0.067)	(0.026)
Mean Outcome	0.15	0.20	0.87
Number of Goods	680	665	650
Number of Observations	13957	13618	650
Specification	Year FE	Year × SITC FE	Only 1842

Panel B. Weighting by SITC

	(1)	(2)	(3)
Homogeneous	0.082	0.30	0.40
	(0.013)	(0.054)	(0.055)
Mean Outcome	0.081	0.081	0.44
Number of Goods	1395	1387	1290
Number of Observations	28126	27944	1290
Specification	Year FE	Year × SITC FE	Only 1842

Notes: This table shows the relationship between price dispersion across varieties of a good and if it has a specific tariff. Each good is included only in the years in which it is covered by a tariff and it has either a specific or ad valorem tariff. Each observation is a good-by-year. The outcome for all regressions is if the good has a specific tariff, and the independent variable is if the good is listed as a commodity in the *The Executive Documents* of the House of Representatives. Panel A additionally controls for the 1842 ad valorem equivalent, for the goods reported in the import statistics. Panel B weights by the inverse of the number of goods within each three-digit SITC classification. All regressions control for year. Column 2 additionally controls for year interacted with two digit SITC classifications. Column 3 only includes 1842. All regressions cluster by good. Source: *Tariff Acts of the United States*.

Table A.12: Singleton Labels Predict Specific Tariffs, Robustness to Sample

Panel A. Goods That Are Never Free

	(1)	(2)	(3)	(4)
Singleton Label	0.048	0.085	0.096	0.16
	(0.012)	(0.012)	(0.013)	(0.033)
Mean Outcome	0.12	0.12	0.12	0.54
Number of Goods	1016	984	1016	1016
Number of Observations	22352	21648	22352	1016
Specification	Year FE	Year × SITC FE	Year & Good FE	Only 1842

Panel B. Major Bills Only

	(1)	(2)	(3)	(4)
Singleton Label	0.17	0.22	0.22	0.14
	(0.021)	(0.021)	(0.020)	(0.029)
Mean Outcome	0.22	0.22	0.22	0.50
Number of Goods	1395	1349	1382	1290
Number of Observations	10298	9971	10285	1290
Specification	Year FE	Year × SITC FE	Year & Good FE	Only 1842

Notes: This table shows the relationship between the aggregation in the tariff code and if a good has a specific tariff. Panel A drops all goods that are ever free. Panel B only includes the major bills (in which at least half of the goods are covered: 1789, 1790, 1792, 1794, 1816, 1824, 1832, and 1842). Each good is included only in the years in which it is covered by a tariff and it has either a specific or ad valorem tariff. Each observation is a good-by-year. The outcome for all regressions is if the good has a specific tariff, and the independent variable is if the label for the good is a singleton (only covers one good). All regressions control for year. Column 2 additionally controls for year interacted with three digit SITC classifications. Column 3 controls for good fixed effects. Column 4 only includes 1842. All regressions cluster by good. Source: *Tariff Acts of the United States*.

Table A.13: Homogeneity Predicts Specific Tariffs, Robustness to Sample

Panel A. Goods That Are Never Free

	(1)	(2)	(3)
Homogeneous	0.17	0.32	0.42
	(0.011)	(0.074)	(0.030)
Mean Outcome	0.12	0.12	0.54
Number of Goods	1016	1006	1016
Number of Observations	22352	22132	1016
Specification	Year FE	Year × SITC FE	Only 1842

Panel B. Major Bills Only

	(1)	(2)	(3)
Homogeneous	0.20	0.22	0.27
	(0.016)	(0.044)	(0.033)
Mean Outcome	0.22	0.22	0.50
Number of Goods	1395	1387	1290
Number of Observations	10298	10231	1290
Specification	Year FE	Year × SITC FE	Only 1842

Notes: This table shows the relationship between price dispersion across varieties of a good and if it has a specific tariff. Panel A drops all goods that are ever free. Panel B only includes the major bills (in which at least half of the goods are covered: 1789, 1790, 1792, 1794, 1816, 1824, 1832, and 1842). Each good is included only in the years in which it is covered by a tariff and it has either a specific or ad valorem tariff. Each observation is a good-by-year. The outcome for all regressions is if the good has a specific tariff, and the independent variable is if the good is listed as a commodity in the *The Executive Documents* of the House of Representatives. All regressions control for year. Column 2 additionally controls for year interacted with two digit SITC classifications. Column 3 only includes 1842. All regressions cluster by good. Source: *Tariff Acts of the United States.*

Table A.14: Singleton Labels Predict Specific Tariffs, Robustness to Definition of a Good

Panel A. Strict Deduplication

	(1)	(2)	(3)	(4)
Singleton Label	0.060	0.084	0.096	0.14
	(0.0097)	(0.011)	(0.011)	(0.030)
Mean Outcome	0.11	0.11	0.11	0.50
Number of Goods	1304	1256	1296	1234
Number of Observations	26693	25790	26685	1234
Specification	Year FE	Year × SITC FE	Year & Good FE	Only 1842

Panel B. Extremely Strict Deduplication

	(1)	(2)	(3)	(4)
Singleton Label	0.055	0.081	0.097	0.14
	(0.011)	(0.011)	(0.013)	(0.032)
Mean Outcome	0.12	0.12	0.12	0.54
Number of Goods	1106	1084	1099	1065
Number of Observations	22922	22467	22915	1065
Specification	Year FE	Year × SITC FE	Year & Good FE	Only 1842

Notes: This table shows the relationship between the aggregation in the tariff code and if a good has a specific tariff. Our definition of a good is imports which are physically distinct than all other imports with the same path of tariffs. This necessitates some judgment calls. In Panel A, we are stricter than in our baseline specification, dropping all plausibly similar objects. In Panel B, we pick one random good from each path of tariffs, dropping all others regardless of physical similarity. Each good is included only in the years in which it is covered by a tariff and it has either a specific or ad valorem tariff. Each observation is a good-by-year. The outcome for all regressions is if the good has a specific tariff, and the independent variable is if the label for the good is a singleton (only covers one good). All regressions control for year. Column 2 additionally controls for year interacted with three digit SITC classifications. Column 3 controls for good fixed effects. Column 4 only includes 1842. All regressions cluster by good. Source: *Tariff Acts of the United States*.

Table A.15: Homogeneity Predicts Specific Tariffs, Robustness to Definition of a Good

Panel A. Strict Deduplication

	(1)	(2)	(3)
Homogeneous	0.13	0.26	0.30
	(0.0094)	(0.049)	(0.033)
Mean Outcome	0.11	0.11	0.50
Number of Goods	1304	1295	1234
Number of Observations	26693	26500	1234
Specification	Year FE	Year × SITC FE	Only 1842

Panel B. Extremely Strict Deduplication

	(1)	(2)	(3)
Homogeneous	0.14	0.24	0.27
	(0.0100)	(0.058)	(0.035)
Mean Outcome	0.12	0.12	0.54
Number of Goods	1106	1102	1065
Number of Observations	22922	22833	1065
Specification	Year FE	Year × SITC FE	Only 1842

Notes: This table shows the relationship between price dispersion across varieties of a good and if it has a specific tariff. Our definition of a good is imports which are physically distinct than all other imports with the same path of tariffs. This necessitates some judgment calls. In Panel A, we are stricter than in our baseline specification, dropping all plausibly similar objects. In Panel B, we pick one random good from each path of tariffs, dropping all others regardless of physical similarity. Each good is included only in the years in which it is covered by a tariff and it has either a specific or ad valorem tariff. Each observation is a good-by-year. The outcome for all regressions is if the good has a specific tariff, and the independent variable is if the good is listed as a commodity in the *The Executive Documents* of the House of Representatives. All regressions control for year. Column 2 additionally controls for year interacted with two digit SITC classifications. Column 3 only includes 1842. All regressions cluster by good. Source: *Tariff Acts of the United States*.

Table A.16: Lower Unit Values Predict Higher Ad Valorem Tariffs (Weighted)

	(1)	(2)	(3)
Unit Value (Standardized)	-2.28	-1.11	-1.87
	(0.54)	(0.65)	(0.55)
Mean Outcome	30.074	29.377	29.763
Number of Goods	854	405	1163
Number of Observations	1069	605	1674
Tariff Regime	1842	1846	Both

Notes: This table shows the relationship between unit values and ad valorem duties. The outcome in all regressions is the ad valorem rate for the import after 1846. The sample is the goods with specific tariffs in the 1842 tariff bill. All regressions additionally control as each good's 1842 ad valorem equivalent, and we weight by the good's share of the total value of imports in each year. Column 1 includes only observations from years where the 1842 tariff applied, Column 2 only from the years where the 1846 tariff applied, and Column 3 includes all observations. Results clustered by good. Source: *Commerce and Navigation of the United States* and *Tariff Acts of the United States*.

Table A.17: Modern Customs House Capacity Predicts More Complicated Tariffs and More Specific Tariffs, Robustness

	ln(Number of Distinct Tariff Rates)	Share of HS 6-digit Codes with Variation in Tariffs	Share of Tariff Lines with Specific Tariffs	Average of HS 6-digit Share with Specific Tariffs
	(1)	(2)	(3)	(4)
Bureaucracy Quality	0.53	0.015	0.057	0.054
	(0.15)	(0.0068)	(0.026)	(0.026)
Mean Outcome	3.05	0.078	0.038	0.035
Number of Observations	99	99	99	99

Notes: This table shows the relationship between modern Customs house capacity and the tariff code. Customs house capacity is measured with an (normalized) index of each country's Bureaucracy Quality index from the International Country Risk Guide. Columns 1 and 2 consider measures of the complexity of the tariff code: the (ln) number of distinct tariff rates, and the share of HS 6-digit codes with variation in tariffs. Columns 3 and 4 consider the specificity of the tariff code. The outcome in Column 3 is the share of tariff lines that are specific. Column 4 takes the unweighted average tariff lines within each HS-6 that are specific, and then take the average across all HS-6 codes. Each observation is a country in its most recently available data, and we consider MFN tariff rates. Robust standard errors reported in parenthesis. Source: WTO Integrated Database and International Country Risk Guide.

Table A.18: Modern AVEs Predict Specificity, Robustness

Panel A. Ad Valorem Equivalents Below 2.5%

	Specific Tariff		
	(1)	(2)	(3)
AVE < 2.5	0.085	0.085	0.062
	(0.006)	(0.006)	(0.006)
Homogeneous		0.0068	0.0053
		(0.001)	(0.001)
AVE $< 2.5 \times$ Homogeneous			0.042
			(0.009)
Mean Outcome	0.017	0.017	0.017
Number of Observations	801016	801016	801016

Panel B. Ad Valorem Equivalents Below 10%

	Specific Tariff		
	(1)	(2)	(3)
AVE < 10	0.0038	0.0031	0.0050
	(0.001)	(0.001)	(0.001)
Homogeneous		0.0076	0.0096
		(0.001)	(0.001)
AVE $< 10 \times$ Homogeneous			-0.0044
			(0.002)
Mean Outcome	0.017	0.017	0.017
Number of Observations	801016	801016	801016

Notes: This table shows the relationship between modern tariff line price variation, ad valorem equivalents, and specific tariffs. Panel A considers the tariff burden calculated as an indictor for the ad valorem equivalent being below 2.5% and Panel B uses an indictor for the ad valorem equivalent being below 10%. Each observation is a tariff line, and the outcome is if the tariff is specific. Homogeneous goods are those that are sold on an organized exchange or have a reference price, following the conservative classification of Rauch (1999). All regressions include importer fixed effects, and standard errors are clustered by HS 6-digit code. We use the most recently available data for each country. Source: WTO Integrated Database and UN Trade Analysis Information System.

Table A.19: Modern Homogeneous Goods Predict Specificity, Robustness

	Specific Tariff				
	(1)	(2)	(3)	(4)	(5)
Homogeneous	0.0073	0.0065	0.0049	0.0077	0.0023
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
AVE < 5		0.044	0.033		
		(0.003)	(0.004)		
AVE $< 5 \times$			0.020		
Homogeneous			(0.005)		
Non-Grouped				0.011	0.0046
				(0.001)	(0.001)
Homogeneous $\times$					0.015
Non-Grouped					(0.003)
Mean Outcome	0.017	0.017	0.017	0.017	0.017
Number of Observations	801016	801016	801016	801016	801016

Notes: This table shows the relationship between modern tariff line price variation and specific tariffs. Each observation is a tariff line, and the outcome is if the tariff is specific. Homogeneous goods are those that are sold on an organized exchange or have a reference price, following the liberal classification of Rauch (1999). Non-grouped goods are those that do not share the same tariff with all of the other tariff lines within the same HS 4-digit code. All regressions include importer fixed effects, and standard errors are clustered by HS 6-digit code. We use the most recently available data for each country. Source: WTO Integrated Database and UN Trade Analysis Information System.

Table A.20: Modern Low AVEs and Homogeneous Goods Predict Specificity, Robustness Only Including New Imports

Panel A. Ad Valorem Equivalents

	Specific Tariff		
	(1)	(2)	(3)
AVE < 5	0.013	0.013	0.0026
	(0.003)	(0.003)	(0.002)
Homogeneous		0.0045	0.0021
		(0.001)	(0.001)
AVE $< 5 \times$ Homogeneous			0.023
			(0.005)
Mean Outcome	0.010	0.010	0.010
Number of Observations	307552	307552	307552

Panel B. Homogeneity

	Specific Tariff			
	(1)	(2)	(3)	(4)
Homogeneous	0.0047		0.0053	0.00089
	(0.0009)		(0.0010)	(0.0003)
Non-Grouped		0.0035	0.0043	0.00038
		(0.0007)	(0.0008)	(0.0004)
Homogeneous $\times$ Non-Grouped				0.011
				(0.002)
Mean Outcome	0.010	0.010	0.010	0.010
Number of Observations	307552	307552	307552	307552

Notes: This table shows modern predictors of specific tariffs. Each panel includes coefficients from three predictors, one of which is always if the good is homogeneous. Panel A also considers the tariff burden, calculated as an indictor for the ad valorem equivalent being below 5% and Panel B considers if the good is non-grouped. Each panel also shows the interaction of the two variables. Each observation is a tariff line, and the outcome is if the tariff is specific. Homogeneous goods are those that are sold on an organized exchange or have a reference price, following the conservative classification of Rauch (1999). Non-grouped goods are those that do not share the same tariff with all of the other tariff lines within the same HS 4-digit code. All regressions include importer fixed effects, and standard errors are clustered by HS 6-digit code. We use the most recently available data for each country, and limit the sample to goods in SITC Revision 2 3 digit sectors that did not have a tariff before 1846. Source: WTO Integrated Database and UN Trade Analysis Information System.

Table A.21: 1980s American Imports: Drivers of Specificity, Only Non-Concentrated Products

Panel A. Unit Values

	(1)	(2)	(3)	(4)
ln(Unit Values)	-0.027	-0.011	-0.029	-0.015
	(0.0022)	(0.0031)	(0.0022)	(0.0048)
Mean Outcome	0.19	0.19	0.19	0.19
Number of Goods	3571	3502	2962	2172
Number of Observations	13717	13648	2973	2183
4-Digit FEs		✓		✓
Sample	Annual	Annual	Pooled	Pooled

Panel B. Ad Valorem Equivalents

	(1)	(2)	(3)	(4)
ln(Ad Valorem Equivalent)	-0.16	-0.11	-0.16	-0.13
	(0.0068)	(0.0087)	(0.0074)	(0.013)
Mean Outcome	0.16	0.16	0.16	0.16
Number of Goods	4152	4085	3496	2670
Number of Observations	16287	16220	3507	2681
4-Digit FEs		✓		✓
Sample	Annual	Annual	Pooled	Pooled

Panel C. Price Dispersion Across Exporters

	(1)	(2)	(3)	(4)
Price Dispersion	-0.13	-0.012	-0.15	-0.027
	(0.0095)	(0.0059)	(0.013)	(0.017)
Mean Outcome	0.19	0.19	0.19	0.19
Number of Goods	3519	3441	2961	2172
Number of Observations	13369	13291	2972	2183
4-Digit FEs		✓		✓
Sample	Annual	Annual	Pooled	Pooled

Notes: The outcome in this table is if the import has a specific tariff. Each observation is a TSUS 5-digit import. We only include products where the HHI by origin is less than 0.5, as described in the text. Columns 1 and 2 include each good by year separately, and Columns 3 and 4 average across years within goods. Columns 2 and 4 additionally include fixed effects for each 4-digit TSUS code. All regressions clustered by 5-digit TSUS code. Panel A considers the unit values of the goods (the value divided by the quantity). Panel B considers the ad valorem equivalents (the tariff revenue divided by the value). Panel C considers the dispersion of unit values across shipments, as described in the text. Source: US Census Annual Import Data Bank (IDB).