THE COST OF TRUMP'S 'RECIPROCAL' TARIFFS:

LESSONS FROM FIRST PRINCIPLES OF CLASSIC TRADE POLICY WELFARE ANALYSIS

DANIEL GROS

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Introduction

Traditional analysis of tariffs in a partial equilibrium setting can tell us much about the welfare consequences of high tariffs.

The column argues that, as tariffs ratchet up, welfare costs increase more than proportionately.

Large differences in tariff rates across countries, as in the US short-lived 'reciprocal' tariffs proposal, are particularly costly as they lead to trade being diverted to less efficient suppliers. The cost of this trade diversion can be a multiple of the standard welfare losses. These large losses are not just a theoretical construct, they also explain the strong reaction of financial markets.

A combination of trade diversion and reduced imports will lead to tariff revenues much lower than expected. The disappointment regarding tariff revenues is connected to welfare losses. The lower tariff revenues, the higher the welfare losses.

Commentary on the evolving tariff sage initiated by Donald Trump based on large global models can provide quick simulations of the impact of tariff structures on macroeconomic variable like exports and or employment. The focus here is different, it is o illustrate the basic economic mechanisms through which tariffs cause economic losses, welfare losses that go beyond the macroeconomic impact.

The basic principles exposed here provide the intuition how to evaluate tariffs strategically as the Trump Presidency struggles to find a coherent policy in its hundreds of bilateral negotiations.

The small country case

The starting point, usually called the 'small country case', is the case when the imposition of a tariff does not affect the world (net of tariff) price. This is what happened with the Trump I tariffs (Cavallo et al. 2021).

Conventional welfare analysis focuses on the areas under the demand and supply curves when the domestic price changes due to the tariff (for an example see Krugman and Obstfeld 1991: 1988).

Three lessons, seldom mentioned in textbooks, follow from applying standard analysis to this simple setting. These three lessons are briefly explained below. The appendix provides an illustrative numerical example and an analytical generalization.

Lesson 1: The welfare loss from tariffs is convex in the tariff rate

In other words, the cost of increasing a tariff from 10% to 20% is higher than the cost of increasing a tariff (on the same goods) from zero to 10%. The economic intuition behind this general result is that when a tariff is increased from zero to some positive value, it displaces only demand and supply, which was operating at close-to-world-market prices.

This means that the welfare loss caused by foreign supply and domestic demand being displaced by a 'small' tariff is second-order small.

In contrast, when a tariff is increased from a positive value to an even higher one, the marginal units of supply and demand displaced will already have, as a starting point, a difference between the world market and the domestic price. In technical parlance this means that increasing a tariff from zero to a small positive value leads to welfare losses in the form of triangles[1], whereas increasing a tariff from a positive level even further leads to welfare losses in the form of 'rectangles'. The larger the initial tariffs, the larger these rectangles become.

When there are linear demand and supply curves one can be more specific: the welfare loss of a tariff (for a small country) is proportional to the square of the tariff rate. This implies that a tariff rate of 40% involves a welfare loss 4 times higher than a tariff on the same good of 20% (and a multiple of the loss from a 10% tariff).

This principle of the more than proportional increase in the welfare loss has important implications:

- **Most of Trump's tariffs are additional.**

  The (temporary) 10 % rate for all countries comes on top of existing rates, for example the 25 % on cars and the 25 % on Canada and Mexico. For China the more than 100 % as of April 9 come on top of rates of 20 % imposed in early 2025 and the rates inherited from Trump I. Again, convexity implies that this last step is more costly than the previous ones, not only because it is larger.

- **Average tariff rates are misleading, on two counts**.

i. With large tariffs, the difference between the trade weighted average calculated before and after adjustment increases. Demand for the goods with the highest tariffs should naturally fall more than those with low tariffs. This means that the average calculated before demand adjusts is typically higher than after the adjustment of demand. For small tariffs, the difference before and after adjustment is second order, but not for large tariffs.

ii. If the US levies tariffs of over 100% on most imports from China, that is about 1/10th (taking into account the exemption for Smartphones) of its overall imports, this could be characterized as contributing 10 points to the overall average rate of the US. But US imports of goods subject to these extreme rates are likely to fall strongly. If they fall by 4/5th, which

[1] The classic 'triangle' welfare loss from a tariff of size t is equal to one half of the product of the tariff rate times the reduction in imports.

appears to be the minimum, the contribution to the US average would fall to 2 percentage points.

The analysis could of course also be applied to the Chinese reaction, which has ratcheted up to over 100%. Chinese imports from the US are about one third of US imports from the China This implies that the total welfare loss for China from the present combination of rates is much lower than for the US. Moreover, as Posen (2025) argues by blocking imports US consumers lose access to important consumer goods and US producers have to find other sources for key inputs; whereas China loses only some foreign exchange earnings. This why trade wars are 'easy to lose' for the importing country.

Average versus dispersion in tariff rates

- The convexity implies that the dispersion of tariff matters, not only the average. If one is interested in welfare losses, one should augment the average tariff rate by a factor that indicates the dispersion of rates.
- With linear demand and supply functions the welfare loss from a tariff structure should be proportional to the squares of the tariff rates (with the factor of proportionality given by the size of imports and the slopes of the demand and supply functions).

Lesson 2: Tariff revenues provide an indication of welfare losses

Tariff revenues today constitute a negligible proportion of overall government revenues. For the US all taxes on foreign trade (tariffs and other levies) only provide less than 2 % of overall revenues, even after all the tariffs on China, steel and other products introduced by Trump I and retained by the Biden administration.

Tariff revenues would need to increase by an order of magnitude to make a meaningful contribution to closing the large US fiscal deficits. The only examples of countries where tariffs contributed a significant share to government revenues are less developed countries, especially some in Latin America.

For example, for Argentina tariff revenues accounted for close to 40 % of government revenues in 1990. That percentage then fluctuated over time as successive governments first liberalized and increased tariffs again. In 2023, just before Javier Milei came to power tariff revenues accounted for 16.6 % of government revenues. To reach the pre-Milei Argentinian contribution of tariff revenues to the budget, tariff revenues would have to increase to about 1 000 billion USD (annually). This would be equivalent to about 30 % of (pre-tariff) imports of 3 300 billion USD.

But imports are likely to decline once Trump's tariffs become effective. By how much, is difficult to guess, since this will also depend on macroeconomic variables, such as the exchange rate and fiscal deficit. But the basic analysis presented here has two related general implications:

i. The lower the elasticity of demand, the higher the tariff revenues, but also the higher the price increases for consumers.
ii. The 'miss' in tariff revenues relative to the naïve pre-tariff estimate is proportional to the welfare loss.

'Essential' goods constitute a good tax base. This is a general principle of economics (Ramsey 1927). The government should tax those goods (or activities) with an inelastic demand (Gruber 2022). There is no welfare loss if people keep buying the same number of smartphones even if they cost twice as much.

The lower the elasticity of demand, the higher tariff revenues, but also the higher the price increase for consumers. This generated a trade-off: high tariffs on essential goods that are not produced in the US represent the ideal object for high tariffs, which in this case act like a specific sales tax.

The impact of Trump I tariffs was absorbed mainly by intermediaries and importers (Amity et al. 2019). But it is not possible with tariff rates over 100 %. It is thus likely that prices of these consumer goods increase almost in proportion to the tariff. This 'sales tax' might be economically efficient, but it comes at a high political cost. For Smartphones the political cost of imposing punitive tariffs on imports from China was perceived as so high that they were exempted from the reciprocal tariffs.

Many estimates of the potential revenues from higher tariffs are based on the simple calculation that multiplies the tariff rates to today's import values. These crude estimates cannot be correct since imports will fall once tariffs go up. Here again the over-estimation of tariff revenue increases more than linearly with the tariff rate.

It is well known that tariff revenues follow a 'Laffer curve'. Revenues initially increase with higher tariff rates because with small to moderate tariffs imports do not diminish much. But as tariffs ratchet up further increases do not bring a lot of revenue. Tariff revenues logically fall to zero when tariffs become prohibitive.

The difference between the 'naïve' estimate of tariff revenue and the actual outcome depends on the reduction in imports. But the latter is also a key element in calculating the welfare loss.

With linear demand curves, as assumed in the illustrative example in the appendix, one can be more precise: the welfare loss is equal to one half of the difference between tariff revenue calculated based on pre-tariff imports and the actual revenue.

Lesson 3: The welfare loss from a discriminatory tariff can be much higher than if the same tariff covers imports from all countries

A country-specific tariff is conceptually equivalent to levying a general tariff on all imports while providing a production subsidy for competing producers from the rest of the world –that is, all the countries not covered by the tariffs (Gardner and Kimbrough 1990).

Until early 2025 US tariffs were levied mainly on imports from China, implying that a production subsidy went to European, Asian and other competitors. In relative terms, this continues to be the case even after post 'Liberation' day as tariffs on China remain by far the highest, for most goods an order of magnitude higher than the 10 % for the rest of the world.

US consumers pay the subsidy to suppliers from countries with lower tariffs in the form of higher prices. It follows immediately that the welfare cost to the US from tariffs that differ strongly from country to country is much higher than if the US were to impose the same tariffs on all imports.

The indirect harmful consequences of country-specific tariffs are the main reason that the 'most favoured nation' principle is a cornerstone of the global trading system (Hashimzade et al. 2011). The US is ignoring this principle at its own cost.

To give an order of magnitude of the additional cost one can start with the estimate of Amity et al. 2029, that the tariffs mostly in the 20-50 % range imposed by the Trump I administration on about $200 billion of Chinese goods resulted in welfare cost of about $8 billion or about 4 % of the initial import value.

Trade diversion, which results in imports from countries with higher costs, would result in much higher costs. The calculations in the Appendix are based on a recent estimate that costs are 40 % higher in Germany than in China. To the extent that this applies to European and other OECD producers as well this means that the welfare cost to the US of having $200 billion of Chinese imports substituted by these higher cost countries will be ten times higher.

The trade diversion that results from the very high differences across US trading partners can thus lead to costs for the US that are an order of magnitude higher than the usual 'triangle' welfare costs.

Concluding remarks

Standard welfare analysis shows that the highly country specific tariff structure of the US 'reciprocal' tariffs, which range from over 100 % for China to 10% as the base case, are likely to entail very high costs for the US as imports switch to countries with higher costs, but lower tariffs. Bilateral trade deals that favour some countries, like the UK, do not lower the costs for the US as they only amplify the trade diversion away from China to less efficient suppliers.

More in general, the welfare cost for the US of the very high rates imposed on China (and threatened for other countries) are an order of magnitude higher than previous tariff increases. This is why US financial markets sold off so strongly – and recovered when the reciprocal tariffs were paused.

Trump's reciprocal tariffs are not the first time the US turned protectionist. The last time was almost 100 years, when Congress passed the Smoot Hawley Act of 1930, which had very high rates for many products.

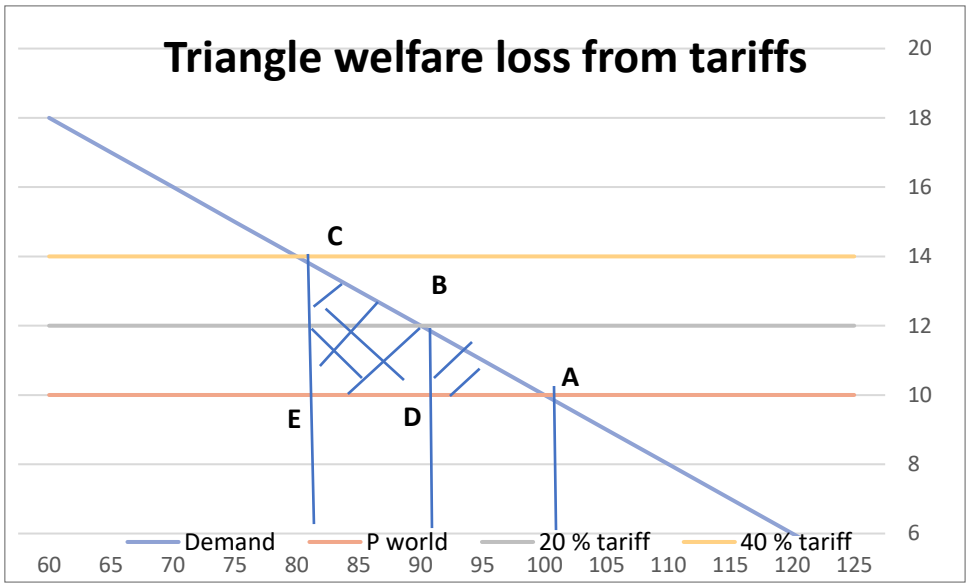
The average rate under Smoot Hawley was about 20 %, not far from the average for the US today. But the Smoot Hawley rates, were high, but not discriminatory. Trump's tariffs are discriminatory and thus have much higher costs for the US economy.

Smoot Hawley contributed to turning the recession of the early 1930s into the Great Depression of 1933 because it initiated a global trade war as other countries also erected trade barriers. This time might be different as few countries are contemplating doing anything more than retaliating directly by putting tariffs on US products.

Appendix

Standard analysis of 'triangle' welfare losses.

The simple diagram shows the standard analysis with a linear demand curve (with parameters equal to the numerical example below) under which the welfare loss from a is equal to the triangle under the demand curve.



In this example the world market price is equal to 10, with demand equal to 100 units. A tariff of 20 % raises the price to 12, resulting in demand being reduced to 90 and the welfare loss is given by the triangle ABD. If the tariff is increased by a further 20 percentage points, i.e. to 40 %, the price increases to 14 and quantity drops to 80. The additional welfare loss from increasing the tariff from 20 to 40 % is given by the trapezoid BCED, which is clearly much larger (3 times larger) than the triangle ABD.

A numerical illustration of the basic principles

To make the comparison concrete, consider the case of a country that imports two goods, both with identical demand conditions, called H and L. Suppose that under free trade (no tariffs), the country imports **200 units** at a world price of **$10** per unit. We assume under free trade one half of imports is good H and one half is good L.

We can now compute the welfare loss for a uniform ad valorem tariff of 20 % applied to imports on all goods and a dispersed tariff structure with a uniform ad valorem tariff of 40 % only on good H.

- **Case A (Uniform 20% Tariff on all imports):** A 20% ad valorem tariff raises the domestic price from $10 to $12. This price increase induces consumers to reduce their quantity demanded.

  Suppose the higher price causes a 10-unit drop in imports (from 100 to 90 units) in each half of the import supply (reflecting the assumed identical price elasticity of demand/supply).

Tariff revenue is \$360 (\$2 per unit) and the bill for consumers goes up from \$2000 to 2160.

But the 360 are just a transfer inside the home country and the government could just rebate this sum to consumers (this is usually assumed in economics).

The deadweight loss in each segment can be calculated as the area of the triangle:

DWL per segment = ½ × (tariff per unit) × (reduction in quantity). For each half: ½ × \$2 × 10 = \$10 loss. There are two identical halves, so the total DWL = \$10 + \$10 = \$20.

- **Case B (Different rates on different goods):** 40% on H, 0% on L): For the half of imports with 0% tariff, the domestic price remains \$10 and import volume stays at 100 units (no change, no DWL for that portion).

  For the other half facing a 40% tariff, the domestic price jumps to \$10 × 1.4 = \$14. This much larger price increase causes a bigger contraction in import quantity.

  Given the assumed constant slope of the demand curve, imports of the high-tariffed good fall by 20 units (from 100 down to 80 units) due to the \$4 price hike.[2]

  The government collects 320 in revenues, but, again, this just represents a transfer inside the country.

  The DWL from this segment is ½ × \$4 × 20 = \$40. The tariff-free half contributes \$0 DWL so that the total DWL = \$40 with a dispersed tariff.

This shows that despite both policies having the same 20% <u>average</u> tariff rate, case B of a discriminatory structure yields a *significantly higher welfare loss*. The reason is that the deadweight loss grows non-linearly with the tariff rate. A 40% tariff on one half of imports creates double the inefficiency of a 20% tariff on all imports.

The two cases involve exactly the same weighted average tariff pre-adjustment of 20%. Even post-demand adjustment they look very similar since the post adjustment trade weighted average in case B is still about 18 % (=80*40/180).

The basic principle behind the numerical example can be generalised analytically:

*DWL per segment = ½ × (tariff per unit) × (reduction in quantity) = ½ × (tariff rate) × (tariff rate * slope of import demand curve).*

[2] It is implicitly assumed that the demand and supply conditions for the two goods are completely independent of each other. This corresponds to the Smoot Hawley case of zero imports on silk, but hig tariffs on some machinery.

It follows that the total Welfare loss with tariff rate of t*N levied on 1/N of imports (= average rate of t) is equal to.

$DWL_{\text{tariff nNt on 1/n imports}}$ = ½ × *(tariff rate*N) × ((tariff rate*N) * slope of import demand curve)/N* = ½ × *N × (tariff rate * slope of import demand curve)* = ½ × *(tariff*N) × (reduction in quantity)*

In general, any unequal tariff structure that includes very high rates on some portion of imports will incur greater total efficiency costs than a uniform tariff that spreads the tax burden evenly.

This is one of the reasons why the Smooth Hawley Act of 1930 was so destructive. It imposed tariffs of around 60 % on a variety of goods that made up about one third of US imports at the time. This is why the average tariff rate of SH is often reported as around 20 %.

The analysis presented here shows that a key reason why SH had such a destructive effect is the high dispersion of tariff rates.

$$DWL_{uniform} = \frac{1}{2}\, t_u(mt_u) = \frac{1}{2} m{t_u}^2$$

A dispersed tariff structure with a rate of t_d applied to 1/Nth of imports has the same average tariff rate if $Nt_d = t_u$. This implies:

$$DWL_{dispersed} = \frac{1}{2}\, \frac{Nt_d(mNt_d)}{N} = \frac{N}{2} m{t_d}^2$$

$$\frac{DWL_{dispersed}}{DWL_{uniform}} = \frac{N{t_d}^2}{{t_u}^2} =$$

It follows that a dispersed tariff structure with an average tariff of t_d, but with only a fraction 1/N subject to a tariff of N times t, is equivalent in terms of welfare loss to a uniform tariff on all imports, t_u equal to t times the square root of N.

$$DWL_{dispersed} = DWL_{uniform}\ implies\ \sqrt{N} t_d = t_u$$

In the case of Smoot Hawley N was equal to 3, which implies that the welfare loss from Smoot Hawley was about 1.7 times higher than one would expect from the average tariff rate of about 20 %. Smoot Hawley was thus equivalent to a uniform tariff of over 34 %, rather than the 20 % widely reported.

Dispersed versus discriminatory rates

Smoot Hawley had tariff rates differing widely across goods, but for each good the same rate applied to all partner countries.

Trump's reciprocal tariffs are the same across goods but differ widely across partner countries. (Cars, steel and aluminum are special cases.)

Since many countries might supply the same good, this means that for Trump's tariffs one has to consider additionally the impact of trade diversion.

For example, a good imported from China would attract a tariff rate over 100 %, but only 10 % if originating from the EU, or elsewhere. This implies that a European supplier that has a 100 % higher cost could still supplant Chinese imports on the US market.

The US Treasury would receive tariff revenues of only 10 % on the increased imports from the non-Chinese supplier, but US consumers would still pay the much higher price, possibly up to 100% more.

Trade diversion: an example

To analyse the effect of the widely different tariff rates across partner countries, the example above is modified. We now consider the case of a country that has two trading partners.

Both offer the same range of goods and face identical demand conditions. They are again called H and L. Suppose that under free trade (no tariffs), the home country again imports 200 units at a world price of $10 per unit. We assume under free trade one half of total imports comes from partner H and one half from partner L.

Case A (Uniform 20% Tariff on all imports): A 20% ad valorem tariff raises the domestic price from $10 to $12. This price increase induces consumers to reduce their quantity demanded. Suppose, as before, the higher price causes a 10-unit drop in imports (from 100 to 90 units) from each half of the two partner counties (reflecting identical price elasticity of demand/supply). Each partner country now faces a $2 tariff. The deadweight loss for each half of imports can be calculated as the area of the triangle:
DWL per segment = ½ × (tariff per unit) × (reduction in quantity).
For each half: ½ × $2 × 10 = $10 loss. There are two identical halves, so the total DWL = $10 + $10 = $20.

Case B (discriminatory Tariff of 40 % on one half imports):

So far, the result is the same for the two-goods and the two-countries cases. But the results change radically if one considers differences in the competitiveness of different countries. For illustrative purposes, assume that country H has lower costs than country L. Assume that country H, the highly competitive one, has costs of $10 per unit, but country L has costs equal to $12 per unit. Under free

trade all 200 imports come from country H. A uniform tariff of 20% on all countries does not change this trade pattern because when the tariff is applied to both countries the price difference remains.[3]

The imposition of a discriminatory tariff of 40% on country H changes the trade pattern completely. After the imposition of the tariff of 40% (on country H only), exports from country H will no longer be able to compete on the home country market with those from country L as their tariff inclusive price increases to 14, whereas exporters from country L can sell at 12.

This implies that trade patterns switch. The home country will now import only from country L at price 12. This is the same price as the one faced by consumers with the 20% uniform tariff. Imports therefore drop by the same amount as before, 20 units.

There is one key difference: with imports switching to the low tariff country, the government does not collect any tariff revenue. Consumers still have to spend $2160 for the 180 units they consume. But since there is no tariff revenue. The $ 360 higher costs for consumers go directly to cover the costs (and profits) of foreign suppliers.

The overall loss for the country is thus much bigger than in the case of a tariff that does not discriminate across countries. The overall reduction in imports causes the usual deadweight loss of 20. But, in addition, trade is diverted to higher cost suppliers.

The home country now imports 180 units at the price of $12, i.e. two $2 higher per unit. This implies a burden of $360 for the home country, bringing the total welfare loss to $380.

The key insight from this, admittedly extreme, example is that the welfare loss from trade diversion can be an order of magnitude larger than the standard welfare losses from tariffs that are the same across countries.

In this example, the trade weighted average tariff rate is zero after the adjustment of suppliers (to the high-cost country). What this implies is that with discriminatory tariffs, looking at the average tariff rate is even more misleading than before.

After the adjustment of suppliers, the weighted average tariff rate (and thus also tariff revenue) falls to zero, but this does not imply a lower welfare loss. On the contrary the welfare loss increases.

Back of the envelope calculation of trade diversion from China to Europe on the US market

The example used so far can be adapted to represent the constellation of the reciprocal tariffs for the EU and China. The rate for the EU is (temporarily) 10% and that for China (over) 100%, as of mid-April about 145 %.

[3] Assuming exports about one half of imports (not far from the average US value), the home country would export $50 to each partner, H and L. Before the imposition of 'reciprocal' tariffs, this would lead to a trade surplus with L (of $50) and a large trade deficit with H, equal to $150, attracting, according to the USTR formula, a tariff of 37 % (one half of 150/200.

It is very difficult to forecast the demand for Chinese products in the US when the tariffs increase to values never seen before. However, this is not necessary as there is a threshold effect set by the differential in production costs between the EU and China.

Costs are of course likely to be higher in Europe. One recent estimate is that costs are 40 % higher in Germany than in China. This applies also to green goods like solar panels and batteries.

Using again the value of $10 per unit for the high productivity country (China) and $14 per unit for the low productivity country (EU), the imposition of these tariffs will increase the price of EU goods on the US market to $15.4, but that of Chinese goods to $24.5 (assuming a tariff of 145 %). The EU will thus take over the (shrinking) US market. Imports fall to about 145 units, and the US government receives tariff revenues of $210. Total outlays for US consumers increase to 15.5*145=$2247 The amount of imports and the cost to consumers is thus approximately the same as if there was a uniform 55% import tariff on all imports.

The deadweight loss from lower imports calculated above for the case of a 40% uniform tariff would be $120. But in this case, government revenues would be $640, much higher than the $384 under the 20% on the EU which excludes China through the 70% percent rate, a loss of about $260.

This implies that the total welfare loss from the combination 20% on EU and 70% on China would be $340 (260+80). This is slightly lower than the welfare loss for combination of rates 40/0% above. But it would be significantly higher than the less even from an average rate of 40%.

In both cases the EU experiences an export boom (to the US) because its main competitor (China) is excluded by much higher tariff barriers.

The simple approach here implies that the exact value of the tariff rate for the high productivity country becomes irrelevant as soon as it is higher than the productivity difference (between H and L). China will be priced out of the US market if the difference in tariff rates is larger than the difference in costs. In a more realistic model with many different goods and different productivity differentials the trade diversion in favour of the EU will be more gradual. But the same principles apply.

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