How a Passive Depreciation of U.S. Specific Tariffs May Affect Imports

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Abstract

Analysis of tariff and trade data at the HTS8 level shows that specific tariff rates have remained constant while the median import price of such products has nearly doubled, leading to a passive depreciation of specific tariffs relative to the value of imported goods. In this paper, I use a partial equilibrium model to quantify the effects of this passive depreciation, representing the interaction between specific tariffs and import prices in the model as a decrease in ad valorem tariff parameters. I evaluate the model for around half of HTS8 products subject to specific tariffs; these products largely belong to the agricultural or food manufacturing sectors but also include non–food sectors such as chemicals and apparel. Results show that this decrease in ad valorem tariff equivalents causes imports for most products to increase by under half a percent compared to a baseline scenario in which AVEs are held constant. Sector–wide effects of this decrease in ad valorem tariffs are negligible. However, counterfactual import changes display considerable heterogeneity, with imports of some products increasing by more than ten percent.

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1 Introduction

Around ten percent of the value of 2022 U.S. imports, and 6.49% of Harmonized Tariff System 8–digit (HTS8) products in 2022, are subject to specific tariffs that are charged as a monetary value per unit of quantity. Because specific tariffs are denominated in monetary units rather than as percentages of import value, the effective size of the tariff changes in response to higher or lower import prices. For example, fresh or chilled garlic has an import charge of 0.43 cents per kilogram, and if the price of imported garlic doubled, the effective tariff charge on garlic would decrease as garlic tariffs constitute a lower fraction of the import price. Unchanging nominal specific rates during a period of increasing prices would result in a passive depreciation of these rates, as tariff charges on imported goods grow progressively smaller relative to the prices of the imported goods. In this paper, I estimate the impact of this passive depreciation on individual products in several different sectors.

Using data on import prices and permanent normal trade relations (PNTR)[1] specific tariff rates since 1997, I document that almost all nominal specific rates have not changed since 2000, while import prices have risen. Specific tariff rates have therefore fallen relative to prices, meaning that the ad valorem equivalents (AVEs) of most specific tariffs have fallen as well.[2] I then use 2022 data on tariff rates and import values to calibrate a partial equilibrium (PE) model where agents consume imported goods, on which they pay an ad valorem tariff, and domestically produced goods. Ad valorem tariffs in the model channel the interaction between specific tariff rates and import prices; these AVEs would fall as import prices rise and specific rates remain unchanged. I can therefore model a passive depreciation of specific rates as a decrease in AVEs.

I compute percentage differences between observed 2022 import levels and import levels under a counterfactual scenario with changing AVEs. Specifically, I look at specific rates and import prices during the periods 2000–2019 and 2019–2022, with the latter period separated from the earlier period in order to isolate the effects of covid–19 and subsequent import price behavior. Since nominal specific rates have remained constant over the last twenty–five years while import prices have increased, AVEs for a majority of products will fall in both counterfactuals, causing an increase in imports relative to a baseline scenario where AVEs do not change.

[1] PNTR tariff rates are levied on the majority of imports to the United States. Iran, North Korea, Cuba, Russia, and Belarus are the only countries whose exports to the U.S. do not have PNTR status.

[2] As discussed in Phillips (2024), the AVE of a specific tariff is the ad valorem tariff rate that generates the same level of revenue as that specific tariff.

Results show that an erosion of effective specific tariff rates leads to small counterfactual increases in imports among products subject to specific tariffs, with the median increase in import quantity around 0.1 percent. Effects on imports at more aggregated product levels are essentially nonexistent. However, import results display considerable heterogeneity among sectors and products, with dairy products in particular responding much more strongly than the median product to decreases in their AVEs. Domestic production and consumption are essentially unchanged between the counterfactuals where AVEs decrease and the baseline where they do not, although they do decrease for some products such as tobacco and cocoa powder.

1.1 Literature

This paper contributes to scholarship on how the use of specific duties leads to a strong relationship between import prices and effective tariff rates. In a recent working paper, Greenland and Lopresti (2024) show that average tariff levels fluctuated enormously between 1900 and 1940 due to price dynamics as well as the frequent use of specific tariffs by the U.S. government during that time. Greenland et al. (2023) show that specific tariffs and high inflation caused AVEs to fall by around four percentage points during the 1970s, while Irwin (1998) uses an econometric model to determine the effect of import prices and commercial policies on tariff rates, finding that higher import prices can explain three-quarters of the decline in effective tariff rates after the passage of the Smoot-Hawley Act in 1930. Crucini (1994), McGuire (1990) and Van Cott and Wipf (1983) also find a strong relationship between import price fluctuations and average tariff rates in the interwar period, the immediate post-Civil War period, and the early 1970s respectively. This paper updates our knowledge of specific tariffs and their AVEs by analyzing these AVEs in a present–day context. Furthermore, while the above papers use econometric methods to make conclusions about extant data, this paper is able to perform counterfactual analysis by embedding AVE data into a partial equilibrium model.

Another body of literature extends the discussion of prices and specific tariff rates to determine how the interaction between these two rates can affect macroeconomic outcomes. Chowdhury (2011) determines that the use of specific tariffs on agricultural products by the European Union penalizes African countries that export low–price goods. Bond et al. (2013) and Crucini and Kahn (1996) look at the macroeconomic effects of the Smoot–Hawley tariffs during the Great Depression, with the first paper looking at the tariffs' effect on industry–level imports and the second looking at the tariffs' effect on aggregate output and investment. This paper extends impact analysis of specific tariffs to the twenty–first century United States, examining how the properties and behavior of specific tariffs may cause an increase in imports.

2 Stylized Facts

In this section, I document a series of stylized facts related to specific tariff rates in the past twenty–five years using tariff and unit import price[3] data at the HTS8 digit level from the USITC's DataWeb. The subset of products used to compute 1997–2019 import price changes includes 460 HTS8 codes, while the subset of products used to compute 2019–2022 import price changes includes 455 HTS8 codes; these numbers comprise around sixty percent of the total number of products whose imports are charged a specific tariff in any given year.[4]Compared to unit import prices, specific tariffs have decreased since the late 1990s, in effect representing a form of trade liberalization as imported products face a lower tariff relative to their price level.

Sector	Percentage of 2022 Imports Facing Specific Tariffs	Change in import prices 1997–2019	Change in import prices 2019–2022
All	10.8	45.4%	11.7%
Meat	26.3	92.9%	13.3%
Dairy	60.2	34.2%	9.29%
Vegetables	45.6	44.5%	17.3%
Fruit	49.4	78.3%	10.6%
Food manufactures	22.7	43.3%	4.30%
Mineral Products	83.9	141.5%	60.19%
Chemicals	0.320	42.0%	16.4%
Clothing and Footwear	0.00803	-6.36%	33.1%
Ceramics, Glass, Jewelry	0.0535	66.8%	66.3%
Base Metals	0.0486	93.3%	24.8%

Table 1: Descriptive statistics of HTS product categories

I begin by discussing sector–level[5] changes in unit import prices, as documented in Table 1. Columns 3 and

[3]A unit import price is defined as the price per unit of quantity of an imported good, and is calculated by dividing the value of imports of a given product by the quantity of imports of that product.

[4]While the total number of products facing specific tariffs varies from year to year, it is generally around 750 products. I eliminate products that did not have positive imports in every year, since with import values and quantities of zero the unit import price would be undefined. To ensure that the set of products is exactly the same across years, I also eliminate all products not included in every year or products that did not face a specific tariff in every year. I manually concord HTS8 information across years using either HTS8 code or product description, to account for products for whom this information changes during the relevant time period.

[5]The term 'food manufactures' refers to products made by transforming agricultural and livestock products into food for consumption through some means other than trimming or drying. For example, "Dried olives, ripe" would fall under vegetables, but "Vegetables (including olives) not elsewhere specified or indicated, prepared or preserved by vinegar or acetic acid" would fall under food manufactures.

4 document median import price increases among products in each sector that face specific tariffs, while Column 2 displays the percentage of 2022 import value in each sector corresponding to products that face a specific tariff. Agricultural products are more likely than non–agricultural products to face specific tariffs. 60.2% of dairy imports, 45.6% of vegetable imports, and 49.4% of fruit imports by value face a specific tariff even though only 10.8% of the total value of 2022 U.S. imports belongs to products that face a specific tariff. Meanwhile, specific tariffs apply to fewer than one percent of imports in the chemical, apparel, and base metals industries. However, specific tariffs are used most frequently on mineral products, a sector including ores, oil, and gas; 83.9% of imports in the mineral products sector are subject to a specific tariff.[6]

Unit import prices across all HTS8 products increase by 45.4% between 1997 and 2022, with some variation between individual sectors. For example, meat products display a 92.9% increase in import prices over this period, while dairy displays a much lower import price increase of 34.2% and the median price of clothing and footwear products decreases. Price decreases could reflect improvements in production technology during the 1997–2022 period, or increases in the labor force among countries from whom the United States imports these products. Price increases were generally lower in the 2019–2022 period than in the 1997–2019 period, with the exception of clothing and footwear, whose median price rose by about a third between 2019 and 2022, and ceramics, glass, and jewelry products, whose median price increased by about the same percentage that it had increased in the twenty–two years prior.

In the 1997–2022 period, prices rise by more than 1000% for four products that face specific tariffs, including chestnuts and watch movements. Conversely, 111 products have price *decreases* during that period, including some processed cheeses, flower bulbs, olives, and some cheeses. During the 2019–2022 period, prices rose by more than 1000% for four products and fell for 115 products.

I also observe information on the tariff rates charged on U.S. imports from 1997, the earliest year for which these rates are available, until 2022. Since sectors such as chemicals or apparel are underrepresented in the selection of products whose imports face specific tariffs, I will henceforth refer to sectors outside food and minerals as 'other,' an amalgamated category which mainly includes products belonging to the apparel, chemical manufacturing, and base metals sectors. This 'other' category includes 47 products, and

[6] Only three HTS8 mineral products regularly have nonzero import quantities recorded in the data. The latter two products, which are both forms of crude petroleum, represent a disproportionate share of imports into the United States, accounting for 3.72% and 2.26% respectively of total import value in 2022 as well as 34.3% and 20.8% of the import value subject to specific tariffs. Due to the disproportionate role mineral products play in U.S. import markets, I continue to include them as a sector in future discussions even though the number of products involved is not large.

the median increase among import prices of other products is 61.2% between 1997 and 2019. Because specific rates are denominated in different units of quantity, I cannot directly compare specific rates of different HTS8 products, so I instead express each specific rate as a fraction of its value in 2022. I plot the median of these specific rate ratios for all products in Figure 1, as well as the corresponding median unit import price ratios.

Figure 1 shows that the median specific rates for all products, unadjusted for inflation, have not changed since 2000.[7] Median specific rates decreased between 1997 and 2000, but have not changed since. However, import prices, while initially following a similar pattern to specific rates, have steadily increased since 2003, with only a slight decrease between 2014 and 2016. The median import price in 2022 is about 170 percent of its value in 1997.

Figure 1: Time series of specific rates and unit import prices

I also compute the ad valorem equivalent tariff rate for each HTS8 product using data on specific rates

[7]Only one product—used or new rags, scrap and worn out articles of twine, cordage, rope or cable, of wool or fine animal hair, not sorted—has had its specific rates change since 2000, and this product has had the same specific tariff rate since 2004.

and unit import prices. The ad valorem equivalent of a specific tariff is given by the formula

$$\tau_a = \frac{\tau_s \text{Quantity of imports}}{\text{Value of imports}} = \frac{\tau_s}{\text{Unit import price}}$$

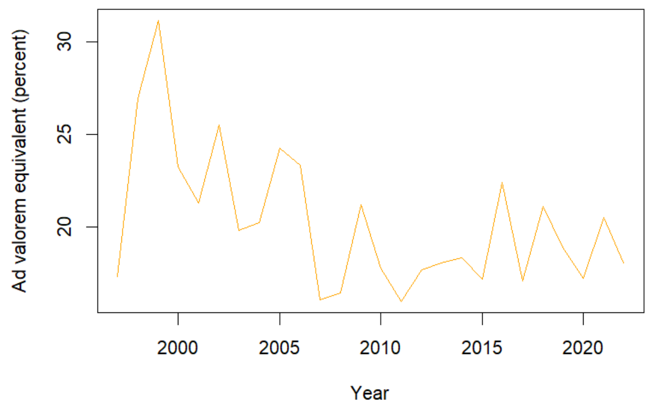
since the ratio of value of imports to quantity of imports can be rewritten as a unit import price. If τ_s remains unchanged and the unit import price rises, τ_a would fall. AVEs therefore represent a method of measuring how price–adjusted trade barriers have changed over time. I calculate these rates using the observed PNTR specific tariff rates as well as data on product–level import quantity and customs value obtained from DataWeb.

Figures 2a) and 2b) compare the ad valorem equivalent (AVE) rates of specific tariffs for all products in the set used for analysis; I use a separate plot for the dairy industry because its AVEs are much higher than those of the other product categories discussed here. Time series in Figure 2 show that AVEs in the meat, produce, and food manufacturing sectors have decreased almost continuously between 1997 and 2022. Median AVEs in the food manufacturing sector fall from 2.46% to 1.42%, while the median AVE on meat products start at a lower 1.34% and decreases to 0.420%. In other words, tariffs expressed as a fraction of the given product's contemporaneous value have declined in the past twenty–five years. Products in the 'other' sector display more volatility, due to the heterogeneity of products included in this category, but still show the same downward trend in AVEs. The dairy industry in Figure 2a) also displays some volatility in its AVE from year to year but its AVEs are on a similar downward trend line; the median dairy AVE was 24.7% in the 1997–2002 period and 18.5% in the 2017–2022 period.

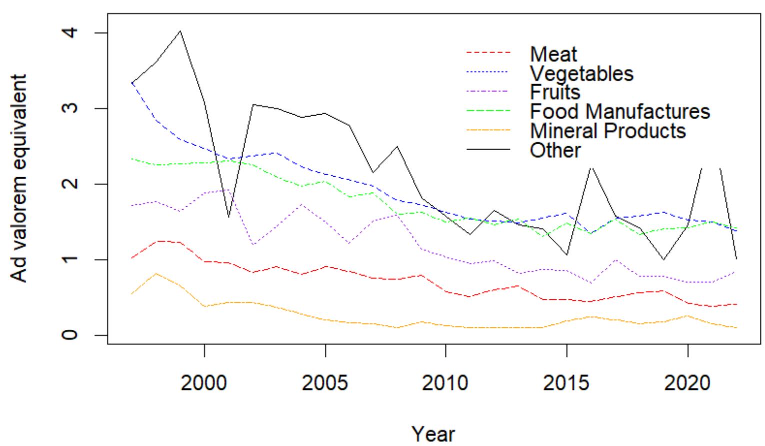
3 Model and Calibration

3.1 Model

The model follows Phillips (2024), which in turn follows the canonical PE model laid out in Riker and Hallren (2017). There are two countries: the United States, indexed by d for domestic, and an aggregation of all other countries in the world, indexed by f for foreign. U.S. consumers consume both domestic production and imports of all given products. Since I compute equilibria separately for each product, I omit a product–level index in presenting this model.



(a) Median ad valorem equivalent tariff rate, dairy sector



(b) Median ad valorem equivalent tariff rate, by sector

Figure 2: Sector–level AVE time series

Consumers consume domestic and foreign goods according to a CES utility function with elasticity of substitution σ and utility weights β_d and β_f. τ represents an ad valorem tariff rate, and ε represents the price elasticity of demand, set equal to one. The consumer demand functions and price index P are given by

$$q_d = \beta_d Y P^{1-\varepsilon}(\frac{P}{p_d})^{\sigma-1} \tag{1}$$

$$q_f = \beta_f Y P^{1-\varepsilon}(\frac{P}{p_f \tau})^{\sigma-1} \tag{2}$$

$$P^{1-\sigma} = \beta_d p_d^{1-\sigma} + \beta_f (p_f \tau)^{1-\sigma} \tag{3}$$

where Y is the total consumption expenditure across domestic and foreign goods, q_d is expenditure on domestic consumption and q_f is expenditure on imported goods. Exogenous supply functions are

$$q_d^s = a_d p_d^{\theta_d} \tag{4}$$

$$q_f^s = a_f p_f^{\theta_f} \tag{5}$$

where θ_d and θ_f represent supply elasticities and a_d and a_f are supply shifters. Finally, market clearing stipulates that $q_d^s p_d = q_d$ and $q_f^s p_d = q_f$, in other words:

$$a_d p_d^{\theta_d+1} = \beta_d Y P^{1-\varepsilon}(\frac{P}{p_d})^{\sigma-1} \tag{6}$$

$$a_f p_f^{\theta_f+1} = \beta_f Y P^{1-\varepsilon}(\frac{P}{p_f + \tau})^{\sigma-1} \tag{7}$$

Market clearing conditions (6) and (7), as well as the price index equation (3), completely characterize an equilibrium in this model and can be used to solve for all prices and quantities.

3.2 Calibration and Counterfactual Procedure

I obtain values of θ_f, σ, and θ_d from external data. θ_f values come from Soderbery (2018), and I estimate elasticities of substitution σ by regressing customs values of imports on the ratio of landed duty–paid values to customs values, as in Riker (2019). Since previous estimations of domestic supply elasticities do not exist in the literature, I set θ_d equal to the median θ_f estimate, or 1.1. For more details, see Phillips (2024).

Other parameters include τ, the ad valorem tariff rate, consumer demand parameters β_d and β_f, and supply shift parameters a_d and a_f. I construct τ using the ad valorem tariff formula presented in Section 2, incorporating data on specific rates, import quantities, and import values. I calibrate the other parameters from an initial baseline equilibrium in which all prices are normalized to one. Rearranging (1) and (2) we have

$$\beta_d = \frac{q_d p_d^{\sigma-1}}{YP^{1-\varepsilon}P^{\sigma-1}}$$
$$\beta_f = \frac{q_f(\tau p_f)^{\sigma-1}}{YP^{1-\varepsilon}P^{\sigma-1}}$$

Normalizing prices to one, β_d is the share of total expenditure spent on domestically–produced goods and β_f is the (tariff–adjusted) share of expenditure spent on imported goods. q_f represents the value of imports and can be obtained through DataWeb, but data on q_d, the value of domestic production consumed in the United States, is not available at the HTS8 level. I instead determine values of q_d and q_f for more aggregated categories and assign β_d and β_f values for HTS8 products based on the more aggregated category to which each product belongs. This data is not available for all categories represented in my set of products, but I can compute domestic production for all manufacturing products and most agricultural products. Given these limitations and previously discussed limitations on unit import price data, my analysis set includes 344 products in the 2000–2019 period and 387 products in the 2019–2022 period, around half of all HTS8 products facing specific tariffs in any given year.

For manufactured products, including food manufactures, I use data on 'sales, value of shipments, or revenue' from the Annual Survey of Manufactures to represent total domestic production; the Annual Survey of Manufactures records this information for NAICS 4–digit industries (NAICS4) until 2021. I subtract the value of exports for each NAICS4 industry from this total domestic production value to obtain a measure of domestic production consumed within the United States. β_d is then given by the ratio

$$\frac{\text{Domestic Production} - \text{Exports}}{\text{Domestic Production} - \text{Exports} + \text{Imports}} \tag{8}$$

and using a NAICS–HTS crosswalk provided by Pierce and Schott (2012) I assign each HTS8 manufactured product the β_d value belonging to its NAICS4 industry.

For mineral products, I use data on gross output for NAICS 211, oil and gas extraction, and NAICS, mining (except oil and gas). I impute exports and imports for NAICS 211 and NAICS 212 to obtain HTS8 indices for all the products that comprise these two sectors, then sum up their import and export values. β_d follows from (8) as in the NAICS 4–digit sectors described in the previous paragraph.

For agricultural products,[8] I observe data on U.S. domestic production, exports and imports from FAOSTAT. Data are observed at the level of FAOSTAT's Central Product Classification (CPC) item codes, and a concordance table provided by the United Nations' Statistics Division relates item codes to HTS 8–digit products. For example, HTS8 07129020, dried olives (ripe), would correspond to CPC category 01450, or olives. I obtain measures of β_d for item codes using (8) and can assign those ratios to the appropriate HTS8 products.

Sector	Median β_d
All	0.847
Meat	0.940
Dairy	0.966
Vegetables	0.756
Fruits	0.824
Food Manufactures	0.824
Minerals	0.874
Other	0.847

Table 2: Values of β_d for different sectors

As shown in Table 2, the majority of consumer expenditure on products facing specific rates goes to goods produced in the United States. Over ninety percent of consumption on meat and dairy products is on domestically produced goods, while with vegetables and food manufactures the share of consumption on imported goods is slightly higher. Heavily imported product categories, such as apparel, are under–represented among products that face specific tariffs.

I perform counterfactual estimations by comparing an equilibrium with observed 2022 AVEs and normalized prices to a counterfactual equilibrium where these AVEs decrease due to an increase in unit import prices and unchanging specific rates. I compute equilibria in two counterfactual scenarios. The first counterfactual incorporates price changes from 2000, the year after which most specific rates stayed constant, to 2019. The second incorporates price changes from 2019 to 2022 in order to capture the effects of the covid and post–covid period. I also conduct this partial equilibrium analysis at the level of the more aggregated products used to calibrate β_d; for example, in the case of olives, I would be solving a PE model for HTS8 07129020 and for olives as an aggregated category.

[8]This category includes meat, fruits, vegetables, and fruits and does not include food manufactures.

3.3 An Illustrative Example: Garlic

To demonstrate how these calculations proceed, I present the case of HTS8 07032000, fresh or chilled garlic, which has had a specific tariff of .43 cents per kilogram since 2000. Dividing the annual customs value of imported garlic by the annual quantity of imported garlic gives unit prices of \$0.96/kg in 2000, \$1.70/kg in 2019, and \$2.03/kg in 2022. The price of garlic therefore increases by 77.7% in the 2000–2019 period and 19.6% in the 2019–2022 period. The AVE for garlic in 2022 is .43 cents/kg divided by 96 cents/kg, or 0.448 percent.

Values of β_d and β_f for fresh or chilled garlic are determined by values of domestic production, exports, and imports of garlic presented by FAOSTAT. Since FAOSTAT does not provide agricultural data at an HTS8 level of granularity, I assign to fresh and chilled garlic the β_d and β_f ratios calculated with data for green garlic, or item code 01252. Calculations using (8) determine that the β_d for garlic is 0.423 and the β_f for garlic is 0.580, indicating that the majority of garlic consumption is consumption of imported garlic rather than of garlic produced within the United States.

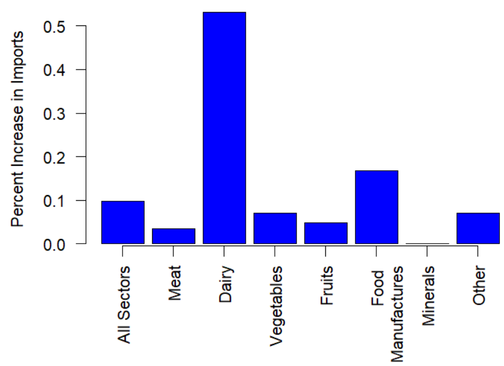
I model counterfactual changes in AVEs by modifying the 2022 AVE using a constant specific rate and the change in unit import prices from the 2000–2019 and 2019–2022 periods. This process yields an AVE of $\frac{.43}{96(1.777)}$ or 0.253 percent in the 2000–2019 case and $\frac{.43}{96(1.196)} = 0.375$ percent in the 2019–2022 case. I then compute counterfactual equilibria using both of these AVEs and compare import quantities under the new equilibria with observed import quantities in 2022.

4 Results

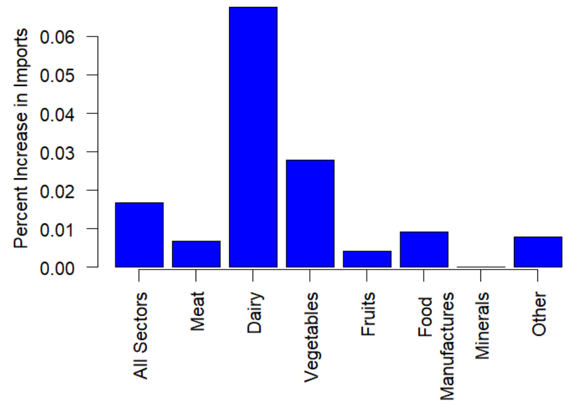
4.1 Counterfactual results at the HTS8 product level

I first discuss counterfactual results for products that face specific tariffs. Figures 3a) and 3b) present the median changes in import quantity by sector for these products, compared to baseline import quantity levels.

The median import change in Figure 3a) is about 0.1 percent, while the median change in Figure 3b) is even smaller. Dairy products display the largest import increases, while meat products and other products display the lowest. The ordinality of median import increases among different sectors is mostly consistent between the 2000–2019 period and the post–pandemic period, with the exception of fruit and vegetable products, whose import changes relative to the baseline are higher compared to other sectors in Figure 3b)



(a) Increase in imports using 2000–2019 price changes



(b) Increase in imports using 2019–2022 price changes

Figure 3: Median percent increase in imports

than in Figure 3a).

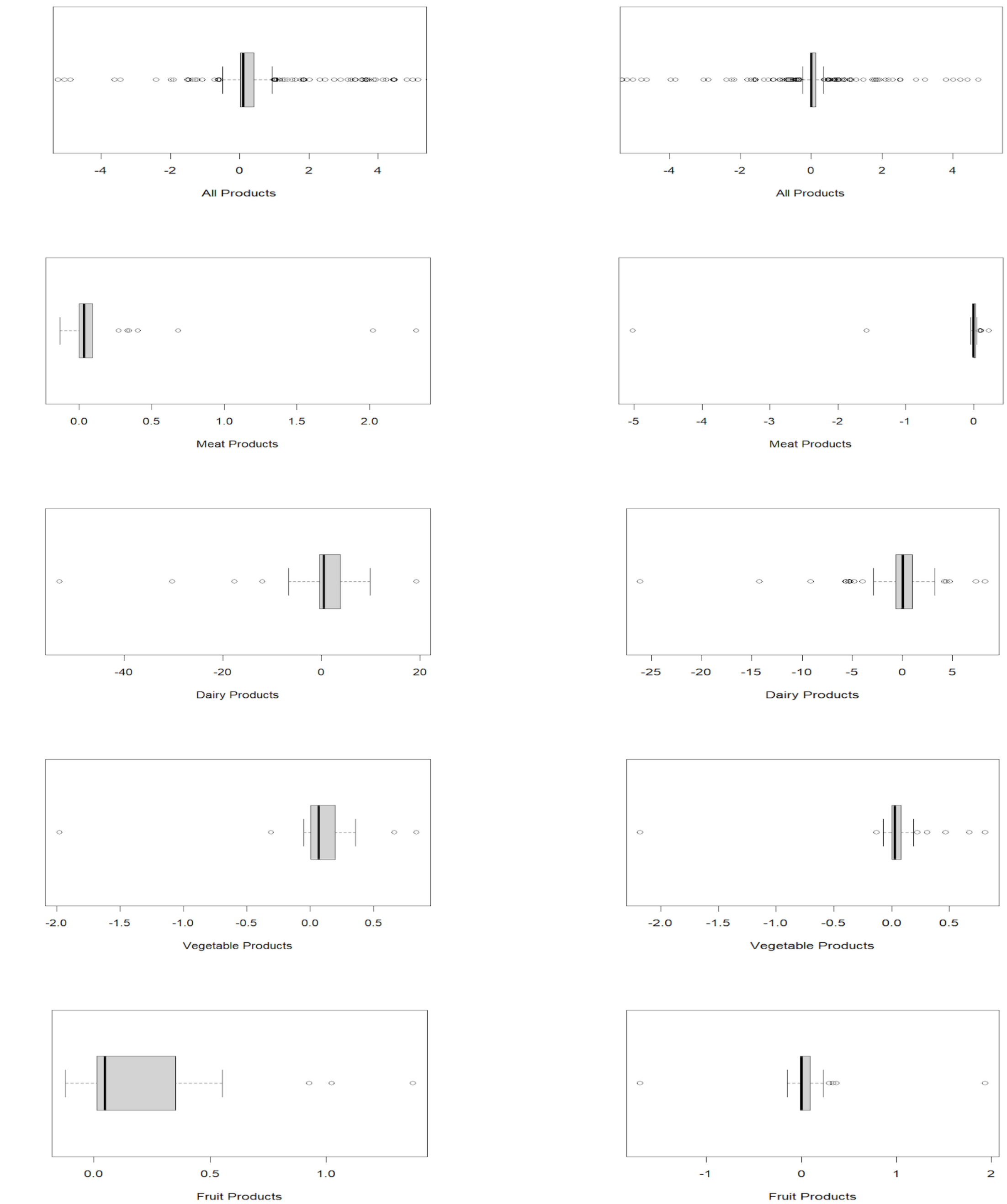
While a passive depreciation of specific tariff rates does cause U.S. imports to increase compared to a situation where specific rates do not depreciate, Figure 3 shows that this increase in imports is minute. The small median import increases observed may be caused by the generally high values of β_d observed in Table 2; if the vast majority of consumption of a given product is produced domestically, a decrease in ad valorem tariffs would not make an enormous difference to consumption decisions.

Box–and–whisker plots[9] in Figure 4 show that while the median import increase in each sector and across all sectors is slightly higher than zero, results show substantial dispersion, with large numbers of outliers. These outliers include both products whose imports increase in the counterfactual by margins higher than two percent as well as products whose imports decrease in the counterfactual. In Figure 4a, meat products and fruit products display a rightward skew, while dairy products have several extremely negative outliers. Vegetable products have more positive outliers in Figure 4b compared to Figure 4a, while fruit products and meat products have more negative ones. Lime peels and bovine and sheep carcasses are some of the products that display positive changes in the first counterfactual and negative changes in the second.

In the counterfactual scenario involving 2000–2019 price behavior, imports increase by more than ten percent for three products–processed edam and gouda and two variants of cocoa powder–and increase by

[9]To make graphical results more presentable, the box–and–whisker plots in Figure 4 for all products exclude observations where the change in imports was greater than five percent.

more than five percent for ten products, including frozen orange juice and condensed milk. Imports of 51 products increase by more than one percent, and imports of 49 products decrease. Raw beet sugar in solid form is the only HTS8 product whose imports increase by more than ten percent when unit import prices change according to their 2019–2022 behavior, while imports increase by more than five percent for seven products, including cocoa powder and several dairy products. Imports of 31 products increase by more than one percent, and imports of 128 products decrease.

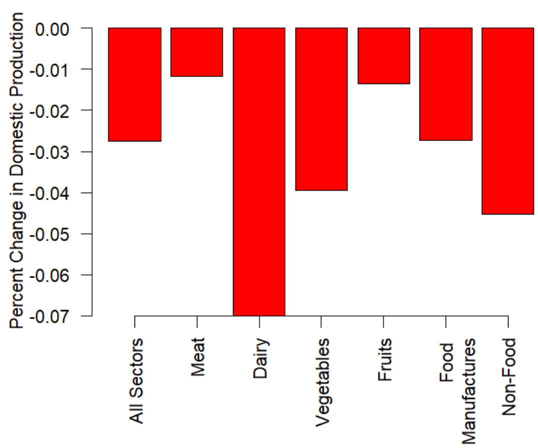


(a) Change in imports using 2000–2019 price changes

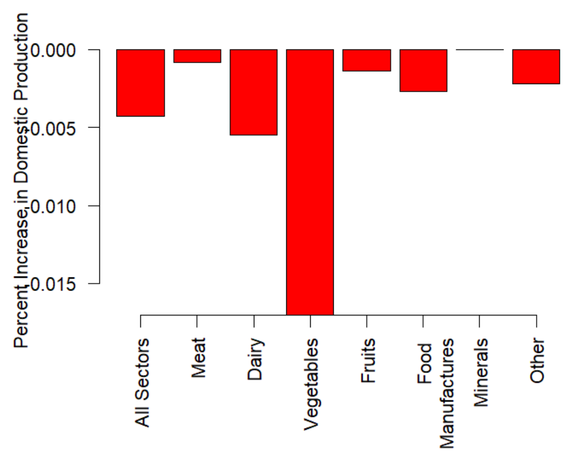
(b) Change in imports using 2019–2022 price changes

Figure 4: Box–and–whisker plots of import changes

I next discuss the effects of a passive depreciation in specific tariffs on domestic production, which due to market clearing is equivalent to domestic consumption in the model. Unlike imports, which increase as effective tariff rates become cheaper, domestic production is affected by two opposing mechanisms. The substitution effect indicates that cheaper imports cause consumers to substitute away from domestic goods toward imported goods, lowering domestic consumption, but the income effect indicates that a decrease in AVEs raises consumers' ability to spend, increasing consumption for both domestic goods and for imported goods.



(a) 2000–2019 price changes



(b) 2019–2022 price changes

Figure 5: Median change in domestic production

Figure 5a shows that the median domestic production for all sectors decreases as a result of the falling AVEs, suggesting that the substitution effect outweighs the income effect and a slight depreciation in the relative value of specific tariff rates induces U.S. consumers to shift a fraction of their expenditure away from domestically produced goods and towards imported goods. However, percent changes are quite small in magnitude; the median change in domestic production is less than 0.1 percent in Figure 4a and less than 0.02 percent in Figure 5b, compared to the baseline scenario before AVEs decrease. Dairy products once again display the highest counterfactual changes in quantity in Figure 5a, but in Figure 5b the domestic production of vegetables is most affected by 2019–2022 passive depreciation of specific tariff rates.

Although domestic production decreases for the majority of products in the counterfactual, these decreases are seldom higher than one percent, with domestic production decreasing by more than one percent for only eight products in the 2000–2019 case and four in the 2019–2022 case. Products with the largest decreases in domestic production are for the most part products with the largest increases in imports, and include beet sugar and cocoa powder as well as several tobacco products. Domestic production increases for fifty products in the 2000–2019 scenario and for 128 products in the 2019–2022 scenario, and all but one of the products with increasing domestic production have decreasing imports.

Finally, I use the counterfactual changes computed in this section to approximate effects of falling AVEs on *total* sector–level imports relative to a situation where AVEs remain constant. I obtain a measure of total trade in a sector by adding up the value of imports among all HTS8 products in that sector, including products subject to ad valorem tariffs, products subject to specific tariffs, and products with no tariffs at all.[10] Any change in counterfactual imports therefore comes exclusively from imports that are subject to specific tariffs, and the effects of a passive depreciation in specific tariffs would be more diluted compared to those shown in Figures 3–5. This setup does not account for general equilibrium effects between sectors, and is intended as a quick overview of how the passive depreciation of specific tariffs discussed in this paper can affect the U.S. economy as a whole.

Table 3 shows how a passive depreciation in specific tariffs affects total imports across all sectors previously

Sector	Change in Imports (2000–2019 prices)	Change in Imports (2019–2022 prices)
All	0	0
Meat	0	0
Dairy	2.15%	0.532%
Vegetables	0.251%	0.146%
Fruit	0.0357%	0.0103%
Food manufactures	0	0
Mineral products	0	0
Other	0	0

Table 3: Counterfactual percent change in aggregated sector–level imports

discussed in this paper. Effects on total imports under both counterfactuals are negligible in percentage terms, with a change less than 0.01 percent, as are effects on total imports of meat, food manufacturing, mineral, and other products. Only dairy products display a change in imports above one percent in the 2000–

[10]Around 36.8 percent of U.S. imports by value are subject to ad valorem tariffs and 51.6 percent do not face any tariffs at all, in addition to the ten percent of imports with specific tariffs. The remaining .7 percent of imports by value face either mixed tariffs–tariffs with an ad valorem component and a specific component–or more product–specific tariff rules such as tariff rates charged at the level of HTS10–digit products that comprise the given HTS8 product. Since these products collectively account for a small fraction of total U.S. imports, I do not consider them here or in Section 4.2.

2019 price counterfactual, and no sector has a change in imports above one percent in the post–pandemic price counterfactual.

The small overall percent changes estimated in this subsection contrast with the findings of papers cited in Section 1.1, which determined that specific tariff dynamics strongly influenced economic outcomes during historical periods such as the 1970s and the Great Depression. However, much of the previous literature on specific tariffs and inflation has focused on historical periods when specific tariffs were both higher and more heavily used than in the twenty–first century. HTS8 products whose imports were charged a specific tariff during the twenty–first century are more likely to be agricultural goods or food manufactures, with a high share of consumption going to domestic production rather than imports. This pattern dampens the effect of specific tariffs on trade or other economic outcomes.

4.2 Counterfactual results for aggregated products

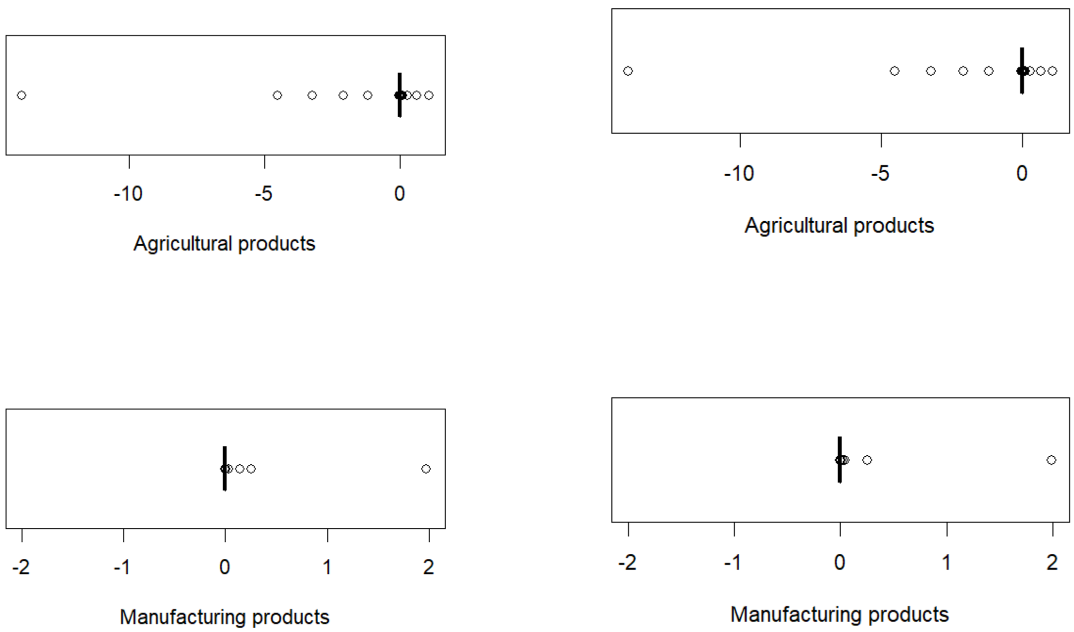
I next estimate the effect of passive specific tariff depreciation at the level of the more aggregated product categories that I used to calibrate β_ds; these groupings include agricultural products, such as wheat or apricots, as well as 3–digit NAICS industries for mineral products and 4–digit NAICS industries for manufactured products, including food manufactures. Groupings include both products subject to specific tariffs and products subject to ad valorem tariffs. This more aggregated analysis may be more interpretable than analysis at the HTS8 product level because the categories are not as abstract[11] and the specific tariff products discussed in Section 4.1 only account for around ten percent of U.S imports in 2022. Furthermore, this analysis can test the robustness of the assumption that β_d shares do not differ across products that share the same NAICS or agricultural grouping, an assumption required to compute the results presented in Section 4.1.

Production, export, and import data are all readily available since I used them to calibrate β_ds, and equations (4) and (5) then give a_d and a_f for baseline price normalizations of one. ε_f and σ, however, are not provided at these levels. I obtain values of ε_f for each product grouping by assigning to each constituent HTS8 product its relevant HTS4 ε_f estimate, then calculating an average of all these elasticities weighted by trade value. I use a similar process for the elasticities of substitution σ estimated at the HTS2 level.

The calculation of AVEs τ also requires an aggregation process for tariffs. I determine tariffs at the

[11]For example, HTS 08043040: "Pineapples, fresh or dried, not reduced in size, in crates or other packages" may be a less specific and more relevant unit of analysis than pineapples as a whole.

NAICS and CPC level by calculating total revenue across each category–the sum of revenues from each product calculated according to that product's PNTR category–and dividing total revenue by the total value of imports in that category. I calculate counterfactual tariff rates by adjusting revenue for all products subject to specific rates, then recalculating total revenue and tariffs. Revenue for products that face ad valorem tariffs will not change, and so the influence of depreciating specific rates will be more diluted than in Section 4.1.



(a) 2000–2019 price changes

(b) 2019–2022 price changes

Figure 6: Median change in domestic production

Figure 6 presents box–and–whisker plots for agricultural products and NAICS4 manufacturing industries, detailing the distribution of import quantity changes relative to a baseline where AVEs stay constant. The median import increase is zero for both agricultural products and manufacturing products, with no noticeable difference between results of the 2000–2019 counterfactual and results of the 2019–2022 counterfactual. Impacts are even smaller than in Figures 3 and 4 because the more aggregated groupings also contain products that face ad valorem tariffs.

The agricultural product category contains several negative outliers, while manufacturing products have several positive outliers. Agricultural products whose imports decrease in both counterfactuals include wheat, pumpkins, carrots/turnips, and maize, while imports of 'sugar and confectionary manufacturing' and 'beverage manufacturing' increase by more than 0.25% in both counterfactuals. Rice and pistachios are the only agricultural goods whose imports increase by more than one–tenth of a percent.

5 Conclusion

In this paper, I document that specific tariffs on most HTS8 products have not changed since 2000, eroding the effective level of these tariffs when import prices rise. I then use a partial equilibrium model to quantify the effect of this passive depreciation, modeling the interaction between increasing import prices and unchanging specific rates as a decrease in the ad valorem equivalents of these specific rates. Model results show that these decreasing AVEs lead to small increases in imports compared to a scenario where AVEs remain constant, with the median import increase among all products around 0.1 percent if unit prices increase according to their behavior in 2000–2019. This headline result masks some heterogeneity among products and sectors, with dairy and food manufacturing sectors displaying larger import changes than the median.

Two major factors can explain the small magnitude of the results presented in Section 4. First, specific tariffs disproportionately apply to agricultural products, of which a large share of consumption expenditure goes to domestically produced goods rather than imports. Because imports do not constitute a large fraction of expenditure for the products discussed in this paper, any decrease in AVEs will not have a large effect. Second, specific tariffs are not used as widely today compared to some historical periods discussed in the literature, so a passive depreciation of effective specific rates will not have a very large impact on aggregate trade.

This analysis would benefit from a more precise measurement of β_d and β_f, the utility weights given to domestically produced goods and imported goods respectively. These weights strongly influence how consumption of imports responds to changes in the ad valorem tariff rate, and the absence of domestic production data limits the number of HTS8 codes eligible for PE equilibrium computation to around half of all products that face specific tariffs. Such precise measurements are currently difficult to obtain, however, since import data is available at a much more granular level than production data.

Another limitation with this paper, as well as an avenue for future research, involves the endogeneity of import prices. The setup in Section 3.1 and Section 3.2 models the effect of unchanging specific rates by calculating the AVEs for these specific rates and lowering the AVEs by raising unit import prices. This setup offers a simple and convenient method for evaluating how constant specific rates can lead to higher imports, but ignores the fact that an increase in import prices is endogenous and would in turn *decrease* consumption of imported goods. An analysis of specific rates that takes into account endogenous effects of an import price increase would require a multi–period general equilibrium model with substantially more complexity than the partial equilibrium model presented in this paper.

Finally, future research should use structural modeling to examine how price increases across the entire economy interact with consistent structural tariff rates. This modeling is both more realistic–import prices and overall price levels often move in tandem–and offers a more complete account of how structural tariffs interact with inflation, to complement the reduced–form analysis discussed in Section 1.1.

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