The Economics of Tariffs*

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Abstract

A central insight from neoclassical economics is that international trade operates like an improvement in production technology. It generates mutual aggregate welfare gains for countries as a whole, but creates winners and losers within countries. Tariffs are a tax on this trading technology and distort the prices faced by domestic consumers and producers. Large countries can use tariffs to improve their terms of trade on world markets. But if all countries try to do so, they can end up with lower welfare than if they cooperated to liberalize trade. Tariffs can be used to redistribute income between the winners and losers from trade within countries. But there can be other more efficient ways to achieve redistribution. Empirical findings from the recent waves of U.S. tariffs suggest that most of the incidence of these tariffs has been borne by U.S. importers, wholesalers, retailers and consumers rather than by foreign exporters.

Keywords: comparative advantage, tariffs, trade, and welfare

JEL Classification: F13, F14, F15

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1 Introduction

For much of the period since the Second World War, tariffs appeared to be a largely settled issue in advanced economies. Successive rounds of multilateral liberalization under the General Agreement on Tariffs and Trade (GATT) and its successor, the World Trade Organization (WTO), together with the expansion of preferential trade agreements, steadily reduced barriers to trade. By the mid-2010s, average import-weighted tariffs in the United States had fallen below 2 percent—levels that were exceptionally low by historical standards.

In recent years, this situation has changed dramatically. Beginning in 2018–2019, and intensifying in 2025–2026, the United States imposed successive waves of tariffs that raised protection to levels not seen since the Smoot–Hawley Tariff Act of the 1930s. Tariffs were applied broadly across products and trading partners and were subsequently adjusted through bilateral bargaining rather than through multilateral, rule-based processes. At the same time, geopolitical tensions have risen, concerns about resilience and national security have intensified, global production has become increasingly fragmented, and industrial policy has regained prominence. In this environment, tariffs have reemerged as an actively-deployed instrument of economic policy.

This renewed prominence of tariffs brings foundational economic questions back to the forefront. What are the aggregate welfare consequences of taxing imports, and who ultimately bears their burden? Under what conditions can tariffs raise national real income? How do they interact with global production structures and domestic distortions? What distributional effects do they generate within countries? And how should we understand their use in a world of strategic interaction among states and international institutions?

Against this background, this article synthesizes theoretical and empirical research on the economics of tariffs. Our aim is not to provide an exhaustive survey, but rather to distill key economic insights and clarify how they relate to contemporary trade policy debates. The exposition is intended to be accessible to advanced undergraduate and graduate students in economics, as well as interested non-economists, while remaining grounded in frontier research.

The analysis is organized around a central conceptual insight: international trade operates like a technology that allows economies to transform what they produce into what they consume through market-based exchange. Tariffs are a tax on this technology. This perspective provides a unified way of understanding both the costs and benefits of tariffs. By distorting the prices faced by consumers and producers, tariffs generate deadweight losses through inefficient consumption and production decisions. At the same time, economies that are large enough to influence world prices can use tariffs to improve their terms of trade, shifting part of the burden onto foreign exporters. The tension between domestic distortions and international price manipulation lies at the heart of the economics of tariffs and underpins both the classic optimum-tariff argument and the rationale for international trade policy cooperation.

Another unifying theme concerns income distribution. Like other technological changes, trade generates winners and losers within countries—across industries, regions, firms, and households. Tariffs can redistribute income toward import-competing sectors or locations, but they do so indirectly and typically at the cost of reducing aggregate real income. These distributional consequences help explain the political appeal of tariffs and the persistence of protectionist pressures, even in circumstances under which tariffs lower aggregate real income.

Finally, many contemporary arguments for tariffs—whether framed in terms of manufacturing revival, supply-chain resilience, or national security—can be understood as modern variants of older economic ideas involving externalities or market failures. While such considerations can, in principle, justify intervention, tariffs are rarely the first-best policy instrument relative to more targeted interventions, particularly in economies deeply embedded in global value chains.

This article complements a broad set of existing surveys and reviews on trade policy. Classic surveys such as Corden (1984), Dixit (1985), Helpman and Krugman (1989), and Feenstra (1995) synthesize the core theory of trade policy in partial and general equilibrium. More recent reviews, including Costinot and Rodríguez-Clare (2014), Goldberg and Pavcnik (2016), and Caliendo and Parro (2022), incorporate quantitative trade models and empirical evidence. For the recent U.S. tariff episodes, particularly relevant reviews are Fajgelbaum and Khandelwal (2022) and Caliendo and Parro (2023).

The remainder of the paper is structured as follows. Section 2 examines the partial equilibrium effects of a tariff on prices and quantities in the industry in which it is introduced. Section 3 establishes mutual aggregate welfare gains from trade and shows that a tariff acts like a tax on the technology of market-based exchange in general equilibrium. Section 4 shows that these mutual aggregate welfare gains from trade typically involve winners and losers within countries, as with any other technological improvement. Section 5 introduces quantitative trade models that have been used to evaluate the impact of actual and counterfactual tariffs. Section 6 examines some of the most influential arguments for tariff protection. Section 7 reviews empirical evidence for the impact of the recent waves of U.S. tariffs during 2018-19 and 2025-26. Section 8 concludes.

2 Partial Equilibrium Effects of Tariffs

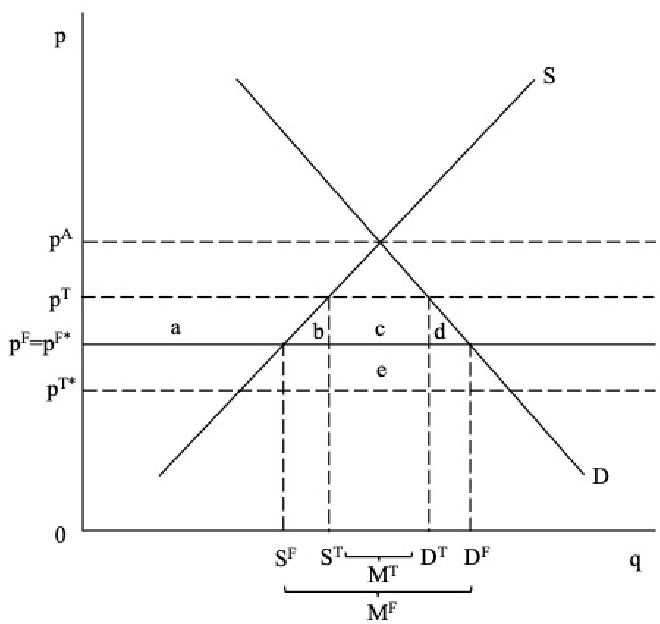
A tariff corresponds to a tax on imports and can take two main forms: *ad valorem* (a percentage amount, such as a 20 percent tariff) or *specific* (a monetary amount such as $10 per unit of a good imported). In perfectly competitive markets, these two forms of tariffs are equivalent, in the sense that one can always find an *ad valorem* tariff that has exactly the same effects on prices, quantities and welfare as any given *specific* tariff. We begin by examining the direct effects of tariffs in the industry where they are introduced. We begin by using partial equilibrium analysis to demonstrate the deadweight welfare losses from the distortion of producer and consumer decisions and the terms of trade effects from the introduction of a tariff.

2.1 Price and Quantity Effects of a Tariff

We consider a neoclassical environment with perfect competition, constant returns to scale and no market failures. We focus on a single sector (e.g., wheat). There are two countries: home and the rest of the world (foreign), where foreign variables are denoted by an asterisk. We assume that each country is large, in the sense that its trade volume is sufficiently large so as to influence the world market price for the good.

Figure 1 shows the home market for wheat. D is the domestic demand curve. S is the domestic supply curve. The closed economy (autarky) equilibrium price is p^A, at which domestic demand is equal to domestic supply. When the closed economy is opened to free trade, we suppose that home is an importer of wheat in the free trade equilibrium, while foreign is an exporter of wheat. The domestic price (p^F) is equal to the world market price (p^{F*}) under free trade: $p^F = p^{F*}$. Home's equilibrium quantity of imports is equal to the difference between domestic demand and supply at the free trade equilibrium price: $M^F = D^F - S^F$.

Figure 1: Impact of a Tariff in the Domestic Market in Partial Equilibrium



Note: Impact of the introduction of a tariff by home on its imported good; S denotes domestic supply; D denotes domestic demand; $M = D - S$ denotes imports; p denotes price; superscript A denotes the autarky value of variable; superscript F denotes the free trade value of a variable; superscript T denotes the value of a variable under a tariff; no asterisk denotes the home value of a variable; an asterisk denotes the foreign value of a variable; areas b and d correspond to the Harberger triangles that capture the deadweight welfare losses as a result of the tariff from the distortion of producer and consumer decisions, respectively; the rectangle e captures the terms of trade improvement.

Suppose that home introduces a specific tariff of $t > 0$, while the rest of the world maintains policies of free trade. Home's tariff introduces a wedge between the domestic price (p^T) and the world market price under the tariff (p^{T*}):

$$p^T = p^{T*} + t. \tag{1}$$

The direct effect of the tariff is to raise the price of imported wheat. But domestic and foreign wheat are perfect substitutes, which implies that the domestic price of wheat must also rise, in order to leave consumers indifferent between consuming domestic and foreign wheat, in any equilibrium with positive wheat imports. Therefore, although only imported wheat is taxed, the price of domestic wheat also rises in equilibrium from p^F to p^T.

As the domestic price of wheat rises, domestic demand for wheat declines (from D^F to D^T), and domestic supply of wheat increases (from S^F to S^T), with the result that there is a decline in home's imports of wheat to $M^T = D^T - S^T$. Since home is large relative to the world market for wheat, this decline in import demand leads to a fall in the world market price of wheat from p^{F*} to p^{T*}.[1]

Therefore, although the statutory incidence of the tariff is on imports, its equilibrium incidence is shared between home consumers (higher home price) and foreign producers (lower world market price). The size of the fall of the world market price depends on the elasticity of the foreign export supply curve. In the special case in which home is small relative to world markets, it faces a perfectly elastic foreign export supply curve, such that its imports have no effect on the world market price ($p^{T*} = p^{F*}$). In this special case, the entire incidence of the tariff falls on domestic consumers.

Multiple claims have been made about the effects of tariffs, such as increasing domestic employment without increasing domestic prices, reducing imports, and raising tax revenue. The demand-supply analysis in Figure 1 already indicates some trade-offs between achieving alternative objectives. In order to stimulate domestic production (from S^F to S^T), tariffs must raise domestic prices (from p^F to p^T), such that domestic producers move up their supply curve. Although tariffs do simultaneously reduce imports (from M^F to M^T) and raise tax revenue (by $M^T\left(p^T - p^{T*}\right)$), the reduction in imports decreases the tax base and hence the revenue raised, thereby indicating a trade-off between the objectives of restricting imports and raising revenue.

2.2 Welfare Effects of a Tariff

In this partial equilibrium setting, national welfare ($\mathcal{W}(t)$) can be represented as the sum of consumer surplus ($CS(p(t))$), producer surplus ($PS(p(t))$) and government revenue ($R(t)$):

$$\mathcal{W}(t) = CS(p(t)) + PS(p(t)) + R(t), \tag{2}$$

[1]We make the standard assumption that the world market price falls by less than the tariff, such that the domestic price rises ($p^T > p^F$), which is the empirically-relevant case of no Metzler Paradox.

$$R(t) = tM(p(t)), \tag{3}$$

where $p(t)$ denotes the domestic price as a function of the specific tariff (t) and $M(p(t))$ denotes imports as a function of the domestic price.

From Figure 1, the tariff reduces consumer surplus by areas $a + b + c + d$; increases producer surplus by area a; and increases government revenue by area $c + e$; which equals the value of the tariff times the quantity of imports under the tariff ($tM(p(t))$). Therefore, the net effect of the tariff on welfare is $e - (b + d)$, which is ambiguous, depending on whether the improvement in the terms of trade (e) exceeds the deadweight welfare loss from the distortion of consumer and producer decisions ($b + d$). Area e corresponds to a welfare improvement, because under the tariff the home country obtains the good from the world market at a lower price than under free trade ($p^{T*} < p^F$), allowing the country to obtain a greater quantity of imports for any given quantity of exports (an improvement in the terms of trade). This terms of trade improvement shows up as part of government revenue, because the wedge between domestic and world prices corresponds to tax revenue. Areas b and d are Harberger triangles for the deadweight welfare losses for producers and consumers (Harberger 1964). The size of these triangles depends on the elasticity of the demand and supply curves. For a small tariff, the welfare impact of the tariff is:

$$\frac{d\mathcal{W}(t)}{dt} = -M(p)\frac{dp^*}{dt} + t\frac{dM(p)}{dp}\frac{dp}{dt}, \tag{4}$$

as shown in Online Appendix B.1. The first term is the terms of trade improvement on infra-marginal imports, and is positive, since $\frac{dp^*}{dt} < 0$. The second term is the deadweight welfare loss from distorting producer and consumer decisions, and is negative, since $\frac{dM(p)}{dp} < 0$ and $\frac{dp}{dt} > 0$.

2.3 Optimum Tariff for a Large Country

Starting from free trade ($t = 0$), the welfare gain from the terms of trade improvement (area e and the first term in equation (4)) is first-order, because it captures the reduction in the cost of sourcing infra-marginal units on world markets. In contrast, the deadweight welfare losses (areas $b + d$ and the second term in equation (4)) are second-order, because the free trade equilibrium is efficient. In this free trade equilibrium, producers equate price to marginal cost, and consumers equate price to marginal utility. Therefore, the envelope theorem applies, and the deadweight welfare losses from the distortion of producer and consumer decisions are second-order small.

This property has two important implications. First, starting from free trade ($t = 0$) and taking the behavior of the rest of the world as given, a country that is large enough to affect the world market price has a unilateral incentive to introduce a small tariff, because the first-order welfare gain from the terms of trade improvement exceeds the second-order welfare loss from the distortion of producer and consumer decisions. Second, as the tariff increases from zero, the second-order welfare losses from the distortion of producer and consumer decisions become large relative to the first-order welfare gain from the terms of trade improvement, such that a large tariff can be welfare reducing.

The optimum tariff for a large country can be obtained by setting equation (4) equal to zero, which yields the classic optimum tariff formula (Johnson 1953):

$$t_V = \frac{1}{\epsilon^*}, \qquad \epsilon^* \equiv \frac{dM}{dp^*(M)} \frac{p^*}{M}, \tag{5}$$

as shown in Online Appendix B.2; where t_V is an *ad valorem* tariff (such that $p = (1 + t_V) p^*$); and ϵ^* is the elasticity of foreign export supply with respect to the world price of the good (which equals the elasticity of home's imports with respect to that world price).

A country that is large enough to affect the world market price faces a positive and finite export supply elasticity ($0 < \epsilon^* < \infty$), which implies that its optimum tariff is strictly positive, assuming no retaliation by the rest of the world. Therefore, the crucial object in determining the size of the optimum tariff is the foreign export-supply elasticity. Using the Feenstra (1994) methodology for estimating demand and supply elasticities, Broda et al. (2008) estimate export supply elasticities for 15 countries that were able to choose tariffs unilaterally, because they were not members of the World Trade Organization (WTO). Estimated inverse export supply elasticities are lower for homogeneous products that are traded on organized exchanges ($1/\epsilon^* = 0.5$) than for differentiated products ($1/\epsilon^* = 2.4$). Countries are found to set tariffs about 9 percentage points higher in goods with medium or high market power than in those with lower market power, consistent with countries' tariff choices being influenced by their ability to manipulate the terms of trade.

2.4 Small Country Special Case

In the special case of a small country that is unable to influence the world price of a good ($\frac{dp^*}{dt} = 0$), there is zero first-order effect of the tariff on welfare in equation (4). Therefore, the tariff only has second-order effects on welfare through the deadweight welfare losses from the distortion of domestic producer and consumer decisions:

$$\frac{d\mathcal{W}(t)}{dt} = t \frac{dM(p)}{dp} \frac{dp}{dt} < 0, \tag{6}$$

since $\frac{dM(p)}{dp} < 0$ and $\frac{dp}{dt} > 0$. Therefore, a tariff necessarily reduces welfare for a small country. Taking a second-order Taylor-series expansion around the free trade equilibrium, the deadweight welfare losses correspond to the area of the Harberger triangles ($b + d$) in Figure 1:

$$\Delta\mathcal{W}(t) \approx \frac{1}{2} \frac{dM(p^*)}{dp} t^2 \approx \frac{1}{2} t (\Delta M) < 0, \tag{7}$$

as shown in Online Appendix B.1. In terms of equation (5), a small country that is unable to influence the world price of a good faces a perfectly elastic export supply curve ($\epsilon_S^* = \infty$), and hence has a zero optimum tariff.

Although the tariff is distortionary and welfare reducing for a small country, one could argue that most forms of taxation (e.g., income, consumption, property taxes) are distortionary, because lump sum taxes that are levied per head regardless of individual characteristics are typically viewed as politically infeasible. There are three reasons why economists typically view tariffs as especially costly from a welfare perspective. First, while consumption taxes distort consumption and production taxes distort production, tariffs simultaneously distort both of these margins. Second, for a large country such as the United States, imports account for a relatively small share of income and expenditure at around 10 percent, which implies a much smaller tax base than for income or expenditure taxes. This smaller tax base implies that a larger tax rate must be chosen in order to raise a given amount of revenue. Since the distortionary effects of taxation increase with the square of the tax rate (as shown for tariffs in equation (7) above), this implies that tariffs are more distortionary than these other taxes for the same amount of revenue raised. Third, since the statutory incidence of tariffs falls directly on imports, they can be more prone to retaliation by foreign countries than domestic taxes, where foreign retaliation reduces home welfare.

3 General Equilibrium Effects of Tariffs

We next use general equilibrium techniques to demonstrate the existence of mutual aggregate welfare gains from trade and the sense in which international trade acts like an improvement in production technology. A key insight from incorporating multiple industries in general equilibrium is that these mutual aggregate welfare gains from trade depend on comparative advantage (relative opportunity costs of production across countries and industries) rather than absolute advantage (relative costs across countries in a single industry). We show that a tariff acts like a tax on the technology of market-based exchange on international markets.

3.1 Welfare Gains from Trade

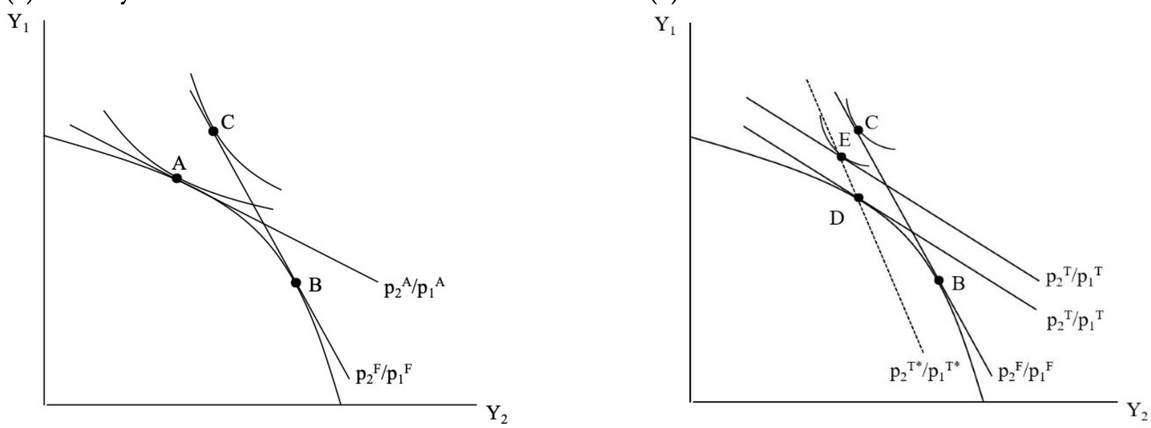
We again consider a neoclassical environment with perfect competition, constant returns to scale and no market failures. There are two countries: home and foreign, where foreign variables are denoted by an asterisk. Home is assumed to be large relative to world markets, such that its imports and exports influence world prices. To illustrate general equilibrium effects as simply as possible, we consider the case in which there are only two goods (1 and 2).

Figure 2 illustrates the home country's production and consumption possibilities, using a production possibility frontier (PPF) and indifference curves. In the closed economy (autarky), home must produce everything that it consumes. Therefore, the autarky equilibrium is at point A, where producers maximize profits (the opportunity cost of production as captured by the slope of the PPF equals autarky relative prices), consumers maximize utility (the slope of the indifference curve equals autarky relative prices), and consumption equals production for each good.

When the economy is opened to free trade, home no longer needs to produce everything that it consumes. Instead, home can specialize in the good where it is relatively productive, sell that good on world markets, and use the revenue to obtain the other good from foreign. As long as relative prices on world markets are different from home's autarky prices, producers will produce more of the good whose relative price has risen, and consumers will demand relatively more of the good whose relative price has fallen. The free trade equilibrium involves production at B (where the slope of the PPF equals free trade relative prices) and consumption at C (where the slope of the indifference curve equals free trade relative prices). Home exports good 2 (for which production at B exceeds consumption at C) and imports good 1 (for which production at B falls short of consumption at C).

Figure 2: Tariffs in General Equilibrium

(a) Autarky and Free Trade (b) Free Trade and a Tariff



Note: Panel (a) shows the autarky (superscript A) and free trade (superscript F) equilibria; p_2^A/p_1^A denotes autarky relative prices; p_2^F/p_1^F denotes free trade relative prices; Panel (b) shows the free trade and tariff (superscript T) equilibria; p_2^F/p_1^F denotes free trade relative prices; p_2^T/p_1^T denotes domestic relative prices under the tariff; and p_2^{T*}/p_1^{T*} denotes world relative prices under the tariff.

Comparing the closed and open economy equilibria, there are aggregate welfare gains from trade, in the sense that home is able to achieve a higher indifference curve under free trade at C than under autarky at A. We also see the sense in which international trade is like an improvement in production technology. In the open economy, home is able to consume at point C, outside of its production possibility frontier. This consumption bundle is technologically infeasible in the closed economy. But it is made feasible by the technology of trade at world market prices. Although home cannot produce the bundle of goods at C itself, it can consume this bundle under international trade, by specializing in the good that is relatively more efficient at producing, and using international trade to expand its ability to consume the good that it is relatively less efficient at producing.

These aggregate welfare gains are just an example of the standard gains from market-based exchange that we experience in our everyday lives. Most of us do not grow all of our own food or make all of our own clothes. Instead, we specialize in our chosen profession, sell our labor services in return for income, and use that income to purchase on markets the goods that we do not produce ourselves. International trade is simply an example of these gains from market-based exchange relative to self sufficiency. Since markets do not stop at countries' borders, these gains from market-based exchange hold internationally as well as domestically.

This insight that there are aggregate welfare gains from trade holds for both countries, such that international trade is mutually beneficial, positive sum and win-win (rather than zero-sum and win-lose). These mutual aggregate welfare gains are possible even if the home country is less efficient at producing both goods, such that its PPF lies everywhere inside the foreign country's PPF. As long as the two countries have different autarky prices, free international trade will ensure a single world market price that differs from both countries' autarky prices, at which both countries can achieve higher welfare than under autarky by specializing and trading. Therefore, the welfare gains from trade depend on comparative advantage (differences in relative autarky prices and opportunity costs of production across countries and industries) rather than on absolute advantages (differences in the absolute levels of prices and costs of production in a single industry).

Another way of viewing these aggregate welfare gains is in terms of revealed preference. The autarky consumption bundle A is feasible in the open economy, in the sense that it lies inside the budget constraint under free trade (the price line passing through B and C). However, the representative consumer instead chooses the free trade consumption bundle C. Therefore, this free trade consumption bundle C must be weakly preferred to the autarky consumption bundle A.

For expositional simplicity, we have developed this revealed preference argument in a setting with two goods and two countries. But the argument holds more generally with many goods and countries, non-traded goods, and intermediate inputs as well as final consumption goods. Under the standard neoclassical assumptions considered here, there exist mutual aggregate welfare gains from trade for all countries (e.g., Dixit and Norman 1980). As long as relative goods prices differ in the open economy and the closed economy, countries can consume outside of their production possibility frontiers, by specializing and trading (see Online Appendix C).

3.2 Welfare Effects of a Tariff

Now suppose that the home country introduces a tariff, which increases good 1's relative price in the domestic market, and reduces its relative price in the world market because home is large relative to world markets:

$$\frac{p_1^T}{p_2^T} = \frac{p_1^{T*} + t}{p_2^{T*}} > \frac{p_1^F}{p_2^F} > \frac{p_1^{T*}}{p_2^{T*}},$$

where we assume that tariff revenue is redistributed lump sum to the representative consumer.

Equilibrium production under the tariff occurs at D (where the slope of the PPF equals domestic relative prices). Equilibrium consumption under the tariff must satisfy two conditions. First, the production bundle at D can be traded with foreign at world prices, such that the representative consumer's budget constraint is shown by the straight line passing through D with slope world relative prices (p_1^{T*}/p_2^{T*}). Therefore, equilibrium consumption must lie somewhere along this budget constraint. Second, consumers maximize utility given domestic relative prices ($p_1^T/p_2^T > p_1^{T*}/p_2^{T*}$), which implies that equilibrium consumption must lie at a point of tangency between domestic relative prices and the representative consumer's indifference curves. The equilibrium consumption point E satisfies both these conditions, with domestic relative prices tangent to the representative consumer's indifference curves at a point along her budget constraint. The equilibrium value of consumption at domestic prices is shown by the line passing through E with slope domestic prices. The equilibrium value of production at domestic prices is shown by the line passing through D with slope domestic prices. The gap between these two lines corresponds to the tariff revenue that is redistributed lump sum to the representative consumer.

As in the partial equilibrium section above, the tariff both distorts domestic production and consumption decisions (which are made based on domestic relative prices under the tariff (p_1^T/p_2^T) rather than free trade relative prices (p_1^F/p_2^F)), and leads to an improvement in the terms of trade (a reduction in the price of imports relative to exports on world markets (fall in p_1^{T*}/p_2^{T*})). Whether the tariff is welfare increasing or reducing depends on whether the deadweight welfare losses from the distortion of domestic production and consumption decisions are larger or smaller than the improvement in the terms of trade. Figure 2 shows the case where the deadweight welfare losses dominate and the tariff is welfare reducing, with consumption under the tariff at E on a lower indifference curve than under free trade at C.

Relative to the partial equilibrium case, we obtain the new insights of the existence of mutual aggregate welfare gains from trade and the sense in which trade acts like an improvement in production technology. Comparing the production and consumption bundles under the tariff (at D and E) to those under free trade (at B and C), we see that production and consumption are closer together under the tariff than under free trade, implying a reduction in the volume of trade. In the same way that trade is like an improvement in production technology, because market-based exchange provides a new technology for obtaining goods, the tariff operates like a tax on this technology, because it reduces the extent to which the economy makes use of this market-based exchange.

3.3 International Trade Agreements

Although a large country can improve its welfare by introducing an optimal import tariff, if all large countries do so, they can each end up achieving little improvement in their terms of trade, at the cost of distorting domestic production and consumption decisions. Therefore, countries face a Prisoners' Dilemma. Starting from free trade, each has a unilateral incentive to introduce an import tariff, but if they all do so, they can end up worse off than if they could all commit to free trade.

Bagwell and Staiger (1999) provide a formal analysis of this Prisoners' Dilemma and its implications for the design of international trade agreements, such as the General Agreement on Tariffs and Trade (GATT) and the World Trade Organization (WTO). In the Nash non-cooperative equilibrium, each country chooses its tariff taking into account that a higher tariff improves its own terms of trade, which has the negative externality of worsening its trade partner's terms of trade. This negative externality implies that the Nash non-cooperative equilibrium is inefficient, in the sense that a Pareto improvement is possible, such that no country experiences a decrease in its welfare, while one or more countries experience an increase in their welfare.

Bagwell and Staiger (1999) show that this insight provides microfoundations for the core principles of reciprocity and nondiscrimination that underlie the GATT and the WTO. Reciprocity is the principle that countries offer (or potentially withdraw) tariff concessions that involve equal improvements in market access in foreign markets for domestic firms as granted in the domestic market for foreign firms. Bagwell and Staiger (1999) interpret this definition of reciprocity as corresponding to equal changes in the value of trade at initial world prices. Non-discrimination is the principle that countries offer the same tariff to all trade partners on any given product (also referred to as the most-favored nation (MFN) principle). Together, these principles constrain tariff changes so that world prices remain unchanged, removing the incentive for governments to manipulate their terms of trade and supporting efficient outcomes.

Although the Nash equilibrium is inefficient and countries can achieve mutual welfare gains through trade negotiations that move them towards the efficiency frontier, there remains the question of the division of these welfare gains between countries. Starting at the Nash equilibrium and bargaining according to the principles of reciprocity and nondiscrimination according to a rules-based international order yields one possible division of the surplus. But other possible divisions of the surplus could be achieved through a power-based international order, in which countries bargain bilaterally or through other bargaining protocols.

Other rationales for international trade agreements have been advanced. The U.S. Reciprocal Trade Agreements Act of 1934 (RTAA) empowered the President to negotiate bilateral tariff reductions, in part with the view that the political economy forces for tariff protection in the domestic market could be offset by the political economy forces for tariff reductions in foreign markets (e.g., Krugman 1997 and Maggi and Ossa 2023). Although the model of international trade agreements above allows for political economy forces, Maggi and Rodríguez-Clare (1998) and Maggi and Rodriguez-Clare (2007) argue that international trade agreements may have an additional role in allowing domestic governments to make credible commitments to not introduce tariffs, thereby avoiding the private-sector making upfront investments to influence subsequent tariff choices.

In the perfectly competitive environment of Bagwell and Staiger (1999), the terms of trade externality is the sole problem for an international agreement to solve. In models of imperfect competition with home market effects, Ossa (2011) shows that there is a production relocation externality, as governments have an incentive to use tariffs for industrial policy purposes to expand domestic manufacturing at the expense of foreign manufacturing. Bagwell and Staiger (2012a) and Bagwell and Staiger (2012b) demonstrate that even in such environments the terms-of-trade externality is the only problem for trade agreements to solve if governments have access to a full set of domestic policy instruments. The intuition is that the economy behaves as if it were perfectly competitive when governments can use domestic policies to address internal distortions.

3.4 Tariffs and Trade Deficits

In this general equilibrium analysis, we assume that consumers are on their budget constraint, such that expenditure is equal to income, which equivalently implies that trade is balanced with the value of exports at world prices equal to the value of imports at world prices:

$$p_1 C_1 + p_2 C_2 = p_1 Y_1 + p_2 Y_2, \tag{8}$$

$$p_1 \left(C_1 - Y_1 \right) = p_2 \left(Y_2 - C_2 \right).$$

Therefore, the distortionary effects of import tariffs hold without multilateral trade deficits, and are driven by tariffs acting as a tax on the technology of market-based exchange.

In reality, countries can run multilateral trade deficits and surpluses, which are driven by intertemporal decisions about consumption and saving. A multilateral trade deficit involves a country spending more than its income today, in return for spending less than its income in the future. This multilateral trade deficit can be financed by capital inflows from the rest of the world (selling IOUs to the rest of the world), such that the balance of payments equals zero as an accounting identity. In contrast, a multilateral trade surplus involves a country spending less than its income today, in return for spending more than its income in the future. This multilateral trade surplus can be offset by capital outflows to the rest of the world (buying IOUs from the rest of the world), such that the balance of payments equals zero as an accounting identity. Therefore, these multilateral trade surpluses and deficits also reflect a welfare gain from trade, namely a welfare gain from intertemporal trade between current and future consumption (Obstfeld and Rogoff 1996).

In principle, the introduction of tariffs can affect multilateral trade deficits through a number of mechanisms. First, if the elasticity of demand with respect to real income differs between imported and exported goods, the reduction in real income caused by tariffs affects imports and exports unevenly (see Costinot and Werning 2025). Second, tariffs can affect savings and investment by changing the values of countries' external asset and liability positions and rates of return to savings and investment (see Aguiar et al. 2025, Bayas-Erazo and Lorenzoni 2025, Ignatenko et al. 2025, Kleinman et al. 2025b, Caliendo et al. 2025, Itskhoki and Mukhin 2025). But the direction of these effects on savings and investment is subtle and in general can be either positive or negative.

In a world of many countries and goods, each country can have complex patterns of bilateral deficits and surpluses with individual partners, even if multilateral trade deficits are zero. These bilateral deficits and surpluses are a consequence of market-based exchange. Britain can specialize in producing whiskey and export it to Japan, and use the resulting revenue to purchase cars from Germany, in which case it can have bilateral trade surplus with Japan, and a bilateral trade deficit with Germany. Again we are aware of this feature from our daily lives. We specialize in a career that we are relatively good at, sell our labor services on the market, and use the revenue obtained to purchase the goods that we are relatively bad at supplying. As a result, most of us have bilateral surpluses with our employers, and bilateral deficits with our grocery stores. Since markets do not stop at borders, the same is true for countries as a whole. Only in a world of bilateral bartering of goods, without market-based exchange, would all bilateral deficits and surpluses equal zero.

3.5 Policy Equivalences

Considering trade and tariffs in general equilibrium also highlights a policy equivalence. In the neoclassical setting considered here, an import tariff is equivalent to an export tax, as summarized in the Lerner Symmetry Theorem (Lerner 1936). An import tariff raises the price of the good imported, whereas an export tax reduces the price of the good exported. But both of these policies deliver the same change in the relative prices of the two goods, which is what matters for production, consumption and trade in Figure 2.[2] An implication of this result is that a large country can use either an import tariff or an export tax to achieve an improvement in its terms of trade.

An important corollary of the Lerner Symmetry Theorem is that an import tariff affects exports as well as imports, a point that is often overlooked in policy debates. In the general equilibrium framework underlying Figure 2, this follows directly from two closely-related equilibrium conditions. First, factor market clearing implies that the expansion of the import-competing sector under a tariff draws resources away from the export sector, reducing its output. Second, the trade balance condition (8) requires that any reduction in the value of imports be matched by a corresponding reduction in the value of exports. Therefore, an import tariff does not merely restrict foreign goods, it also reshapes domestic production and consumption, and hence both sides of trade flows.

3.6 Intermediate Inputs and Global Value Chains (GVCs)

We noted above that the existence of aggregate welfare gains from trade is robust to the introduction of intermediate inputs. Trade in such intermediate inputs grew particularly rapidly in the late-

[2] For an analysis of the conditions under which the Lerner Symmetry Theorem holds in a wider range of economic environments, see Costinot and Werning (2019).

twentieth century, with the emergence of GVCs, in which stages of production are fragmented across national borders (e.g., Feenstra 1998). In the presence of such trade in intermediate inputs, tariffs can be particularly costly, because they are paid on the full gross value of a good each time that it crosses national borders (e.g., Yi 2003). While tariffs on final consumption goods protect domestic firms from foreign competition in product markets, tariffs on imported intermediate inputs raise the production costs of domestic firms in input markets. For this reason, countries have historically imposed higher tariffs on downstream goods than upstream goods ("tariff escalation"). One line of research computes "effective rates of protection," taking into account the effect of tariffs on domestic value added (e.g., Corden 1966). Another line of research provides evidence that output tariffs (in product markets) have opposite effects on domestic firms from input tariffs (in input markets), including for example Amiti and Konings (2007) and Goldberg et al. (2010).

4 Distributional Consequences

If international trade acts like an improvement in technology and delivers aggregate welfare gains, this raises the question of why many countries choose to introduce tariffs and tax this technology of market-based exchange. One reason is that although there are aggregate welfare gains from trade for a country as a whole, there are winners and losers within countries. In principle, the winners could compensate the losers and still be better off, thereby ensuring a Pareto improvement (the Kaldor-Hicks compensation criterion). But this compensation does not typically occur in practice.

4.1 Industry Rents

Perhaps the starkest illustration of these distributional consequences of international trade is the so-called specific-factors or Ricardo-Viner model, in which changes in the relative prices of goods induced by international trade lead to changes in rents across industries. We consider a small open economy that faces exogenous prices on world markets. The economy can produce two goods $j \in \{A, M\}$: manufacturing (M) and agriculture (A). The economy is endowed with an exogenous supply of labor (L), which is perfectly mobile between industries. The economy is also endowed with two specific factors that are perfectly immobile between industries: capital (K) that is only used in manufacturing and land (H) that is only used in agriculture. Production technologies are constant returns to scale in the mobile and specific factors, such that there is diminishing marginal returns to the mobile factor in each sector. Markets are perfectly competitive. We suppose that the economy has a comparative advantage in manufacturing, such that under free trade it exports manufacturing and imports agriculture.

We denote the exogenous prices of the two goods on world markets by $\{p_A^*, p_M^*\}$. Given these prices, the initial equilibrium allocation of labor between the two sectors is determined by the equality of the value marginal product of labor in the two sectors. We suppose that this small open economy introduces a specific tariff on agricultural imports ($t > 0$), which raises the domestic price of agriculture to $p_A = p_A^* + t$. This increase in the domestic price of agriculture raises the value marginal product of labor in agriculture, which leads to an expansion of employment in agriculture and a reduction in employment in manufacturing, until the value marginal product of labor is again equalized in the two sectors, as shown formally in Online Appendix D. The wage rises less than proportionately to the increase in the domestic price of agriculture, which implies that the real wage in terms of the manufacturing good (w/p_M) rises, whereas the real wage in terms of the agricultural good (w/p_A) falls. Therefore, the tariff has an ambiguous effect on the real income of mobile workers, depending on their expenditure shares on manufacturing and agriculture.

In contrast, the tariff has unambiguous and opposite effects on the real income of landowners and capitalists. The real income of landowners in terms of agriculture is determined by the marginal physical product of land in agriculture ($\frac{q}{p_A} = MPH_A(\frac{L_A}{H}, 1)$). Since the tariff raises employment in agriculture, it raises the marginal physical product of land, and hence raises the real income of landowners in terms of agriculture. Since the price of agriculture has risen, while the price of manufacturing has remained constant, it also follows that the real income of landowners in terms of manufacturing has risen. The real income of capitalists in terms of manufacturing is determined analogously by the marginal physical product of capital in manufacturing ($\frac{r}{p_M} = MPK_M(\frac{L_M}{K}, 1)$). Since the tariff reduces employment in manufacturing, it reduces the marginal physical product of capital, and hence reduces the real income of capitalists in terms of manufacturing. Since the price of agriculture has risen, while the price of manufacturing has remained constant, it also follows that the real income of capitalists in terms of agriculture has fallen.

Once one recognizes that international trade has these income distributional consequences by changing the relative prices of goods, one can rationalize tariffs as a policy to offset these income distributional effects. This argument in favor of tariffs comes with two main limitations. First, the redistribution of income achieved by tariffs comes at the cost of a reduction in the aggregate welfare gains from international trade, because the tariffs correspond to a tax on international trade. Second, tariffs are typically not the first-best or most targeted policy to redistribute income, because they not only distort producer decisions but also distort consumer decisions.

4.2 Trade and Technology

This analysis of the distributional consequences of trade and tariffs again highlights that international trade acts like an improvement in production technology. The shifts in the value marginal productivity of labor in the agricultural sector discussed above also could be achieved by changes in productivity. For example, an improvement in agricultural productivity would also raise the real income of landowners and reduce the real income of capitalists. Therefore, one could argue that the distributional consequences of trade should be treated in many ways as just like the distributional consequences of technology (e.g., Costinot and Werning 2023). In the same way that international trade generates aggregate welfare gains combined with winners and losers, so do advances in technology such as computers, automation and artificial intelligence. Taxing any of these technological improvements reduces aggregate welfare and redistributes income between different groups in society. The case for or against such taxation depends on the weights that the policy maker puts on the welfare of these different groups. Whether tariffs are part of the optimal policy mix depends on how distortionary they are relative to other redistributive tax policies.

4.3 Geography

The specific-factors model focuses on distributional conflict at the aggregate economy-wide level, based on the industry affiliation of factors of production. More recent research has highlighted geography as an important dimension along which the income distributional consequences of international trade occur, because traded industries are often highly geographically concentrated. Therefore, the negative effect of an international trade shock for an industry can be especially severe if it leads to the loss of the main source of employment in a town, city or region, and workers are geographically immobile between locations. Examples include the impact of the China Shock in the United States (e.g., Autor et al. 2013) and Brazil's and India's trade liberalizations (e.g., Topalova 2010, Kovak 2013, and Dix-Carneiro and Kovak 2017).

If industries in the specific-factors model are thought of as being located in specific regions within countries (or interpreted as region-industry pairs), this model provides a useful framework for interpreting these distributional consequences of trade across regions within countries. Recent research has developed general equilibrium trade models, in which labor reallocation across regions and sectors occurs gradually because of migration frictions, and shown that these models are able to rationalize empirical findings for the impact of the China shock in the United States (e.g., Caliendo et al. 2019 and Rodríguez-Clare et al. 2026).

In the same way that trade can have adverse consequences for towns, cities or regions, because traded industries are often geographically concentrated, so too can technological innovations. For example, Kodak's decline, because of the displacement of analog photography by digital photography led to a wider decline in the city of Rochester. Although tariffs can be used to redistribute income towards regions adversely affected by an industry trade shock, they are not typically the first-best policy, because of the associated distortion of consumer decisions. If the goal is to redistribute income from rich to poor regardless of region, the income tax schedule is typically a more targeted policy instrument. If the goal is to redistribute income to particular regions, there are typically other more targeted place-based policies (e.g., Gaubert et al. 2025).

4.4 Political Economy

These distributional consequences of trade provide political economy reasons why countries can choose to introduce tariffs, even if they reduce aggregate real income (e.g., Grossman and Helpman 1994 and Grossman and Helpman 1995).[3] If some groups within society lose from trade, they may lobby in favor of tariffs. Furthermore, the losers from trade may be small in number and highly concentrated (e.g., import-competing firms or industries), while the winners from trade may be large in number and highly dispersed (e.g., individual consumers throughout the economy). Therefore, it may be easier for the concentrated losers from trade to overcome the free-rider problem and lobby for tariffs than it is for the diffuse winners from trade to do so.

5 Quantitative Trade Models

An advance in international trade in recent years has been the development of quantitative trade models following Eaton and Kortum (2002). These quantitative frameworks are sufficiently rich to capture key features of the data, such as many asymmetric countries and a rich geography of bilateral trade costs. Yet these models remain tractable and amenable to a theoretical analysis of their properties, including the existence and uniqueness of the equilibrium. In contrast to earlier computable general equilibrium (CGE) models, these quantitative trade models typically have only a small number of structural parameters to estimate. Therefore, they lend themselves to credible identification of these parameters, using quasi-experimental sources of exogenous variation. Since these quantitative trade models are able to rationalize the data on bilateral trade and income as an equilibrium outcome, they can be used to undertake counterfactuals for the impact of empirically-relevant public-policy interventions, such as tariffs between particular pairs of countries, and to compare observed and optimal trade policies.

5.1 Constant Elasticity Trade Models

A particularly influential class of quantitative trade models is those with a constant elasticity gravity equation, as characterized in Arkolakis et al. (2012). This class of models includes those in which trade arises from the differentiation of goods across countries (Armington 1969); Ricardian technology differences (Eaton and Kortum 2002); the differentiation of goods across firms and increasing returns to scale (Krugman 1980); and producer heterogeneity in differentiated product markets with a Pareto productivity distribution (Melitz 2003 and Chaney 2008).

We consider a world of many countries indexed by $n, i \in \{1, \ldots, N\}$. The representative agent in country n has a labor endowment $\bar{\ell}_n$. From expenditure minimization in this class of models,

[3] For empirical evidence, see Goldberg and Maggi (1999) and Adão et al. (2023).

the share of expenditure of importer n on exporter i (s_{ni}) can be written as the following constant elasticity gravity equation:

$$s_{ni} = \frac{\left(T_{ni} w_i \tau_{ni} / z_i\right)^{-\theta}}{\sum_{j=1}^{N} \left(T_{nj} w_j \tau_{nj} / z_j\right)^{-\theta}}, \tag{9}$$

where w_i denotes the wage; z_i corresponds to country productivity; τ_{ni} are iceberg bilateral costs of trade, such that $\tau_{ni} \geq 1$ units of a good must be shipped from exporter i in order for one unit to arrive in importer n, with $\tau_{ni} > 1$ for $n \neq i$ and $\tau_{nn} = 1$; $T_{ni} = 1 + t_{ni}$ captures tariff barriers, where t_{ni} is the *ad valorem* tariff imposed by importer n on exporter i; and tariff revenue in each country is assumed to be redistributed lump sum to the representative consumer.

Income accounting requires that the income of each exporter i equals the sum across importers n of expenditure on the goods produced by that exporter. Using cost and expenditure minimization, we can write this income accounting equation as:

$$w_i \bar{\ell}_i = \sum_{n=1}^{N} \frac{s_{ni}}{T_{ni}} \frac{w_n \bar{\ell}_n + d_n}{1 - \sum_{j=1}^{N} \frac{T_{nj}-1}{T_{nj}} s_{nj}}, \tag{10}$$

where income from production on the left-hand side equals the wage (w_i) times the economy's labor supply ($\bar{\ell}_i$); expenditure equals income from production plus the trade deficit (which is typically taken as exogenous), adjusted for the tariff revenue that is redistributed lump-sum to the representative consumer.[4]

General equilibrium reduces to solving for the N wages in each country (w_n) such that the system of N equations (10) holds. Given this solution for wages in each country, we can recover all other endogenous variables. This system of equations has an interpretation as an excess demand system for labor in each country. In the absence of tariffs, countries' wages are gross substitutes in this system of equations, and conditions for the existence and uniqueness of the wage vector (up to a choice of numeraire) can be provided (see Alvarez and Lucas 2007 and Allen et al. 2020).

5.2 Welfare Effects of Trade

We begin by examining the aggregate welfare effects of trade in the absence of tariffs ($t_{ni} = 0$ and $T_{ni} = 1$ for all n, i). In this case, the welfare gains from opening the closed economy to trade can be expressed solely in terms of the open-economy domestic trade share (s_{nn}) and a partial elasticity of trade with respect to trade costs (θ):

$$\frac{\mathcal{W}_n^O}{\mathcal{W}_n^A} = \left(\frac{1}{s_{nn}^O}\right)^{\frac{1}{\theta}}, \tag{11}$$

[4] Research at the intersection of international trade and international macroeconomics increasingly models these trade deficits as endogenous, including Reyes-Heroles (2016), Eaton et al. (2016), and Kleinman et al. (2025b).

where the superscript O denotes the observed open-economy equilibrium (which in general will differ from free trade); the superscript A denotes autarky; $\mathcal{W}_n$ denotes welfare (real income); and the domestic trade share (s_{nn}) corresponds to the share of a country's expenditure on its own goods, which equals one under autarky.

We can thus compute the welfare gains from opening the closed economy using observable sufficient statistics and without having to undertake a counterfactual analysis of an autarky equilibrium that could differ substantially from the observed equilibrium. The open-economy domestic trade share (s_{nn}^O) can be measured directly from the data in the observed equilibrium. The elasticity of trade with respect to trade costs (θ) in principle can be estimated using the gravity equation (9) and data on bilateral trade and bilateral trade costs.

An upper bound on the welfare losses from tariffs can be found by considering the limiting case of prohibitive tariffs that take the economy to autarky. Applying the sufficient statistics formula (11), Costinot and Rodríguez-Clare (2018) estimate these welfare losses for the United States to be from 2-8 percent of GDP. Given a GDP of \$29.2 trillion and \$132.2 million households in 2024, this corresponds to \$4,417.6-\$17,670.2 per household, compared to a median household income of \$83,730. Therefore, although prohibitive tariffs are extreme, these welfare losses are non-negligible as a share of income for many households in the United States. Smaller countries naturally have higher open-economy domestic trade shares and hence larger welfare losses from autarky.

Although these sufficient statistics are model based, these predicted welfare gains from trade align relatively closely to the empirical findings from studies that have examined natural experiments that approximate movements from autarky to open trade (or vice versa). Using the natural experiment of Japan's rapid opening to trade in the mid-19th century, Bernhofen and Brown (2005) estimate an upper bound to the estimated welfare gains from trade of around 8-9 percent of real gross domestic product (GDP). Using the natural experiment of the embargo on international shipping imposed by the United States in 1808, Irwin (2005) estimates a welfare cost of the embargo of about 5 percent of U.S. real GDP at the time.

Allowing for multiple industries with heterogeneous trade elasticities magnifies the welfare gains from trade (see Costinot et al. 2012 and Ossa 2016). For example, if oil is a critical input for a modern industrial economy, with a low elasticity of substitution with other goods, and an economy does not have domestic supplies of oil, the gains from international trade can become large. Introducing intermediate inputs also magnifies the welfare gains from trade, because the gains from trade are accrued at each stage of production (e.g., Costinot and Rodríguez-Clare 2014, Melitz and Redding 2014, and Antràs and Gortari 2020). In contrast, introducing non-traded goods reduces the welfare gains from trade, because these gains are only accrued within the traded sector (e.g., Eaton and Kortum 2002). Allowing for variable trade elasticities can either raise or reduce the welfare gains from trade (e.g., Melitz and Redding 2015 and Adão et al. 2026).

Static trade models are well suited to measuring the level effects of trade in a given steady state, but they cannot account for sustained trade-led growth experiences, such as the rapid recovery of Japan and Germany in the post–World War II period, the sharp rise in living standards in the Asian Tiger economies—Singapore, Hong Kong, South Korea, and Taiwan—starting in the 1960s, or more recently the transformative growth experience of China and Central and Eastern Europe beginning in the 1990s. These historical episodes have motivated work on the dynamic gains from trade through channels such as capital accumulation, endogenous innovation and knowledge diffusion, which typically magnify the comparative steady-state welfare gains from trade (e.g., Ravikumar et al. 2019, Kleinman et al. 2025b, Sampson 2016, Buera and Oberfield 2020, Perla et al. 2021).

5.3 Welfare Effects of Trade Policy

To evaluate the impact of changes in trade policy, the welfare expression in equation (11) must be generalized to take into account tariff revenue. This class of quantitative trade models can be used for both *ex ante* policy evaluation (before a policy is enacted) and *ex post* policy evaluation (after the policy is enacted). Both approaches involve solving the system of general equilibrium conditions in the model for the counterfactual impact of the change in tariffs, holding all else constant.

In the class of models with a constant trade elasticity, counterfactuals can be undertaken using exact-hat algebra techniques following Dekle et al. (2007), as discussed further in Online Appendix E. According to this approach, we can solve for these counterfactuals in terms of relative changes in the endogenous variables ($\widehat{x} = x'/x$) between the counterfactual equilibrium (denoted with a prime) and the observed equilibrium (denoted without a prime). We use only the assumed counterfactual policy change and the observed endogenous variables in the initial equilibrium in the data, without needing to know the unobserved levels of model fundamentals (such as country productivities and trade costs). Therefore, the "hat" in "exact-hat" refers to solving the model in relative changes, and the "exact" refers to solving for general equilibrium in the full non-linear model.

A limitation of the partial equilibrium measures of welfare changes based on Harberger triangles in equation (7) is that they are based on a first-order approximation for small changes in tariffs. In contrast, the measures of welfare changes in these exact-hat algebra counterfactuals allow for large changes in tariffs and take into account general equilibrium effects, albeit at the cost of imposing the assumptions of this class of constant elasticity quantitative trade models.

5.4 Empirical Applications

This class of quantitative trade models, and extensions of them, have been used to evaluate a range of actual and counterfactual trade policies. Caliendo and Parro (2015) evaluate the economic impact of NAFTA using a quantitative trade model that incorporates multiple industries and input-output linkages. NAFTA's tariff reductions are estimated to have raised Mexican and U.S. welfare by 1.31 and 0.08 percent, respectively, and reduced Canada's welfare by 0.06 percent.

Fajgelbaum et al. (2020) evaluate the impact of the 2018-2019 U.S. tariffs and foreign retaliation using a quantitative trade model that distinguishes three tiers of substitution: among varieties of an imported product, among import products, and among imported and domestic aggregates. The estimated losses to U.S. consumers and firms that buy imports are $51 billion, which corresponds to about 0.27 percent of GDP. After taking account of tariff revenue and gains to domestic producers, the estimated aggregate real income loss is $7.2 billion, which corresponds to around 0.04 percent of GDP. U.S. import tariffs are found to be clustered in sectors that were concentrated in politically-competitive U.S. counties. In contrast, foreign retaliation is focused on industries that were concentrated in heavily-Republican U.S. counties.

Quantitative trade models have also been used to evaluate the welfare implications of trade wars and trade talks. Ossa (2014) develops a multi-country, multi-industry quantitative trade model that incorporates inter-industry trade, intra-industry trade, and the political economy of trade policy. Countries choose import tariffs seeking to manipulate the terms of trade, shift profits away from other countries, and protect politically-influential industries. Unilateral optimal tariffs in the absence of foreign retaliation are relatively large, averaging around 62 percent. Nash non-cooperative tariffs are relatively close to the unilaterally optimal tariffs, averaging around 63 percent across countries. Cooperative trade negotiations starting at the Nash equilibrium can raise welfare by up to 3.6 percent on average and involve substantial reductions in tariffs to close to free trade.[5]

6 Arguments for Protection

While the traditional economic analysis of tariffs emphasizes the trade-off between the deadweight welfare losses from the distortion of producer and consumer decisions and the terms of trade improvement, the classic result that a tariff is welfare reducing for a small country depends on the assumption that the initial equilibrium is efficient. In general, domestic distortions can create wedges between private and social marginal costs or benefits. In such second-best settings, a tariff that changes domestic production or consumption can in principle raise welfare. But the standard lesson of the economics of the second best is that policy should be targeted as closely as possible to the underlying distortion. This logic is useful for interpreting the infant-industry, external-economies, and national-security arguments to which we now turn.

[5] Using a sufficient statistics approach, Lashkaripour (2021) also finds substantial Nash non-cooperative tariffs (around 38-49 percent), and estimates an average reduction in welfare from a trade war from 2.4-2.8 percent.

6.1 Infant Industry Argument

Perhaps the best known argument for a tariff is the infant-industry argument, which argues that an industry in its infancy may need protection from import competition in order to enable it to develop and reach its potential, at which point it will become competitive on world markets and no longer need protection. Mill (1848) emphasized the requirement that the industry ultimately become competitive, such that only temporary tariff protection is required. Using quasi-experimental variation from Britain's blockade during the Napoleonic Wars, Juhász (2018) provides compelling empirical evidence that this temporary protection allowed the French cotton spinning industry to develop and become competitive, even after the end of the Napoleonic Wars.

However, the requirement that the industry ultimately become competitive on world markets is not sufficient for this argument to be valid. Bastable (1903) and Bardhan (1971) stress the additional requirement that the net present value of the stream of profits in the industry is non-negative, such that initial losses are more than offset by future profits, after discounting. Even this requirement is not sufficient, since a cost-benefit analysis should also take into account the losses to consumers from the higher prices induced by the tariff (e.g., Irwin 2000). Finally, if the development of capabilities that allow the industry to become competitive occurs within firm boundaries, firms should be willing to borrow on credit markets to finance the initial losses until the industry becomes competitive, such that tariff protection is not required in order for the industry to develop. If firms are not able to borrow to finance the initial losses because of credit market imperfections, government policy should be targeted towards alleviating those credit market imperfections, rather than introducing a tariff that will also distort consumer decisions.

Therefore, the infant industry argument ultimately relies on some form of market failure, such that firms are not able to internalize the benefits of the development of capabilities for their industry.

6.2 External Economies of Scale

Another classic and related argument for a tariff is external economies of scale, where each firm's productivity depends on the scale of the industry as a whole, and each firm is too small to internalize its impact on the scale of the industry as a whole (e.g., Ethier 1982).

In the presence of such external economies of scale within an industry, the economy can produce too little of a good, and a tariff that increases domestic production of the good can be welfare improving. Furthermore, the economy's PPF can be characterized by decreasing opportunity costs of production, such that it is concave rather than convex to the origin. As a result, there can be multiple equilibrium patterns of specialization for given world relative prices, with different levels of welfare. Therefore, there can be scope for public policy interventions to be welfare improving by shifting the economy between multiple equilibria.

Recent work shows, however, that such multiplicity is not a generic feature of scale-based trade models. Embedding industry-level external economies of scale into a multi-industry gravity framework, Kucheryavyy et al. (2023) demonstrate that the equilibrium is unique and consistent with comparative advantage provided that the scale elasticity is sufficiently small relative to the trade elasticity. In particular, if the product of the two elasticities does not exceed one, all countries gain from trade and the multiplicity problem disappears.

Although tariffs can be welfare improving under external economies of scale, the first-best policy intervention is typically a production subsidy, which is more closely targeted at the source of the market failure, although this production subsidy must be financed by other distortionary taxation. This argument for a production subsidy relates to the large theoretical and empirical literature concerned with industrial policy, as reviewed in Juhász et al. (2024). Industrial policies featured prominently in the development strategies of a number of East Asian countries, including China and South Korea. There is some evidence that these policies promoted economic development in the targeted industries (e.g., Kalouptsidi 2024 for Chinese shipbuilding and Lane 2025 for South Korea). But there is less evidence on whether these industrial policies improved aggregate welfare and other examples can be found where policies of import substitution appeared to be less successful such as in Latin America (e.g., Edwards 2009, Irwin 2021).

Using a multi-sector quantitative trade model, Bartelme et al. (2025) estimate substantial external economies of scale for a number of manufacturing sectors, but find relatively small welfare gains from the optimal industrial policy. The reason is that the implied bilateral trade costs between countries are relatively large and the elasticity of substitution across sectors is relatively low (close to one). Therefore, the extent of reallocation of resources across countries and sectors induced by the optimal industrial policy is relatively small. Using a model of an input-output network with distortions, Liu (2019) develops a sufficient statistic for the social value of promoting a sector, and finds that this sufficient statistic has predictive power for sectoral policies in China and South Korea.

Although external economies of scale can occur in a static model at a point in time, research on endogenous growth and trade emphasizes dynamic externalities from learning by doing (e.g., Krugman 1987, Lucas 1988, and Young 1991) or endogenous innovation (Romer 1990, Grossman and Helpman 1991, and Aghion and Howitt 1992). In the presence of these dynamic externalities, an activist trade and industrial policy in principle can be welfare improving for both the country introducing the policy and its trade partners (Redding 1999).

6.3 Imperfect Competition

While neoclassical economics maintains the assumption of perfect competition, imperfectly competitive market structures can provide a rationale for activist trade and industrial policies.

If an industry is dominated by a foreign monopolist, an import tariff can be used to shift profits from the foreign monopolist to the domestic government in the form of tariff revenue (see Katrak 1977 and Brander and Spencer 1981).

Alternatively if an industry has an oligopolistic market structure, a range of activist trade policies can be rationalized to shift profits from foreign to domestic firms, although these typically do not take the form of an import tariff. If firms compete in foreign markets in quantities according to Cournot competition, export subsidies can be welfare improving (see Brander and Spencer 1985). In contrast, if firms compete in foreign markets in prices according to Bertrand competition, export taxes can be welfare improving (see Eaton and Grossman 1986).

In general, a challenge for designing an activist trade policy under imperfect competition is that the form of intervention can be highly dependent on the form of strategic interaction between firms (e.g., Cournot versus Bertrand competition). Many of these policy interventions are also subject to a similar issue of foreign retaliation as the optimum tariff argument discussed above.

6.4 National Security and Supply Chain Resilience

Recent years have heightened concerns about the resilience of global supply chains. Transportation disruptions following COVID-19, policy uncertainty at the national and multilateral levels, growing national security concerns over access to critical goods, and rising geopolitical tensions—including between China and the United States and in the context of the Russia–Ukraine war—have all reinforced perceptions of vulnerability.

While specialization and trade increase aggregate welfare, they may also leave a country reliant on foreign suppliers for critical inputs such as advanced semiconductors or rare-earth minerals. Such dependencies can create "chokepoints" that confer geoeconomic leverage on the supplying country. This leverage can potentially be used to extract economic rents or political concessions, as emphasized in the emerging literature on geoeconomics (e.g., Clayton et al. 2026, Liu and Yang 2025, and Liu et al. 2026). Moreover, even the anticipation that trade partners may exploit such leverage can distort equilibrium specialization patterns. Countries may diversify or reshore production beyond what would be implied by purely economic fundamentals, thereby forgoing some of the aggregate gains from trade (Becko and O'Connor 2024 and Clayton et al. 2024).[6]

These concerns raise the question of how firms and governments should respond to supply chain risk. At the firm level, resilience may involve diversifying suppliers across countries, maintaining inventories, or reshoring particular stages of production (Elliott et al. 2022, Grossman et al. 2023, and Grossman et al. 2024b). In the presence of uncertainty and risk aversion, sourcing decisions resemble portfolio choices: firms care not only about expected costs, but also about variance and covariance across alternative supply relationships (Kleinman et al. 2025a). From this perspective, reshoring is

[6] For evidence on the relationship between economic exposure and political alignment, see Kleinman et al. (2024).

not automatically synonymous with diversification or resilience; in some cases, concentrating production domestically may increase exposure to correlated domestic shocks.

The appropriate role for policy depends on the source of the inefficiency. If private firms fully internalize risk and capital markets function well, decentralized sourcing decisions may already reflect optimal diversification. However, if there are externalities—such as systemic supply chain risk, coordination failures, or national security spillovers—policy intervention may be justified. Even in such cases, tariffs are unlikely to be first-best instruments, given their distortionary effects on consumption and production. More targeted policies such as subsidies may better address the underlying market failure.

More broadly, rising geopolitical tensions raise the question of how to weigh national security considerations against economic efficiency. Although it is difficult to place a monetary value on national security, economic analysis can quantify the efficiency costs of alternative policies. If a country chooses to sacrifice economic efficiency in the name of national security, revealed preference implies that the perceived gains from enhanced national security exceed the measured economic losses. The role of economic analysis is therefore not to deny national security concerns, but to clarify the magnitude of the trade-offs involved.

7 Evidence from the Recent U.S. Tariffs

We now summarize recent evidence on the effects of the recent U.S. tariffs. We focus mainly on the 2018-2019 tariffs for four main reasons. First, the outcome of the 2016 presidential election was uncertain, which implies that it is unlikely that the tariffs were anticipated, and there is little evidence of pre-trends in the treated industries. Second, the new tariffs were sufficiently large to create meaningful variation across products, time and countries. Third, there is a substantial time period after the tariffs were introduced and before the COVID-19 pandemic to examine their effects. Fourth, there has been substantially more policy uncertainty for the 2025-26 U.S. tariffs, making it more challenging to isolate the effects of the tariffs from those of policy uncertainty.

7.1 Import Prices and Values

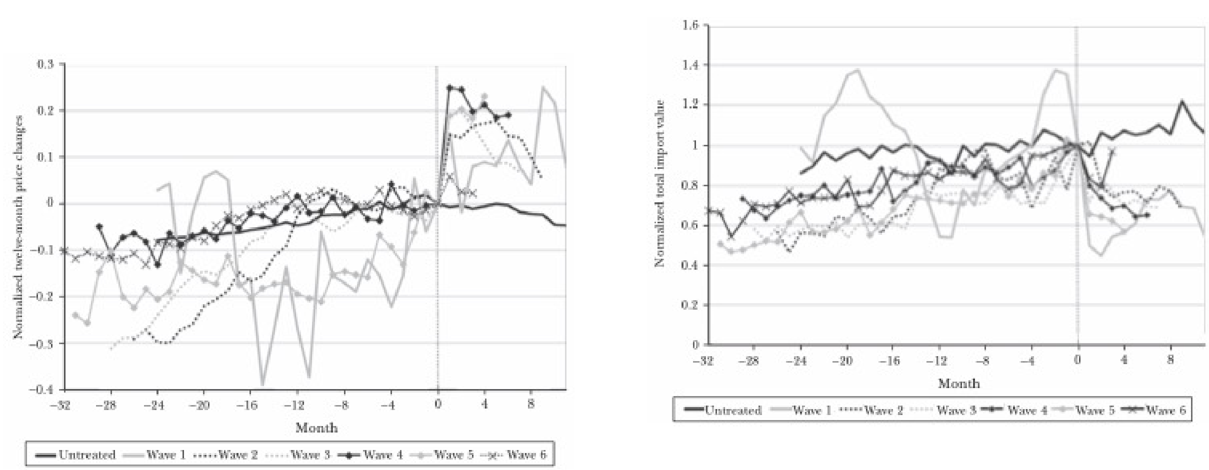
Amiti et al. (2019) provide empirical evidence on the effects of the 2018-2019 tariffs on import prices and values. Figure 3a shows import-weighted averages across countries and products of the twelve-month proportional changes in import prices (inclusive of the tariffs) for the six waves of new tariffs introduced during 2018 and the untreated group of countries and products. The zero on the horizontal axis corresponds to the month before each of the six tariff waves started (where month zero for untreated good-country pairs is the same as for the first tariff wave). We subtract the price change in the month before the tariff was implemented from each price change, so a zero on the vertical axis corresponds to a price change that equals its value before the tariffs were implemented.

Several features are apparent. First, the "untreated" prices are relatively flat, suggesting that the movements for the treated groups are the result of the tariffs. Second, we see substantial increases in the prices of the goods subject to the tariffs, which are comparable in magnitude to the tariffs imposed, suggesting that much of the tariffs were passed on to U.S. importers, wholesalers, retailers, or consumers. Third, although there is some pre-trend for the specific goods in waves one and five, there is little evidence of pre-trends for other waves, again supporting the idea that the movements in prices after the tariffs are imposed are capturing the impact of the tariffs.

Figure 3b shows an analogous figure for the total value of imports for each group of goods and countries. In this case, we normalize the import value in month zero to be one for all goods, so that the import values are all relative to imports in the last month before the tariffs were imposed. The figure shows a surge in imports for wave 1 (washing machines and solar panels) before the tariffs were imposed, which likely reflects importers moving forward their orders in anticipation of the tariffs being imposed. For the other tariff waves, imports were on average increasing faster than for untreated goods and countries before the tariffs were applied. For all tariff waves, import values decline sharply after the imposition of the tariffs, with declines of around 25-30 percent. In contrast, imports for untreated goods and countries rise by around 10 percent over the same period, which could in part be explained by substitution away from treated goods and countries.

Figure 3: Twelve-Month Proportional Changes in Import Prices by Tariff Wave during 2018

(a) Import Prices (Inclusive of Tariff) (b) Import Values



Note: Panel (a) denotes import share–weighted averages of twelve-month relative changes in U.S. import unit values (import values divided by import quantities), inclusive of tariffs, by tariff wave and for unaffected countries and products. Proportional changes for each wave are normalized to equal zero in the month prior to the introduction of the tariff; for the untreated month, zero is defined as in the first tariff wave. Panel (b) denotes twelve-month proportional changes in the value of U.S. imports by tariff wave and for unaffected countries and products. Each series is normalized to the value one in the month prior to the introduction of the tariff; for the untreated month, zero is defined as in the first tariff wave. Results are reported for the six waves of new tariffs during 2018. Source: Amiti et al. (2019).

This empirical finding in Figure 3a of almost complete passthrough of the 2018-2019 tariffs into import prices, with little fall in foreign exporter prices, has been confirmed by a range of studies, including Amiti et al. (2020), Fajgelbaum et al. (2020), and Cavallo et al. (2021), as surveyed in Fajgelbaum and Khandelwal (2022). More recent research for the 2025-2026 tariffs has continued to find high rates of passthrough into domestic prices at the border, including Cavallo et al. (2025), Amiti et al. (2026), Fajgelbaum and Khandelwal (2026), and Gopinath and Neiman (2026). These findings are consistent with constant markups and constant marginal costs, which imply complete passthrough of tariffs into import prices. However, from the perspective of conventional economic theory, the absence of reductions in foreign exporter prices is puzzling, because the U.S. is plausibly large relative to world markets, and hence one would expect a fall in its import volumes to lead to an improvement in its terms of trade. One caveat is that many of these empirical studies estimate rates of passthrough from relative comparisons across goods and countries and include country-time fixed effects, which would absorb any general equilibrium effects of changes in factor prices at the country level that are common across goods (the so-called missing-intercept problem).

Although there is abundant evidence of complete passthrough of tariffs into import prices at the border, there is much less evidence of the extent to which these tariffs have been passed through to the consumer versus absorbed by importers, wholesalers and retailers, in part because of the challenges of matching goods classifications between the import data and the consumer price index data. In a study of washing machines, Flaaen et al. (2020) find high rates of passthrough into consumer prices, and that the prices of dryers increased by around the same magnitude as washing machines, even though they were not themselves subject to tariffs. Using data on online prices from two large multichannel retailers, Cavallo et al. (2021) find that a 20 percent tariff is associated with only a 0.7 percent increase in retail prices, suggesting that most of the tariffs were absorbed through changes in importer, wholesaler or retailer markups. In a study of U.S. tariffs on European wine, Flaaen et al. (2025) find incomplete passthrough to consumer prices in percentage terms. But the price increase at the border from tariffs is magnified by markups along the distribution chain, such that the passthrough of the tariff to the consumer is more than complete in dollar terms.

One reason for the relatively modest impact of the U.S. tariffs on the consumer price index (CPI) so far is that the implemented tariff rates are only around half of the statutory tariff rates (see Gopinath and Neiman 2026). This gap is explained by a combination of exemptions, shipment lags, imperfect enforcement, and increased compliance with the rules of origin requirements of the USMCA for goods to enter tariff free. Flaaen and Pierce (2025) distinguish between the impact of the 2018-2019 U.S. tariffs on output prices (protecting domestic firms) and input prices (anti-protecting domestic firms). U.S. manufacturing industries more exposed to tariff increases are found to experience relative reductions in employment, because the positive effect from import protection is more than offset by negative effects from higher input costs and foreign retaliatory tariffs.

The empirical finding of a large-scale reorganization of U.S. import sourcing in response to the tariffs in Figure 3b also has been confirmed by a number of studies. From 2017-2022, China's share in U.S. direct imports declined from around 21-16 percent, with third countries such as Vietnam and Mexico gaining much of this market share (e.g., Alfaro and Chor 2023, Fajgelbaum et al. 2024, Grossman et al. 2024a, Alfaro and Chor 2025, and Gopinath et al. 2025). In principle, some of this "great reallocation" could reflect pure transshipment, but there is evidence that much of it involved a reorganization of production and the genuine relocation of stages of production. Although this reallocation has reduced the direct dependence of the United States on trade with China, it continues to have substantial indirect exposure, through intermediate inputs imported by these third countries from China (e.g., Baldwin and Freeman 2023).

8 Conclusions

Standard economic theory highlights that international trade acts like an improvement in production technology that is mutually beneficial (win-win) for all nations. Instead of producing everything domestically, countries can specialize in what they are relatively good at producing, and use the technology of market-based exchange to obtain other goods. A tariff is a tax on this technology of market-based exchange and is necessarily welfare reducing for a country that is too small relative to world markets to be able to affect world prices.

The main conventional economic argument in favor of a tariff is terms of trade manipulation. A country that is large relative to world markets can use its market power to restrict import volumes, which reduces import prices relative to export prices, and enables the country to obtain more imports for a given amount of exports. This terms of trade improvement is a transfer from the rest of the world to the home country and is achieved at the cost of reducing world welfare. If all countries succumb to this unilateral incentive to introduce tariffs, and engage in a trade war, the effects of these tariffs on the terms of trade can be offsetting. Therefore, countries can end up with little improvement in the terms of trade, but welfare losses from the distortion of consumption and production decisions. If all countries could collectively commit not to introduce these tariffs, they could achieve a higher level of welfare than under the trade war. The rationale for international trade agreements, such as the WTO, is to achieve this international cooperation and realize mutual welfare gains from trade.

At the same time, the aggregate gains from trade coexist with substantial distributional consequences within countries. Like other technological changes, trade creates winners and losers across industries, regions, firms and households. These distributional effects help explain the political appeal of tariffs, especially when import-competing interests are concentrated and consumers are diffuse. But if the objective is redistribution, tariffs are usually a blunt instrument: they raise domestic prices and simultaneously distort consumption and production decisions. Domestic taxes and transfers, place-based policies, or more targeted subsidies are typically more efficient ways of assisting adversely affected groups.

Although standard economic theory emphasizes the distortionary effects of tariffs, there are circumstances in which tariffs can be welfare improving in the presence of market failures and externalities. An example is when there are strong external economies of scale in an industry, in which case individual firms do not internalize that if they expanded output, they would benefit all domestic firms in the industry. Another example is when specialization and trade moves production of a critical good or input (e.g., advanced semi-conductors or rare earths) to a foreign country, thereby creating a chokepoint that can be exploited by that foreign country through the exertion of geopolitical power. In both cases, policies to support domestic production in the industry can be welfare enhancing. But the policies should be targeted towards the industry in question, rather than applied broadly, and production subsidies are typically more efficient than tariffs, because tariffs simultaneously distort the prices faced by both consumers and producers.

References

Adão, Rodrigo, Costas Arkolakis, and Sharat Ganapati (2026). "From Heterogeneous Firms to Heterogeneous Trade Elasticities: The Aggregate Implications of Firm Export Decisions". In: *NBER Working Paper* 28081.

Adão, Rodrigo, Arnaud Costinot, Dave Donaldson, and John A. Sturm Becko (2023). "Why is Trade not Free? A Revealed Preference Approach". In: *NBER Working Paper* 31798.

Aghion, Philippe and Peter Howitt (1992). "A Model of Growth Through Creative Destruction". In: *Econometrica* 60.2, pp. 323–351.

Aguiar, Mark A., Manuel Amador, and Doireann Fitzgerald (2025). "Tariff Wars and Net Foreign Assets". In: *NBER Working Paper* 33743.

Alfaro, Laura and Davin Chor (2023). "Global Supply Chains: The Looming 'Great Reallocation'". In: *NBER Working Paper* 31661.

— (2025). "An Anatomy of the Great Reallocation in US Supply Chain Trade". In: *NBER Working Paper* 34490.

Allen, Treb, Costas Arkolakis, and Yuta Takahashi (2020). "Universal Gravity". In: *Journal of Political Economy* 128.2, pp. 393–433.

Alvarez, F. and R. E. Lucas (2007). "General Equilibrium Analysis of the Eaton-Kortum Model of International Trade". In: *Journal of Monetary Economics* 54, pp. 1726–1768.

Amiti, Mary, Chris Flanagan, Sebastian Heise, and David E. Weinstein (2026). "Who Is Paying for the 2025 U.S. Tariffs?" In: *Liberty Street Economics* February 12.

Amiti, Mary and Jozef Konings (2007). "Trade Liberalization, Intermediate Inputs, and Productivity: Evidence from Indonesia". In: *American Economic Review* 97.5, pp. 1611–1638.

Amiti, Mary, Stephen J. Redding, and David E. Weinstein (2019). "The Impact of the 2018 Trade War on U.S. Prices and Welfare". In: *Journal of Economic Perspectives* 33.4, pp. 187–210.

— (2020). "Who's Paying for the U.S. Tariffs? A Longer Term Perspective". In: *American Economic Review, Papers and Proceedings* 110, pp. 541–546.

Antràs, Pol and Alonso de Gortari (2020). "On the Geography of Global Value Chains". In: *Econometrica* 84.4, pp. 1553–1598.
Arkolakis, Costas, Arnaud Costinot, and Andrés Rodriguez-Clare (2012). "New Trade Models, Same Old Gains". In: *American Economic Review* 102.1, pp. 94–130.
Armington, Paul S. (1969). "A Theory of Demand for Products Distinguished by Place of Production". In: *IMF Staff Papers* 16, pp. 159–178.
Autor, David, David Dorn, and Gordon H. Hanson (2013). "The China Syndrome: Local Labor Market Effects of Import Competition in the United States". In: *American Economic Review* 103.6, pp. 2121–68.
Bagwell, Kyle and Robert W. Staiger (1999). "An Economic Theory of GATT". In: *American Economic Review* 89.1, pp. 215–248.
— (2012a). "Profit Shifting and Trade Agreements in Imperfectly Competitive Markets". In: *International Economic Review* 53.4, pp. 1067–1104.
— (2012b). "The Economics of Trade Agreements in the Linear Delocation Model". In: *Journal of International Economics* 88.1, pp. 32–46.
Baldwin, Richard and Rebecca Freeman (2023). "Hidden Exposure: Measuring U.S. Supply Chain Reliance". In: *Brookings Papers on Economic Activity* 2, pp. 79–134.
Bardhan, Pranab K. (1971). "On Optimum Subsidy to a Learning Industry: An Aspect of the Theory of Infant-Industry Protection". In: *International Economic Review* 12.1, pp. 54–70.
Bartelme, Dominick, Arnaud Costinot, Dave Donaldson, and Andrés Rodríguez-Clare (2025). "The Textbook Case for Industrial Policy: Theory Meets Data". In: *Journal of Political Economy* 133.5, pp. 1401–1704.
Bastable, C. F. (1903). *The Theory of International Trade, with Some of Its Applications to Economic Policy.* London: Macmillan and Co.
Bayas-Erazo, Mathias and Guido Lorenzoni (2025). "Tariffs, Trade Deficits, and Liquidity Supply". Mimeograph.
Becko, John S. and Daniel G. O'Connor (2024). "Strategic Disintegration". Princeton University.
Bernhofen, Daniel M. and John C. Brown (2005). "An Empirical Assessment of the Comparative Advantage Gains from Trade: Evidence from Japan". In: *American Economic Review* 95.1, pp. 208–225.
Brander, James and Barbara Spencer (1985). "Export Subsidies and Export Share Rivalry". In: *Journal of International Economics*, pp. 83–100.
Brander, James A. and Barbara J. Spencer (1981). "Tariffs and the Extraction of Foreign Monopoly Rents under Potential Entry". In: *Canadian Journal of Economics* 14.3, pp. 371–389.
Broda, Christian, Nuno Limão, and David E. Weinstein (2008). "Optimal Tariffs and Market Power: The Evidence". In: *American Economic Review* 98.5, pp. 2032–2065.
Buera, Francisco J and Ezra Oberfield (2020). "The Global Diffusion of Ideas". In: *Econometrica* 88.1, pp. 83–114.
Caliendo, Lorenzo, Maximiliano Dvorkin, and Fernando Parro (2019). "Trade and Labor Market Dynamics: General Equilibrium Analysis of the China Trade Shock". In: *Econometrica* 87.3, pp. 741–835.
Caliendo, Lorenzo, Samuel Kortum, and Fernando Parro (2025). "Tariffs and Trade Deficits". Mimeograph.
Caliendo, Lorenzo and Fernando Parro (2015). "Estimates of the Trade and Welfare Effects of NAFTA". In: *Review of Economic Studies* 82.1, pp. 1–44.

Caliendo, Lorenzo and Fernando Parro (2022). “Trade Policy”. In: *Handbook of International Economics*. Ed. by Gita Gopinath, Elhanan Helpman, and Kenneth Rogoff. Vol. 5. Amsterdam: Elsevier. Chap. 4, pp. 219–295.

— (2023). “Lessons from U.S.-China Trade Relations”. In: *Annual Review of Economics* 15, pp. 513–547.

Cavallo, Alberto, Gita Gopinath, Brent Neiman, and Jenny Tang (2021). “Tariff Pass-Through at the Border and at the Store: Evidence from US Trade Policy”. In: *American Economic Review: Insights* 3.1, pp. 19–34.

Cavallo, Alberto, Paola Lamas, and Franco M. Vazquez (2025). “Tracking the Short-Run Price Impact of U.S. Tariffs”. In: *NBER Working Paper* 34496.

Chaney, Thomas (2008). “Distorted Gravity: The Intensive and Extensive Margins of International Trade”. In: *American Economic Review* 98.4, pp. 1707–21.

Clayton, Christopher, Matteo Maggiori, and Jesse Schreger (2024). “A Theory of Economic Coercion and Fragmentation”. In: *NBER Working Paper* 33309.

— (2026). “A Framework for Geoeconomics”. In: *Econometrica* forthcoming.

Corden, W. M. (1984). “The Normative Theory of International Trade”. In: *Handbook of International Economics*. Ed. by Ronald W. Jones and Peter B. Kenen. Vol. 1. Amsterdam: Elsevier North Holland. Chap. 2.

Corden, W. Max (1966). “The Structure of a Tariff System and the Effective Protective Rate”. In: *Journal of Political Economy* 74.3, pp. 221–237.

Costinot, Arnaud, Dave Donaldson, and Ivanka Komunjer (2012). “What Goods Do Countries Trade? A Quantitative Exploration of Ricardo?s Ideas”. In: *Review of Economic Studies* 79, pp. 581–608.

Costinot, Arnaud and Andrés Rodríguez-Clare (2014). “Trade Theory with Numbers: Quantifying the Consequences of Globalization”. In: *Handbook of International Economics*. Ed. by Elhanan Helpman, Kenneth Rogoff, and Gita Gopinath. Vol. 4. Amsterdam: Elsevier North Holland, pp. 197–262.

— (2018). “The US Gains from Trade: Valuation Using the Demand for Foreign Factor Services”. In: *Journal of Economic Perspectives* 32.2, pp. 3–24.

Costinot, Arnaud and Iván Werning (2019). “Lerner Symmetry: A Modern Treatment”. In: *American Economic Review: Insights* 1.1, pp. 13–26.

— (2023). “Robots, Trade, and Luddism: A Sufficient Statistic Approach to Optimal Technology Regulation”. In: *Review of Economic Studies* 90.5, pp. 2261–2291.

— (2025). “How Tariffs Affect Trade Deficits”. In: *NBER Working Paper* 33709.

Dekle, Robert, Jonathan Eaton, and Sam Kortum (2007). “Unbalanced Trade”. In: *American Economic Review* 97.2, pp. 351–355.

Dix-Carneiro, Rafael and Brian K. Kovak (2017). “Trade Liberalization and Regional Dynamics”. In: *American Economic Review* 107.10, pp. 1908–2946.

Dixit, Avinash (1985). “Tax Policy in Open Economies”. In: *Handbook of Public Economi*. Ed. by Alan Auerbach and Martin Feldstein. Vol. 1. Amsterdam: Elsevier North Holland. Chap. 6, pp. 313–374.

Dixit, Avinash and Victor Norman (1980). *Theory of International Trade*. Cambridge: Cambridge University Press.

Eaton, Jonathan and Gene Grossman (1986). “Optimal Trade and Industrial Policy Under Oligopoly”. In: *Quarterly Journal of Economics* 101.2, pp. 383–406.

Eaton, Jonathan and Samuel Kortum (2002). “Technology, Geography, and Trade”. In: *Econometrica* 70.5, pp. 1741–1779.

Eaton, Jonathan, Samuel Kortum, and Brent Neiman (2016). "Obstfeld and Rogoff's International Macro Puzzles: A Quantitative Assessment". In: *Journal of Economic Dynamics and Control* 72, pp. 5–23.

Edwards, Sebastian (2009). "Protectionism and Latin America's Historical Economic Decline". In: *Journal of Policy Modeling* 31.4, pp. 573–602.

Elliott, Matthew, Benjamin Golub, and Matthew V. Leduc (2022). "Supply Network Formation and Fragility". In: *American Economic Review* 112, pp. 2701–47.

Ethier, Wilfred J. (1982). "Decreasing Costs in International Trade and Frank Graham's Argument for Protection". In: *Econometrica* 50.5, pp. 1243–1268.

Fajgelbaum, Pablo D., Pinelopi K. Goldberg, Patrick J. Kennedy, and Amit K. Khandelwal (2020). "The Return to Protectionism". In: *Quarterly Journal of Economics* 135.1.

Fajgelbaum, Pablo D., Pinelopi K. Goldberg, Patrick J. Kennedy, Amit K. Khandelwal, and Daria Taglioni (2024). "The US-China Trade War and Global Reallocations". In: *American Economic Review: Insights* 6.2, pp. 295–312.

Fajgelbaum, Pablo D. and Amit K. Khandelwal (2022). "The Economic Impacts of the US-China Trade War". In: *Annual Review of Economics* 14, pp. 205–228.

— (2026). "Tariffs in 2025: Short-Run Impacts on the U.S. Economy". In: *Brookings Papers on Economic Activity* forthcoming.

Feenstra, Robert C. (1994). "New Product Varieties and the Measurement of International Prices". In: *American Economic Review* 84.1, pp. 157–177.

— (1995). "Estimating the Effects of Trade Policy". In: *Handbook of International Economics*. Ed. by Gene M. Grossman and Kenneth Rogoff. Vol. 3. Amsterdam: Elsevier. Chap. 30, pp. 1553–1595.

— (1998). "Integration of Trade and Disintegration of Production in the Global Economy". In: *Journal of Economic Perspectives* 12.4, pp. 31–50.

Flaaen, Aaron, Ali Hortaçsu, and Felix Tintelnot (2020). "The Production Relocation and Price Effects of US Trade Policy: The Case of Washing Machines". In: *American Economic Review* 110.7, pp. 2103–27.

Flaaen, Aaron, Ali Hortaçsu, Felix Tintelnot, Nicolás Urdaneta, and Daniel Xu (2025). "Who Pays for Tariffs Along the Supply Chain? Evidence from European Wine Tariffs". In: *NBER Working Paper* 34392.

Flaaen, Aaron and Justin Pierce (2025). "Disentangling the Effects of the 2018-2019 Tariffs on a Globally Connected U.S. Manufacturing Sector". In: *Review of Economic Statistics* forthcoming.

Gaubert, Cecile, Patrik Kline, Damian Vergara, and Danny Yagan (2025). "Place-based Redistribution". In: *American Economic Review* 115.10, pp. 3415–50.

Goldberg, Penny K. and Nina Pavcnik (2016). "The Effects of Trade Policy". In: *Handbook of Commercial Policy*. Ed. by Kyle Bagwell and Robert W. Staiger. Vol. 1A. Amsterdam: Elsevier, North Holland. Chap. 3, pp. 161–206.

Goldberg, Pinelopi K. and Giovanni Maggi (1999). "Protection for Sale: An Empirical Investigation". In: *American Economic Review* 89.5.

Goldberg, Pinelopi Koujianou, Amit Kumar Khandelwal, Nina Pavcnik, and Petia Topalova (2010). "Imported Intermediate Inputs and Domestic Product Growth: Evidence from India". In: *The Quarterly Journal of Economics* 125.4, pp. 1727–1767.

Gopinath, Gita, Pierre-Olivier Gourinchas, Andrea F. Presbitero, and Petia Topalova (2025). "Changing Global Linkages: A New Cold War?" In: *Journal of International Economics* 153, p. 104018.

Gopinath, Gita and Brent Neiman (2026). "The Incidence of Tariffs: Rates and Reality". In: *NBER Working Paper* 34620.

Grossman, Gene and Elhanan Helpman (1991). *Innovation and Growth in the Global Economy*. Cambridge MA: MIT Press.

Grossman, Gene M. and Elhanan Helpman (1994). "Protection for Sale". In: *American Economic Review* 84.4, pp. 833–850.

— (1995). "Trade Wars and Trade Talks". In: *Journal of Political Economy* 103.4, pp. 675–708.

Grossman, Gene M., Elhanan Helpman, and Hugo Lhullier (2023). "Supply Chain Resilience: Should Policy Promote International Diversification or Reshoring?" In: *Journal of Political Economy* 131.12, pp. 3462–3496.

Grossman, Gene M., Elhanan Helpman, and Stephen J. Redding (2024a). "When Tariffs Disrupt Global Supply Chains". In: *American Economic Review* 114.4, pp. 988–1029.

Grossman, Gene M., Elhanan Helpman, and Alejandro Sabal (2024b). "Resilience in Vertical Supply Chains". In: *Quarterly Journal of Economics* forthcoming.

Harberger, Arnold C. (1964). "The Measurement of Waste". In: *American Economic Review, Papers and Proceedings* 54.3, pp. 58–76.

Helpman, Elhanan and Paul Krugman (1989). *Trade Policy and Market Structure*. Cambridge MA: MIT Press.

Ignatenko, Anna, Ahmad Lashkaripour, Luca Macedoni, and Ina Simonovska (2025). "Making America Great Again? The Economic Impacts of Liberation Day Tariffs". In: *Journal of International Economics* 157, pp. 104–138.

Irwin, Douglas A. (2000). "Did Late Nineteenth Century U.S. Tariffs Promote Infant Industries? Evidence from the Tinplate Industry". In: *Journal of Economic History* 60, pp. 335–360.

— (2005). "The Welfare Cost of Autarky: Evidence from the Jeffersonian Trade Embargo, 1807-09". In: *Review of International Economics* 13.4, pp. 631–45.

— (2021). "The Rise and Fall of Import Substitution". In: *World Development*, p. 105306.

Itskhoki, Oleg and Dmitry Mukhin (2025). "The Optimal Macro Tariff". In: *NBER Working Paper* 33839.

Johnson, Harry (1953). "Optimum Tariffs and Retaliation". In: *Review of Economic Studies* 21.2, pp. 142–153.

Juhász, Réka (2018). "Temporary Protection and Technology Adoption: Evidence from the Napoleonic Blockade". In: *American Economic Review* 108.11, pp. 3339–76.

Juhász, Réka, Nathan Lane, and Dani Rodrik (2024). "The New Economics of Industrial Policy". In: *Annual Review of Economics* 16, pp. 213–242.

Kalouptsidi, Myrto (2024). "Detection and Impact of Industrial Subsidies: The Case of Chinese Shipbuilding". In: *Review of Economic Studies* 85.2, pp. 1111–1158.

Katrak, Homi (1977). "Multi-national Monopolies and Commercial Policy". In: *Oxford Economic Papers* 29.2, pp. 283–291.

Kleinman, Benny, Ernest Liu, and Stephen J. Redding (2024). "International Friends and Enemies". In: *American Economic Review: Macroeconomics* 16.4, pp. 350–385.

Kleinman, Benny, Ernest Liu, Stephen J. Redding, and David Xu (2025a). "International Trade in an Uncertain World". Stanford University.

Kleinman, Benny, Ernest Liu, Stephen J. Redding, and Motohiro Yogo (2025b). "Neoclassical Growth in an Interdependent World". In: *NBER Working Paper* 31951.

Kovak, Brian K. (2013). “Regional Effects of Trade Reform: What is the Correct Measure of Liberalization?” In: *American Economic Review* 103.5, pp. 1960–1976.
Krugman, Paul (1980). “Scale Economies, Product Differentiation, and the Pattern of Trade”. In: *American Economic Review* 70.5, pp. 950–59.
— (1987). “The Narrow Moving Band, the Dutch Disease, and the Competitive Consequences of Mrs. Thatcher: Notes on Trade in the Presence of Dynamic Scale Economies”. In: *Journal of Development Economics* 27.1-2, pp. 41–55.
— (1997). “What Should Trade Negotiators Negotiate About?” In: *Journal of Economic Literature* 35.1, pp. 113–120.
Kucheryavyy, Konstantin, Gary Lyn, and Andrés Rodriguez-Clare (2023). “Grounded by Gravity: A Well-Behaved Trade Model with Industry-Level Economies of Scale”. In: *American Economic Journal: Macroeconomics* 15, pp. 372–412.
Lane, Nathan (2025). “Manufacturing Revolutions: Industrial Policy and Industrialization in South Korea”. In: *Quarterly Journal of Economics* 140.3, pp. 1683–1741.
Lashkaripour, Ahmad (2021). “The Cost of a Global Tariff War: A Sufficient Statistics Approach”. In: *Journal of International Economics* 131, p. 103419.
Lerner, Abba P. (1936). “The Symmetry Between Import and Export Taxes”. In: *Economica* 3.11, pp. 306–313.
Liu, Ernest (2019). “Industrial Policies in Production Networks”. In: *Quarterly Journal of Economics* 134.4, pp. 1883–1948.
Liu, Ernest, Stephen J. Redding, Bennett Smith-Worthington, and David Y. Yang (2026). “Strategic Influence in Geopolitical Networks”.
Liu, Ernest and David Y. Yang (2025). “International Power”. In: *NBER Working Paper* 34006.
Lucas Jr., Robert E. (1988). “On the Mechanics of Economic Development”. In: *Journal of Monetary Economics* 22.1, pp. 3–42.
Maggi, Giovanni and Ralph Ossa (2023). “The Political Economy of International Regulatory Cooperation”. In: *American Economic Review* 113, pp. 2168–2200.
Maggi, Giovanni and Andres Rodriguez-Clare (2007). “A Political-Economy Theory of Trade Agreements”. In: *American Economic Review* 97.4, pp. 1374–1406.
Maggi, Giovanni and Andrés Rodríguez-Clare (1998). “The Value of Trade Agreements in the Presence of Political Pressures”. In: *Journal of Political Economy*, pp. 574–601.
Melitz, Marc J. (2003). “The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity”. In: *Econometrica* 71.6, pp. 1695–1725.
Melitz, Marc J. and Stephen J. Redding (2014). “Missing Gains from Trade?” In: *American Economic Association, Papers and Proceedings* 104.5, pp. 317–321.
— (2015). “New Trade Models, New Welfare Implications”. In: *American Economic Review* 105.3, pp. 1105–1146.
Mill, John Stuart (1848). *Principles of Political Economy: With Some of Their Applications to Social Philosophy*. London: John W. Parker.
Obstfeld, Maurice and Kenneth Rogoff (1996). *Foundations of International Macroeconomics*. Cambridge MA: MIT Press.
Ossa, Ralph (2011). “A ‘New Trade’ Theory of GATT/WTO Negotiations”. In: *Journal of Political Economy* 119.1, pp. 122–152.
— (2014). “Trade Wars and Trade Talks with Data”. In: *American Economic Review* 104.12, pp. 4104–46.

Ossa, Ralph (2016). “Why Trade Matters After All”. In: *Journal of International Economics* 97.2, pp. 266–277.

Perla, Jesse, Christopher Tonetti, and Michael E. Waugh (2021). “Equilibrium Technology Diffusion, Trade, and Growth”. In: *American Economic Review* 111.1, pp. 73–128.

Ravikumar, B., Ana Maria Santacreu, and Michael Sposi (2019). “Capital Accumulation and Dynamic Gains from Trade”. In: *Journal of International Economics* C, pp. 93–110.

Redding, Stephen J. (1999). “Dynamic Comparative Advantage and the Welfare Effects of Trade”. In: *Oxford Economic Papers* 51, pp. 15–39.

Reyes-Heroles, Ricardo (2016). “The Role of Trade Costs in the Surge of Trade Imbalances”. Princeton University.

Rodríguez-Clare, Andrés, Mauricio Ulate, and Jose P. Vasquez (2026). “Trade with Nominal Rigidities: Understanding the Unemployment and Welfare Effects of the China Shock”. In: *Journal of Political Economy* forthcoming.

Romer, Paul M. (1990). “Endogenous Technological Change”. In: *Journal of Political Economy* 98.5, Part 2, S71–S102.

Sampson, Thomas (2016). “Dynamic Selection: An Idea Flows Theory of Entry, Trade, and Growth”. In: *The Quarterly Journal of Economics* 131.1, pp. 315–380.

Topalova, Petia (2010). “Factor Immobility and Regional Impacts of Trade Liberalization: Evidence on Poverty from India”. In: *American Economic Journal: Applied Economics* 2.4, pp. 1–41.

Yi, Kei-Mu (2003). “Can Vertical Specialization Explain the Growth of World Trade?” In: *Journal of Political Economy* 111.1, pp. 52–102.

Young, Allwyn (1991). “Learning by Doing and the Dynamic Effects of International Trade”. In: *Quarterly Journal of Economics* 106, pp. 369–405.