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Deriving the Trump tariffs

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Abstract

On April 2, 2025, President Donald Trump announced a wide-ranging set of "reciprocal tariffs" against many of its trading partners. The calculation of these tariffs have elicited a largely negative reaction in part due to the simple formula used to calculate them. In this note, I provide a model which, under the proper assumptions, does indeed result in the administration's formula. I, however, leave it to the reader to judge whether these assumptions are reasonable.

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1. Introduction

On April 2, 2025, President Donald Trump announced a sweeping set of tariffs against nearly all of the US's trading partners.[1] These tariffs have attracted numerous comments from academics, policy makers, and the wider public. Many of these comments have been negative and have focused on the simple formula used in their calculation. In this note, I present a model under which the administration's formula is indeed appropriate. This set-up, however, requires a number of assumptions which many may feel are inappropriate. My goal, however, is not to comment on their appropriateness nor the potential political or economic ramifications of the Trump trade policy, rather, it is to lay out a set of assumptions under which one can derive the optimal tariffs laid out in the announcement. I leave it to the reader to decide whether or not they agree with those assumptions.

2. Model

The stated goal of Trump's trade policy is to implement "the tariff rates that would drive bilateral trade deficits to zero".[2] Furthermore, based on the tariff rates set forth in the announcement, it is clear that the goal is in fact to drive the bilateral trade deficit in goods to zero, i.e. services trade does not factor into the government's objective function. We begin with three assumptions. For the rest of our discussion, we follow the administration's lead and refer to the trade deficit in goods as simply the "trade deficit".

Assumption 1. *For each country i, the objective function is decreasing in trade deficit and invariant to trade surpluses.*

Assumption 2. *The national objective function is additively separable in bilateral trade balances.*

Assumption 3. *The trade balance of country k is independent of the tariffs for country i.*

The first of these matches the aim to drive deficits to zero with no mention of nations where surpluses are positive. The latter two rationalize the focus on bilateral deficits with no need to consider how they interact with one another. Although this matches the administration's announcement, it omits empirically-relevant features such as global supply chains. Given the independence across countries, for the rest of the discussion we focus on a single country i.

Define the trade deficit between the US and country i as $x_i - m_i \leq 0$. In this, exports are $x_i = \sum_j p^x_{ij} q^x_{ij}$ where p_{ij} is the price of good j in country i received by US exporters and q_{ij} is the quantity exported from the US to i. Likewise, imports are $m_i = \sum_j p^m_{ij} q^m_{ij}$ where the price p^m_{ij} is the price paid by US consumers.

[1] The announcement can be found at `https://www.whitehouse.gov/presidential-actions/2025/04/regulating-imports-with-a-reciprocal-tariff-to-rectify-trade-practices-that-contribute-to-large-and-persistent-annual-united-states-goods-trade-deficits/`.

[2] See `https://ustr.gov/issue-areas/reciprocal-tariff-calculations`.

Combining the above three assumptions, let the objective function be $W = -\sum_i I_i f(x_i - m_i)$ where I_i is an indicator function that equals 1 if $x_i < m_i$ and zero otherwise and $f(.)$ is an increasing function of the trade deficit. Note that, consistent with the announcement, this allows us to focus solely on trade deficits and ignore any cross-country general equilibrium effects. This objective function is maximized by choosing a vector of tariffs τ_i where a generic element is a country-product level tariff τ_{ij}.

Based on this objective function, it is clear that the optimal tariffs for country i will be those that set $x_i = m_i$. In order to arrive at the administration's formula for those tariffs, two further assumptions are needed.

Assumption 4. *Exports are independent of tariffs.*

Assumption 5. *The elasticities of import values and tariff passthrough are equal for all products and all countries.*

The first of these means that it is sufficient to simply focus on changes in imports. It is worth noting that this therefore rules out general equilibrium effects – as might occur when imported intermediates are used in the production of exports – or changes in export demand due to exchange rates, both of which are explicitly stated in the announcement. Furthermore, it ignores any possibility of retaliation in which other countries adjust their tariffs on US goods in response. In practice, it took the Chinese just nine days to announce an increase in their duties on American goods. The second of these means that we can safely ignore the need for differential tariffs across the products imported from country i. Note that this does not match the empirical findings of e.g. Amiti et al. (2020), Grübler et al. (2021) and Feng et al. (2023).

As we are beginning from non-zero deficits, a discrete change in imports is required as indicated by the announcement's use of Δ rather than marginal changes. Thus, taken as a whole, what is required is a change in imports of $\Delta m_i = -(x_i - m_i)$, The change in imports from a given change in tariffs has two aspects. Let $\epsilon < 0$ be the elasticity of import demand with respect to the US price of imported products and ψ be the elasticity of US prices to the tariff (passthrough). Note that in e.g. Amiti et al. (2020), ψ is estimated from a log-log specification where the tariff variable is $\frac{1+\tau_i}{1+\tau_{i0}}$, so that the tariff is measured relative to a baseline rate τ_{i0}.

We require one final assumption before we can arrive at the government's solution for the optimal tariff.

Assumption 6. *Assume that the elasticity of import demand and the passthrough elasticity are constant.*

This assumption allows us to use a marginal concept like elasticity when considering discrete changes so that we can write $\Delta m_i = \epsilon\psi\frac{m_i}{\tau_i}\Delta\tau_i$. Recalling that this should equal the opposite of the trade deficit and evaluating the tariff at the baseline rate so that $\tau_i = 1$, we arrive at:

$$\Delta\tau_i = \frac{x_i - m_i}{\epsilon\psi m_i}. \tag{1}$$

This matches what is found in the announcement. Two final items deserve note. First, the announced tariffs did not seem to depend on $\tau_{i0} = 0$ suggesting that the administration

was assuming that $\tau_{i0} = 0$ for all i. This baseline is slightly lower than the 2024 actual simple average rate of 3.3 reported by World Trade Organization (2024). Second, this result varies across i irrespective of the product mix. Consequently, it could be seen as inconsistent with the Most Favoured Nation obligation under GATT Article I. However, given the current impasse at the WTO Appellate Body due to the United States' continued refusal to appoint new members any challenge may have limited practical effect.

3. Conclusion

The goal of this note has been to lay out a set of assumptions under which the Trump administration's tariff plan is indeed the solution to an optimization problem. In particular, this requires an objective function that is independent across countries and ignores trade surpluses, a setting where exports are independent of imports (unlike what occurs in supply chains), and where the elasticity of import demand and passthrough are identical across products and countries. As with any economic model, it is up to the reader to decide whether they feel the assumptions are reasonable. Furthermore, one can take issue with the elasticity values used by the administration in its final calculations. Nevertheless, I do hope that this discussion proves useful in that deliberation.

References

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