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Trade Wars, Relative Economic Power, and Household Welfare

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Trade Wars, Relative Economic Power, and Household Welfare [±]

“..defence, however, is of much more importance than opulence”

Adam Smith (The Wealth of Nations)

George Economides* and Thomas Moutos*

December 15, 2025

Abstract: We develop a modified version of the Flam and Helpman (1987) framework of North–South trade in vertically differentiated products, by endogenizing the labour market participation decisions of heterogeneous households and allowing for tariffs to substitute for income taxes. The model reveals a fundamental asymmetry: while Northern tariffs depress labor force participation among low-ability households in the North, Southern tariffs do not generate comparable effects in the South. We demonstrate that the shift from the pre–Trump 2.0 environment of modest reciprocal tariffs to a Trump 2.0–style tariff war disproportionately harms low- and middle-income households in the North, whereas households in the South experience significantly smaller welfare losses. Furthermore, an escalated tariff conflict erodes the North’s relative economic power. Our results indicate that, from both a geopolitical and political economy perspective, the South is more resilient to a trade war.

Keywords: tariffs, trade war, household welfare, geoeconomics

JEL classification: F10, F13, I30

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1. Introduction

In his treatise on *Mercantilism*, Eli Heckscher (1935), whilst commenting on Adam Smith's views regarding the (trade-restricting) Navigation Acts of 1660, stated that "No one could have made it clearer [than Smith] that economic activity ought to be subordinated to the state's striving for external power" (vol. 2, p.16). Although the Navigation Act was a particularly egregious instance of the Mercantilism, which Smith otherwise soundly condemned, he thought that (some of) of its regulations "... are as wise, ... as if they had been dictated by the most deliberate wisdom. National animosity at that particular time aimed at the very same object which the most deliberate wisdom would have recommended, the diminution of the naval power of Holland, the only naval power which could endanger the security of England As defence, however, is of much more importance than opulence, the act of navigation is, perhaps, the wisest of all the commercial regulations of England" (Smith, p. 408).

The views of Adam Smith are echoed in the modern world by the "realist school" of international relations. Indeed, in their geopolitical analysis of the world trade system, Mattoo, Ruta, and Staiger (2024) quote Mearsheimer (2003) to this effect: "... Saying that states are power maximizers is tantamount to saying that they care about relative power, not absolute power. ... Thus, states motivated by relative power concerns are likely to forgo large gains in their own power, if such gains give rival states even greater power, for smaller national gains that nevertheless provide them with a power advantage over their rivals. States that maximize absolute power, on the other hand, care only about the size of their own gains, not those of other states. ... They would jump at the opportunity for large gains, even if a rival gained more in the deal (Mearsheimer, 2003, p. 36)".

Economists have also drawn attention to the interdependence between "Power and Plenty". In their masterful survey of last millennium's developments, Findlay and O'Rourke (2007) have documented how the interplay of international trade and geopolitics has shaped the development of the world economy, and the welfare of the empires/nations involved. One of the important conclusions emanating from their work is that even if politicians *do* succeed in persuading their constituents of the benefits of international trade, this may not be sufficient to avoid trade wars – relative economic power concerns are of paramount importance in determining countries' attitudes toward open (international) markets.

To what extent can the trade wars initiated by the first and second Trump administrations against China — and largely preserved by the intervening Biden administration — be interpreted as a strategic effort by the United States to curb China's perceived trajectory toward global economic and military hegemony? In other words, could the trade wars be a rational response to a *Great Powers*¹ game in which the losses incurred by the rival matter more than the self-inflicted economic wounds? Would the associated benefits or losses be distributed equitably among households in the two countries?

We try to answer these questions by constructing a two-country general equilibrium North-South trade model. The model's main feature is borrowed from Flam and Helpman (1987), who considered a North-South model of trade in vertically differentiated products. In this model – see, also, Stokey (1991), Murphy and Shleifer (1997), Matsuyama (2000), and Fajgelbaum, Grossman, and Helpman

¹ Political scientists and historians have defined as Great Powers those countries that extend their influence far beyond their own borders through military, or economic means (e.g., Kennedy, 1987).

(2011) - the pattern of trade follows from an assumption that richer countries have relative technological superiority, and thus, comparative advantage in producing higher-quality varieties. As a result, the structure of international trade is determined by intercountry differences in technology and income distribution. The North produces and exports high quality, high-cost varieties, while the South exports low-quality, low-cost varieties. High-ability, high-income households in both countries consume high-quality varieties, whereas low-ability, low-income households consume low-quality varieties.²

We depart from Flam and Helpman (1987) and the subsequent literature in two interrelated ways. First, we allow for labour-leisure choice by endogenizing the labour market participation decision of households. We assume that households differ in their endowment of effective units of labour at their disposal (and, thus, in their incomes) and face a fixed disutility from working. We show that if a household's ability is below a cut-off level, these households will not participate in the labour market. This cut-off ability level is determined by the extra utility that the after-tax income of a working household can confer on to it relative to the disutility of labour. Naturally, both the income tax and tariff rates affect this trade-off: increases in either tax instrument raise the threshold level and, therefore, expand the share of non-participating households.

Second, instead of assuming a lump-sum rebate of tariff revenue to all households, we consider the more realistic scenario that (potentially) higher tariff revenue can substitute for lower income tax rates. As a result, the extent to which tariff hikes allow for a reduction in income tax rates will be intermediated by the effect of both on labour market participation rates, e.g. if higher tariffs in the North tend – *ceteris paribus* – to discourage participation, the income tax rate may have to *increase* (instead of the presumed decrease) in order to make up for the loss in aggregate taxable income that lower participation rates entail.

The above indicate an important asymmetry between North and South regarding tariffs. When the North imposes tariffs, there is an immediate impact on the cost of the products (varieties) bought by low-income Northern households, some of which may decide not to participate. In contrast, if the South imposes a tariff, it will be the high-income households in the South that will face a rise in their cost of living, whereas the low-income households consuming the low-quality variety, that is locally produced, will not face an immediate rise in their cost of living. As a result, the immediate (partial equilibrium) effect of tariffs is to decrease the participation rate in the North, and to leave it intact in the North.

To be sure, the general equilibrium effects of tariffs on participation rates will be determined in conjunction with their effect on relative wage rates and income tax rates. The presence of demand switching effects and household heterogeneity prevents us from deriving analytic solutions. However,

² The assumption of vertical specialization has received a lot of support in empirical literature. Indeed, as demonstrated by various authors (Schott 2004; Hummels and Klenow 2005; Hallak and Schott 2011; Heins 2023) when rich and poor countries export goods in the same product category, the richer countries sell goods with higher unit values. For example, Heins (2023) using data for European Union countries, reports that “Richer economies export the same types of goods at up to 3 times higher unit values without noticeably lower market shares, suggesting that these varieties have certain characteristics that are superior to others and are preferred by consumers ... , while imports in rich EU economies are consistently cheaper and of lower quality than varieties offered by home firms, the opposite is true in poorer Eastern European countries... (p. 911). Moreover, as Hallak (2006) demonstrated, when a country imports goods in a product category from several sources, the higher-quality goods are imported disproportionately from the higher-income countries.

our model calibrations indicate that the effects on these variables depend on the relative size of the two countries. If the two countries are not too dissimilar in economic size (i.e. even when the North is 10 times larger than South), we find that a unilateral tariff by the North reduces the Northern participation rate, while leaving the Southern participation rate intact; in contrast, a unilateral tariff by the South, reduces the Northern participation rate, and it increases the Southern one.

We discuss extensively results for two unilateral and reciprocal tariff rates: 5 and 25 percent. The 5 percent tariff rate may be considered as close to the pre-Trump 2.0 world trading system.³ It is also the reciprocal tariff rate which maximizes tariff revenue for both countries in our benchmark calibration. In this calibration the GDPs of the two countries are approximately equal, while tariff revenues amount to 0.6 percent of GDP in the North and 0.3 percent in the South.⁴ These tariff revenue data are close to actual data: for example, combining World Bank data for customs and other import duties revenue as percentage of total government revenue (<https://data.worldbank.org/indicator/GC.TAX.IMPT.ZS>), and of tax revenue as percentage of GDP, we get that in 2023, (broad) tariff revenue were equal to 0.2 percent of GDP in China and 0.3 percent in the United States.⁵ The 25 percent tariff rate is intended to approximate the trade policy environment that may characterize the global trading system in a post-Trump 2.0 era.⁶ In what follows we shall term the 5 percent reciprocal tariff rates as the “pre-Trump 2.0 status quo”, and the 25 percent reciprocal rates as the “tariff war” scenario. In any case, the qualitative nature of our findings remains robust even if the tariff war scenario involves significantly lower tariff rates (e.g. 10 or 15 percent), or if these lower tariff rates are applied unilaterally.

A consistent finding of our analysis is that if the North and the South are not too dissimilar in size, and countries care only about relative economic power⁷, it pays for both countries to retaliate in response to the other country’s tariff. The effect of retaliation on relative GDP comes mainly from the positive effect that a country’s tariff has on its relative wage rate (another manifestation of Lerner’s (1936) symmetry theorem – see, Costinot and Werning (2019) for a modern treatment). The implication of this is that if countries predominantly care about their relative economic power, they will retaliate in response to the other country’s tariff – thus a trade war will commence.

We find that if the countries engage in a trade war involving reciprocal tariffs, Northern (Southern) relative economic power will decline (rise). If the two countries are of almost equal size (what we call our “benchmark scenario”), the move from the pre-Trump 2.0 situation to the tariff war will result in Northern GDP declining from being just 2 percent lower than Southern GDP, to being 17 percent lower.⁸ We note that the deterioration in North’s relative economic power is larger, the larger is the

³ According to the WTO (https://www.wto.org/english/res_e/publications_e/world_tariff_profiles24_e.htm) the simple average MFN applied tariff rate in 2024 was 7.5 percent for China, 5.0 percent for the EU, and 3.3 percent for the United States.

⁴ We note that the 25 percent tariff rates are far above the unilateral tariff revenue maximizing rates for both countries in our benchmark scenario, which are between 10 and 11 percent for both countries.

⁵ In other major developing countries like Brazil and India tariff revenue were equal to 0.5 percent of GDP, whereas the corresponding figure for developed countries is usually less than 0.5 percent of GDP (e.g. for Japan it is 0.2 percent).

⁶ According to The Budget Lab at Yale (<https://budgetlab.yale.edu/research/state-us-tariffs-august-7-2025>), the average effective US tariff rate was, as of August 6, 2025, 18.6 percent, and 27.9 percent against China, but possible further increases are pending. The 25 percent tariff rates used in this paper are also close to the Dinopoulos, Heins and Unel (2024) calculations of Nash tariff rates in a trade war between China and the US.

⁷ We measure relative economic power as the ratio of Northern to Southern GDP.

⁸ The decline in relative GDP for the North obtains also in cases in which the pre-Trump 2.0 Northern GDP is substantially larger than Southern GDP (even up to 10 times larger).

rise in the tariff rates, i.e. a trade war involving 10 percent tariff rates would reduce North's relative economic power by just 4 percentage points.

Granted the North's inability to increase its relative economic power when the South is not very small, could the trade war still be beneficial for Northern households? We find that the move from the pre-Trump 2.0 situation to the trade war will harm *all* Northern households. Moreover, its effects will be particularly onerous for the low-to-medium income households, whose utility losses can reach up to 30 percent (relative to pre-Trump 2.0); these are the households that not only have to shoulder the price increases that the higher tariff brings, but also to face the decrease in their purchasing power that their new non-employment status and the reduction in the Northern relative wage implies. In contrast, the losses for the high-income households will be smaller (by less than 1 percent) since they will not be burdened with the higher tariff, but only with the higher income tax rate which the drop in tariff revenue will bring about.⁹

Continuing with the benchmark case, we also find that *no* Southern household stands to gain from the trade war. Here the utility losses are far smaller than for Northern households (only up to 0.8 percent) and more affect the high-income households which are buyers of the imported varieties, while the low-ability households which are consuming the domestically produced low quality varieties are not burdened by the extra tariffs.

The upshot of these findings is that both from a geopolitical and from a political economy perspective, the South appears more resilient to withstand the move to the trade war; not only will its relative economic power increase (i.e. its relative GDP will increase from being 1.6 percent larger than North's in the pre-Trump II situation, to being 20.3 percent larger), but the domestic political pressure from disgruntled households will be far higher in the North than in the South.

Moreover, our findings suggest that if the North raises its tariff rate from 5 to 25 percent, and the South prioritizes maintaining its relative economic power it is very likely that it will retaliate. This is because by retaliating, its GDP will advance from being 1.1 percent higher than the North's to being 20.3 percent larger, while the losses to Southern households will be very small, i.e. up to 0.02 percent of their non-retaliation utility level. Policymakers in some countries may deem these (admittedly small) utility losses as irrelevant to the pursuit of "national greatness".

Interestingly, if it is the South that initiates the rise in its tariff rate to 25 percent, and the North responds by raising its tariff to 25 percent as well, the North's relative economic power will hardly increase (by less than 0.1 percent), while the majority of its households will lose (some of which up to 10 percent).

The finding that no household in either the North or the South stands to benefit from a shift from a reciprocal 5 percent tariff rate to a 25 percent trade war, is impervious to changes in parameter values, or to changes in the strength of the North's comparative advantage in high quality varieties as long as the North is not far larger than the South. Moreover, this conclusion stands if the trade war involves smaller rises in reciprocal tariff rates (e.g. to 10 or 15 percent), with the utility losses becoming larger as the tariff rates increase.

⁹ The drop in tariff revenue arises since the revenue maximizing tariff rate is considerably lower than 25 percent in a trade war. Lashkaripour (2020) also finds that governments involved in trade wars will have to raise domestic taxes in order to maintain their spending programmes.

How do the conclusions we have drawn when the two countries are of comparable size alter when the two countries are of different size?¹⁰ Our findings indicate that a trade war may increase the North's relative economic power relative to pre-Trump II situation only if the South is very small relative to the North.¹¹ For example, if North's GDP is 126 times larger than South's with the 5 percent reciprocal tariffs, the move to a 25 percent tariffs trade war will make North's GDP 132 times larger than South's. However, even in this case the absolute level of Northern GDP will decrease (due to a decrease in its participation rate); the rise in relative GDP for the North will be entirely due to the rise in the Northern relative wage rate.¹²

We note that even when the South is very small, the South can increase its relative GDP by retaliating against the increase in the Northern tariff.¹³ This arises because the Southern retaliatory tariff will result not only in an increase (decrease) in the Southern (Northern) participation rate, but it will also increase the South's relative wage rate.¹⁴

How do the households fare in the case of a trade war when the South is small (relative to the pre-Trump II situation)? Again, *all* Northern households become worse off, with the low-income ones suffering utility losses up to 10 percent. No Southern household benefits: in fact, the majority of Southern households, except for low-income ones, suffer utility losses which can reach up to 20 percent for the high-income ones.

A surprising finding is that despite the small size of the South, most Southern households would be in favour of retaliation if the North hikes its tariff rate from 5 to 25 percent. The opposite is true for the North: *all* Northern households would be against retaliating to a tariff hike by the small country. The difference in outcomes is caused by the behaviour of the tax rate; the very small size of the South, implies that imports, and tariff revenue, are a substantial part of GDP in the South, and a very small one in the North. As a result, Northern households do not experience a drop in their income tax rate if they retaliate, while Southern households do.

The above results indicate that even though the North can increase its relative economic power by a trade war when the South is very small, it can do so only at a cost to itself. Own GDP will decline due to the drop in its participation rate, whereas all its households will be worse off. The only "rationale" that can be given in this case is that the South will suffer as well, and it may thus be coerced to adopt non-economic policies which are aligned with the North's geopolitical desires.

We note that when the North is very small relative to the South (with Southern GDP being 40 times larger than Northern GDP), the results mentioned for the benchmark case in which the two countries are of comparable size, continue to hold with one exception: retaliation by the North to a tariff hike by the South, not only will harm all Northern households, but it will also decrease the North's relative GDP.

¹⁰ Using a neoclassical trade model, Syropoulos (2002) shows that a sufficiently large relative economic size can make a country prefer a non-cooperative Nash tariff equilibrium over free trade.

¹¹ To be sure, the concept of relative economic power (or, geopolitical rivalry) loses much of its relevance if applied to countries that whose size difference is very large.

¹² Moreover, sensitivity analysis indicates that if the North's comparative advantage in high quality varieties does not increase very rapidly as quality increases, then North's relative economic power can decrease after the trade war even when the South is very small.

¹³ The same holds true for the North as well, i.e. it will increase its relative GDP by retaliating against the South.

¹⁴ The latter effect is due to the rise in the relative demand for Southern labour because of the Southern (retaliatory) tariff.

Beyond the relative size of the two countries, what other parameter values may influence the qualitative nature of our results? After extensive experimentation with different sets of parameter configurations, we find that the most significant factor is the parameter describing the rate at which North's comparative advantage intensifies as quality increases.

The most worthwhile amendment to the conclusions stated earlier regarding relative economic power arises when the superiority of the North in high quality varieties is smaller (i.e. the North retains its comparative advantage in high quality varieties, but now the range over which it has the cost advantage in both markets becomes smaller; in other words the South's technological sophistication looks more like Thailand than Laos). In this case, North's relative economic power *decreases* due to a shift from the pre-Trump 2.0 situation to the trade war, even when the South is very small. We conclude that the principal finding of our analysis concerning relative economic power - namely that the North's relative economic power will decline when the two countries are not very different in economic size - remains robust.

Regarding household utility, the most notable amendment to our previous results arises when the North's technological advantage is stronger – implying a broader range of varieties over which the North holds a cost advantage (i.e. the South looks more like Laos than Thailand) - and the South is very small. Under these conditions it is no longer the case that no household in the North stands to benefit by a shift from the pre-Trump 2.0 situation to the trade war. In this case, the majority of the Northern households will benefit from the trade war since the already small share of imports does not adjust very much, thus enabling a rise in tariff revenue and a fall in the income tax rate.¹⁵

The remainder of the paper is organized as follows. Section 2 reviews the relevant literature and situates our findings within existing research. Section 3 develops the theoretical model, while Section 4 examines the effects of unilateral tariffs. Section 5 analyzes the consequences of tariff wars, and Section 6 provides a robustness analysis. Finally, Section 7 concludes with a summary of key insights.

2. Relevant literature

How do our findings relate to previous investigations? The studies closest to our investigation are by Ossa (2014), Lashkaripour (2021), Dinopoulos, Heins and Unel (2024), and Ignatenko et al. (2025) who develop multi-county/multi-industry quantitative trade models to study the long-run effects of tariff wars.¹⁶ A major difference between these studies and the present paper is that we do not rely on the representative agent assumption – thus, we are able to study the differential consequences of tariff wars across households.¹⁷ In addition, the present paper relies on a model of vertical product differentiation, which allows for a sharp delineation of the incidence of tariffs across income groups.

Using data from the World Input-Output Database from 2000 to 2014, Lashkaripour (2021) calculates that under the non-cooperative Nash tariff levels (of almost 50 percent on average) which will prevail under a global tariff war, will impose losses that are in rough accordance with long-held theoretical

¹⁵ If the tariff hike is larger, then this effect can be reversed as imports may drop to zero.

¹⁶ There is also an extensive literature recognizing that while tariffs impose efficiency costs, they can benefit the tariff-imposing country by improving its terms of trade. The tradeoff between these two forces is the traditional focus of the “optimal tariff” literature (see, e.g. Bickerdike, 1906; Kaldor, 1940, Johnson 1954, Tower, 1977; Dixit, 1985; Costinot et al, 2015).

¹⁷ Dinopoulos, Heins and Unel (2024) also present a model with differences in entrepreneurial ability and employment status, but they report results only for aggregate welfare.

priors, i.e. that country size is one of the determining factors, with the largest economies suffering smaller losses, or, even gaining (see, e.g. Johnson, 1954; Kennan and Riezman, 1988). In our benchmark calibration we also find that a tariff war will impose GDP losses on both countries, and that the losses are only partly determined by a country's relative size.

Ignatenko et al. (2025) construct a quantitative trade model to estimate the long run effects of "Liberation Day" Tariffs. They find that in their specification involving input-output linkages, the tariffs imposed by the U.S. can result in welfare gains for the representative U.S. household equal to 0.25 percent relative to the pre-Liberation Day status quo. However, if the foreign countries engage in reciprocal retaliation, there will be a loss of 2.99 percent for the representative U.S. household, while the (average) loss for foreign households will be 5.30 percent. As stated earlier, our benchmark findings suggest that the losses for the low-income (high-income) Northern (Southern) households can be substantially larger.

The effects of noncooperative and cooperative trade policy have also been studied by Ossa (2014) in a quantitative multi-region/multi-industry trade model with lobbying activities. His calculations indicate that each country/region has an incentive to impose an optimal tariff (i.e. the tariff that a country would impose if they did not fear retaliation, and which on average would be 62.4 percent), which would result in a mean welfare gain of 1.5 percent for the tariff imposing country, and a mean welfare loss of 0.7 percent for the other countries. In the case of Nash tariffs (i.e. the tariffs countries would impose in a worldwide trade war in which the other countries retaliated optimally, and which on average would be 63.4 percent), all countries would suffer losses, and the mean welfare loss for all countries would be 3.2 percent.

Dinopoulos, Heinz and Unel (2024) have also developed a multi-country trade model with occupational choice, heterogeneous firms, and unemployment to study the effects of tariff wars. In their model, the presence of market distortions makes the tariff a second-best policy instrument, even for a small economy. They find that if the US unilaterally imposes an optimal tariff (of 23.1 percent) against China, but keeps tariffs on other regions (the EU and the ROW) unchanged at their 2017 tariff rates, aggregate welfare in the US will increase by 0.28 percent, while Chinese welfare will fall by 0.64 percent, and the effect on the other regions will be positive (but small). In the case of a US-China tariff war (with the Nash tariffs being 23.2 and 24.4 percent, respectively, while the other countries maintain their tariffs), both countries lose (but the losses for China are larger), while the rest will gain. In the event of a global tariff war with Nash tariff rates ranging between 24 and 30 percent, all countries/regions lose, with the welfare losses being lowest for the EU (0.96 percent) and highest for China (2.43 percent).

The effects of tariff shocks/trade wars have also been studied in New Keynesian open economy models. Bergin and Corsetti (2023) find that unilateral tariffs are expansionary, while Barattieri, Cacciatore and Ghironi (2021) uncover a recessionary effect due to a reduction in investment. Auclert, Rognlie and Straub (2025) argue that temporary tariffs are recessionary, thus weakening the standard optimal tariff argument and inducing welfare losses from any tariff if there is retaliation. Auray, Deveraux and Eyquem (2024) study how monetary policy can impact on the welfare consequences of trade wars and find that trade wars under inflation targeting regimes will involve substantially lower tariffs, resulting in much lower welfare losses.

3. The Model

We consider a two-country general equilibrium model. The two countries, North and South, engage in trade in a vertically differentiated product, with the North (no *) and the South (*) specializing in different quality segments. Production in both countries is carried out under perfectly competitive conditions with the use of labour services, L (L^*). We conceive $L(L^*)$ as being the simple aggregate of effective labour services provided by perfectly substitutable workers with each of them possessing different units of effective labour. Firms pay the same wage rate per effective unit of labour—thus the distribution of talent across firms does not affect unit production costs.

3.1 Technology and Pricing

Following Rosen (1974) and Flam and Helpman (1987) we assume that the vertically differentiated product (VDP) is produced at various quality levels (varieties) and that is indivisible. Northern firms have access to the production function

$$Y_Q = \frac{L}{Q},$$

where Y_Q denotes the number of units of quality Q produced, and L is the number of efficiency units of labour employed. Quality is measured by an index $Q > 1$, and there is complete information regarding the quality level inherent in all varieties produced at home and abroad. The above production function implies that although costs per unit in terms of quantity are constant, costs are increasing per unit of the quality index. The latter assumption is motivated by the fact that increases in quality - for a given state of technological capability - involve the "sacrifice" of an increasing number of personnel. These workers must be allocated not only to the production of a higher number of features attached to each product (e.g. connectivity, safety, etc. in the case of automobiles) that directly absorb labour, but also to the development and refinement of these features.

Assuming perfect competition, the price at which each unit of quality Q will be offered by Northern firms will be equal to their unit cost, i.e.

$$P(Q) = AC(Q) = wQ. \quad (1)$$

To ensure that Northern firms have comparative advantage in producing high quality varieties of the VDP, we assume that Southern firms can convert effective labour units to output according to the following technology,

$$Y_Q^* = \frac{L^*}{Q^\gamma},$$

Parameter $\gamma > 1$ governs the extent to which the North's technological superiority over the South expands as quality increases, i.e. for low values of Q the productivity differential between North and South is small, but it expands as Q increases. It also implies that the higher is γ , the lower the Southern wage will have to be relative to the Northern wage in a trade equilibrium.

Perfect competition implies that the price at which each unit of quality Q will be offered by Southern firms will be equal to

$$P^*(Q) = AC^*(Q) = w^*Q^\gamma. \quad (2)$$

Assuming away transportation costs, the price which Northern consumers will have to pay for each variety (i.e. quality level) of the VDP will be

$$P_c(Q) = \min[wQ, (1 + \tau)w^*Q^\gamma], \quad (3)$$

whereas the price that Southern consumers would have to pay is

$$P_c^*(Q) = \min[w(1 + \tau^*)Q, w^*Q^\gamma], \quad (4)$$

where τ (τ^*) stands for the tariff rate imposed by the Northern (Southern) government. Equation (3) implies that in order for Southern firms to be able to sell any variety in the Northern market, the Northern wage rate per effective unit of labour must be greater than the Southern wage rate ($w > w^*$). Equations (3) and (4) also imply that there will be *dividing* quality levels, Q_D (Q_D^*), such that any quality level below it will be offered at a lower price by Southern firms, and qualities above it will be offered at a lower price by Northern firms (see, Dornbusch, Fischer, and Samuelson, 1977; Flam and Helpman, 1987).

3.2 Households

There are H (H^*) households in each economy, and they have identical preferences. As in Rosen (1974), Flam and Helpman (1987), and Flam, Helpman and Grossman (2011) we assume that households value only one unit of the VDP, and each buys the unit that offers them the highest utility (i.e. they prefer to buy one Mercedes than many Trabants). We also assume that households have an indivisible labour unit at their disposal, and their utility function is given by

$$U_i = Q_i - \delta N_i, \delta > 0, \quad i = 1, \dots, H,$$

$$U_j^* = Q_j - \delta N_j, \quad j = 1, \dots, H^*.$$

In this expression, Q_i (Q_j) stands for the quality of the VDP consumed by household i (j), and N_i (N_j) is null if the household remains inactive, and equal to one if it works.

Although all households have one indivisible labour unit at their disposal, there are differences in ability between households, which is reflected in differences in their endowment of *effective* labour units, e_i (e_j^*). We assume that ability is distributed uniformly among households in the interval $[b, c]$ ($[b^*, c^*]$), where b , b^* , c , and c^* are greater than 1. As will become clear in what follows, the existence of welfare benefits may induce some (low ability) households to stay out of the labour force.

3.3 Government

Governments in both countries run balanced budgets. Their sources of revenue are income taxes and tariffs. Government spending takes two forms. First, the governments provide benefits to those staying idle, which are a fraction, θ (θ^*) of what the lowest ability household would earn (before taxes) if it were willing to work, i.e. welfare payments for each household out of the labour force are equal to θbw ($\theta^* b^* w^*$).¹⁸ Second, governments hire labour to provide services which are essential for the smooth functioning of the economy (e.g. law and order services). We assume that governments hire randomly among households, and that the total number of effective labour units hired are equal

¹⁸ We assume that welfare benefits are untaxed.

to $gH (g^*H^*)$, with each unit being compensated at the market clearing wage rate.¹⁹ We naturally assume that that $g (g^*)$ are smaller than the average effective units of labour per household, which is equal to $\frac{c-b}{2} \left(\frac{c^*-b^*}{2} \right)$.

3.4 Household Ability and Demand Allocation

To determine how households of different abilities choose their preferred variety (i.e. quality level) of the VDP, we note that, in effect, households face two mutually exclusive budget constraints.

Conditional on labour market participation, and letting $t (t^*)$ stand for the income tax rate, the budget constraint of a Northern household deciding to acquire a variety of the VDP which is offered by Northern firms is

$$(1 - t)e_i w = wQ,$$

whereas if the household were to acquire a Southern-produced variety, its budget constraint would be

$$(1 - t)e_i w = (1 + \tau)Q^\gamma w^*.$$

These imply that the desired quality level if the household were to purchase it from Northern producers would be

$$Q_D = (1 - t)e_i, \tag{5}$$

and if it were to buy it from Southern producers,

$$Q_F = \{(1 - t)we_i/w^*(1 + \tau)\}^{\frac{1}{\gamma}}. \tag{6}$$

The resulting utility for household with ability e_i would then be:

$$U_D = (1 - t)e_i - \delta, \tag{7}$$

$$U_F = \{(1 - t)we_i/w^*(1 + \tau)\}^{\frac{1}{\gamma}} - \delta, \tag{8}$$

Equations (7) and (8) imply that there exists a *dividing* ability level (e_d), such that the household with that ability would be indifferent between buying its desired variety from Northern or Southern producers. The ability level for which this holds, is found by setting $U_D = U_F$, implying that

$$e_d = \left(\frac{1}{1-t}\right)\left\{\frac{w}{w^*(1+\tau)}\right\}^{1/(\gamma-1)}. \tag{9}$$

We note that households with $e_i > e_d$ prefer to buy a domestically produced variety -since the domestic country has comparative advantage in producing the high-quality varieties desired by the higher ability/income households, whereas the opposite is true for households with $e_i < e_d$.

As expected, equation (9) implies that -ceteris paribus - a rise in the tariff rate, decreases the dividing ability level, i.e. there will now be more domestic households purchasing domestically produced varieties. In contrast, a higher income tax rate increases the dividing ability level since the lower after-tax income would induce some households to purchase lower quality varieties which are offered

¹⁹ We introduce this second category of spending since otherwise the income tax rate required to fund just the welfare benefits program would have been far smaller than existing tax rates.

at a lower cost by the foreign (i.e. Southern) firms. Thus, as far as the allocation of demand is concerned, the two tax instruments work in opposite directions in the North. Finally, a rise in the Northern relative wage rate ($\omega \equiv \frac{w}{w^*}$), increases e_D , i.e. it expands the proportion of Northern households consuming imported varieties as the relative costs of Northern produced varieties increase.

Given that ability is distributed uniformly in the interval $[b, c]$, the number of domestic households choosing to buy the domestically produced varieties will be equal to $H \frac{(c-e_d)}{(c-b)}$, while $H \frac{(e_d-b)}{(c-b)}$ households will be buying the foreign produced varieties.

The same method can be used to determine South's dividing ability level, e_d^* . Conditional on labour market participation, the budget constraint of a Southern household deciding to acquire a variety of the VDP which is offered by Northern firms is

$$(1 - t^*)w^*e_j^* = w(1 + \tau^*)Q,$$

whereas, if the household were to acquire a South-produced variety, its budget constraint would be

$$(1 - t^*)w^*e_j^* = w^*Q^\gamma.$$

These imply that the desired quality level if the household were to purchase it from Northern producers would be

$$Q_D^* = (1 - t^*)w^*e_j^*/w(1 + \tau^*), \quad (10)$$

and if it were to buy it from Southern producers,

$$Q_F^* = [(1 - t^*)e_j^*]^{1/\gamma}. \quad (11)$$

The resulting utility for a foreign household with ability e_j would then be:

$$U_D^* = (1 - t^*)w^*e_j^*/w(1 + \tau^*) - \delta,$$

$$U_F^* = [(1 - t^*)e_j^*]^{1/\gamma} - \delta.$$

The *dividing* ability level for Southern households is then found to be:

$$e_d^* = [w/w^*(1 - t^*)](1 + \tau^*)^{\gamma/(\gamma-1)}. \quad (12)$$

As expected, equation (12) implies that -ceteris paribus - a rise in the Southern tariff rate, increases the dividing ability level, i.e. there will now be more Southern households purchasing Southern produced varieties. We note that unlike the North, increases in the income tax rate and in the tariff rate in the South influence the allocation of demand between domestic and imported varieties in the same direction; they both result in a reallocation in the demand of Southern households toward locally produced varieties.

3.5 Labour Force Participation Decisions

Households will decide to participate in the labour force if the utility they derive from working is higher than the utility from non-participation. Since the disutility from working is the same for all households, and all idle households receive the same welfare benefits, it follows that for some households with relatively few effective units of labour at their disposal, non-participation may be

preferable to working. To determine the cut-off ability level that makes a Northern household indifferent between working and non-participating we assume that this (relatively low ability) household would, even when working, buy a low-quality variety which is produced by Southern firms. In that case, using equation (6), the utility derived from labour force participation is

$$U_{P,i} = \left\{ \frac{(1-t)we_i}{w^*(1+\tau)} \right\}^{1/\gamma} - \delta,$$

whereas, if the household does not participate, its welfare receipts are θbw , and its utility

$$U_{NP,i} = \left\{ \frac{\theta bw}{w^*(1+\tau)} \right\}^{1/\gamma}.$$

The cut-off ability level (e_p) for which the household is indifferent between participation and non-participation is then found by equating $U_{P,i}$ with $U_{NP,i}$, implying that

$$e_p = \frac{(1+\tau)\left\{\left(\frac{\theta bw}{(1+\tau)w^*}\right)^{1/\gamma} + \delta\right\}^\gamma}{(1-t)w/w^*}. \quad (13)$$

Equation (13) implies that the higher is the tariff rate, the higher is e_p , i.e. a rise in the domestic tariff rate will raise the cost of acquiring the Southern variety, thus reducing the benefit in terms of utility from working, and inducing a decline in the participation rate. Obviously, the general equilibrium effect of tariff hikes on participation rates will also depend on its effects on income tax rates and the relative wage rate, i.e. a rise in the Northern relative wage rate will increase participation by reducing e_p , while a rise in the income tax rate will have the opposite effect.

Given the uniform distribution of ability, the number of households participating in the labour market is equal to $H \frac{(c-e_p)}{(c-b)}$, whereas the total supply of effective units of labour offered by these households is:

$$L_s = H \int_{e_p}^c \frac{1}{c-b} e de = H \frac{(c^2 - e_p^2)}{2(c-b)}. \quad (14)$$

The same procedure can be followed to determine the cut-off ability level for foreign households. Using equation (11) – since the low-ability Southern households would be buying Southern produced low-quality varieties – we can calculate the cut-off ability level (e_p^*) for which the Southern household is indifferent between participation and non-participation:

$$e_p^* = \frac{\{(\theta^* b^*)^{1/\gamma} + \delta\}^\gamma}{(1-t^*)}. \quad (15)$$

Equation (15) indicates that the participation rate in the South is not *directly* affected by the Southern tariff rate; this is a direct consequence of the fact that low ability households in the South are buying the low quality, Southern produced varieties. Naturally, the general equilibrium effects of tariff changes depend on their influence on the income tax rate, i.e. if a higher tariff rate can be consistent with a lower income tax rate, the participation rate will increase (i.e. e_p^* falls).²⁰

²⁰ We note, that unlike the North, the participation rate in the South is not affected by the relative wage rate since the participation decision concerns low ability households which are consuming the low quality, locally produced varieties.

3.6 Labour Market Equilibrium

The private sector's total demand for labour in the North (or, equivalently the world demand for the varieties produced by Northern firms) arises from two sets of households: first, from Northern households whose ability (and thus, income) is high enough to prefer to buy the high quality varieties produced by Northern firms (i.e. households with ability greater than e_d), and second, from Southern households which also choose to buy the Northern produced varieties (i.e., those with ability greater than e_d^*).

Consider first the demand generated by the Northern households. Since Q effective units of labour are needed for one unit of quality Q to be produced, the demand for effective labour units generated by the purchases of each household will be equal to $(1 - t)e_i$ (see, equation (5)). Accordingly, the demand for labour by all Northern households with $e_i > e_d$ will be equal to

$$H \int_{e_d}^c (1 - t)e \left(\frac{1}{c-b} \right) de = H(1 - t) \frac{(c^2 - e_d^2)}{2(c-b)}.$$

Regarding the demand for Northern labour arising from the purchases of Southern households, note that the demand for labour generated by each household will be equal (see, equation (10)) to $(1 - t^*)w^*e_j^*/w(1 + \tau^*)$. Thus, the demand for Northern labour by all Southern households with $e_j > e_d^*$ will be equal to

$$H^* \int_{e_d^*}^{c^*} \left[\frac{(1-t^*)w^*e^*}{w(1+\tau^*)} \right] \left(\frac{1}{c^*-b^*} \right) de^* = H^* \left[\frac{(1-t^*)w^*}{w(1+\tau^*)} \right] \frac{(c^{*2} - e_d^{*2})}{2(c^*-b^*)}.$$

In addition to the private sector's demand for labour, the total demand for labour in the North includes the government's demand for labour, gH , where g stands for effective units of labour per household hired by the government.

Using equation (14), the labour market equilibrium condition in the North can be written as

$$H \frac{(c^2 - e_d^2)}{2(c-b)} = H(1 - t) \frac{(c^2 - e_d^2)}{2(c-b)} + H^* \left[\frac{(1-t^*)w^*}{w(1+\tau^*)} \right] \frac{(c^{*2} - e_d^{*2})}{2(c^*-b^*)} + gH. \quad (16)$$

The demand for Southern labour arises from the product demand generated by four groups of households: Southern welfare recipients, Northern welfare recipients, Northern working households with ability up to e_d , and Southern households with ability up to e_d^* . Using the same procedure as above, we can write the equation describing labour market equilibrium in the South as:

$$H^* \frac{(c^{*2} - e_p^{*2})}{2(c^*-b^*)} = H^* \frac{\theta^* b^* (e_p^* - b^*)}{c^* - b^*} + H \frac{\theta b w (e_p - b)}{(1+\tau)w^*(c-b)} + H^* \frac{(1-t^*)(e_d^{*2} - e_p^{*2})}{2(c^*-b^*)} + H \frac{(1-t)w(e_d^2 - e_p^2)}{2(1+\tau)w^*(c-b)} + g^* H^*. \quad (17)$$

3.7 Government Budget Constraint

The total payments for welfare benefits in the North are equal to the number of non-participating households ($=H[\frac{e_p-b}{c-b}]$) times the welfare benefit paid to non-participating households ($=\theta bw$), i.e. they are equal to $H[\frac{e_p-b}{c-b}] \theta bw$. In addition, the government spends wgH on government employees. These payments are financed by the revenue generated from income taxes and tariffs.

Income tax revenue are just equal to the total wage income of (participating) households times the tax rate. The pre-tax total wage income in the North is equal to the total number of efficiency units

of labour offered times the wage rate. Using equation (14), we find that income tax revenue are equal to $twH \frac{(c^2 - e_p^2)}{2(c-b)}$.

To calculate the tariff revenue, we note that the imported low-quality varieties are consumed by the non-participating households as well as those with ability up to e_d . The total income of the first group is equal to $H[\frac{e_p - b}{c-b}] \theta bw$, whereas the income of the second group is equal to

$$H \int_{e_p}^{e_d} (1-t)we \left(\frac{1}{c-b} \right) de = (1-t)wH[\frac{e_d^2 - e_p^2}{c-b}].$$

Since both groups of households spend their entire income on the imported varieties, the total value that Northern consumers spend on Southern varieties, I , will be equal to

$$I = H[\frac{e_p - b}{c-b}] \theta bw + (1-t)wH[\frac{e_d^2 - e_p^2}{c-b}].$$

However, since consumers pay a price inclusive of the tariff, the value of imports on which the tariff is applied is equal to $I/(1+\tau)$, and thus the tariff revenue are equal to $\tau I/(1+\tau)$.

The above imply that —after eliminating w and H from both sides - that the Northern government budget constraint can be written as:

$$t \frac{(c^2 - e_p^2)}{2(c-b)} + \left(\frac{\tau}{1+\tau} \right) \left\{ [\frac{e_p - b}{c-b}] \theta b + (1-t)[\frac{e_d^2 - e_p^2}{c-b}] \right\} = [\frac{e_p - b}{c-b}] \theta b + g. \quad (18)$$

We follow a similar procedure to determine the Southern budget constraint. Aggregate government spending is equal to $H^*[\frac{e_p^* - b^*}{c^* - b^*}] \theta^* b^* w^* + w^* g^* H^*$. Income tax revenue are equal to $t^* w^* H^* \frac{(c^{*2} - e_p^{*2})}{2(c^* - b^*)}$.

To calculate the tariff revenue, we note that the imported high-quality varieties are consumed only by households with ability higher than e_d^* . The total income of this group of households (and thus, the country's total consumer spending on imports) is equal to

$$I^* = H^* \int_{e_d^*}^{c^*} (1-t^*)w^*e^* \left(\frac{1}{c^* - b^*} \right) de = H^*(1-t^*)w^*[\frac{(c^{*2} - e_d^{*2})}{2(c^* - b^*)}],$$

thus, the value of imports on which the tariff is applied is equal to $I^*/(1+\tau^*)$, and thus the tariff revenue are equal to $\tau^* I^*/(1+\tau^*)$.

The resulting Southern government budget constraint can be written as:

$$t^* \frac{(c^{*2} - e_p^{*2})}{2(c^* - b^*)} + \frac{\tau^*}{1+\tau^*} \left\{ (1-t^*) \left[\frac{(c^{*2} - e_d^{*2})}{2(c^* - b^*)} \right] \right\} = [\frac{e_p^* - b^*}{c^* - b^*}] \theta^* b^* + g^*. \quad (19)$$

3.8 General Equilibrium

The general equilibrium features satisfaction of the private and government budget constraints in the two countries, which along with labour market clearing implies that trade is balanced. We assume that income tax rates in the two countries adjust to maintain balanced budgets. The model can be solved using equations (9), (12), (13), (15), (16), (18) and (19) to determine $e_d, e_d^*, e_p, e_p^*, t, t^*$, and

the relative wage rate, $\omega = \frac{w}{w^*}$.²¹ The resulting utility levels for the various groups of households (working/non-working, low/high ability) in each country can then be calculated.

Despite the model's simplicity, the solution to this model is not attainable in closed form. We thus proceed by specifying a set of parameter values that can generate under free trade an equilibrium in which the North enjoys higher wage rates, while the South has a higher population. These two features are consistent with an equilibrium in which there are not large differences in GDP between the two countries. As will become apparent later, our conclusions are not driven by specific parameter choices, thus we find it useful to center our discussion around some empirically plausible parameter values.

3.9 Reference Calibration

We start by noting that, as evidenced by equations (16) to (19), it is the relative size of the population ($h = \frac{H}{H^*}$), and not the absolute size, that matters for the determination of equilibrium values. For our benchmark calibration we set $h = 0.5$. This choice, along with the rest of our benchmark parameter values, produces an equilibrium in which the two countries are of similar size. The full set of parameter values and policy variables is given in Table 1, whereas the resulting free trade ($\tau = \tau^* = 0$) equilibrium values are presented in Table 2.

Table 1: Benchmark Parameter Values

Parameter	Description	Value
h	Relative population size of North	0.5
b	Effective units of labour for household with lowest ability in North	2
b^*	Effective units of labour for household with lowest ability in South	2
c	Effective units of labour for household with highest ability in North	100
c^*	Effective units of labour for household with highest ability in South	100
δ	Disutility of labour	1.5
γ	Northern technological advantage parameter	1.2
θ	Northern welfare benefit replacement ratio	0.7
θ^*	Southern welfare benefit replacement ratio	0.7
g	Effective units of labour per household hired by the Northern government	10
g^*	Effective units of labour per household hired by the Southern government	10

Regarding the effective units of labour that households have at their disposal, we assume that the range is the same in both countries, and we set $b = b^* = 2$, and $c = c^* = 100$. Although this choice of parameters is arbitrary, it allows for a reasonable split of the population in both countries between labour market participation and non-participation, as well as between consumption of Northern, and Southern-produced varieties. In the same way, we set the disutility of labour, δ , to be equal to 1.5,

²¹ Equation (17) is redundant due to Walras' Law.

in both countries. The welfare benefit replacement ratio in both countries ($\theta = \theta^*$) is set at 0.7, ensuring that the after-tax income of non-participating households is enough to allow them to purchase at least the lowest quality variety ($Q > 1$). We set the effective units of labour per household hired by the government in both countries ($g = g^*$) to 10, thus ensuring that the income tax rates are close to 20 percent. The joint influence of these assumptions is to generate reasonable non-participation rates in both countries (1.1 percent in the North, and 2.3 percent in the South)²².

Parameter γ - which is a measure of how the North's technological superiority over the South varies at different quality levels – is set at 1.2.²³ In conjunction with the other parameters this implies that, under a free trade equilibrium, the Northern wage rate is about twice as large as the Southern one (i.e., $\omega = \frac{w}{w^*} = 2.04$).²⁴ Moreover, this parameterization produces a (long-run) trade elasticity (i.e. the response of trade flows to tariff changes) which, depending on the benchmark from which the change in tariffs is applied, varies between 2 and 5. These values for the trade elasticity are consistent with empirical estimates (see, e.g. Head and Mayer, 2014; Simonovska and Waugh, 2014; Fontagné, Guimbard and Orefice, 2022; Boehm, Levchenko and Pandalai-Nayar, 2023).²⁵

They also imply that (about) 43 percent of Northern households buy imported (i.e. South-produced) varieties²⁶, whereas the proportion of Southern households buying imported (North-produced) varieties will be just 11 percent. This is consistent with balanced trade since, first, the value of the higher quality varieties imported by Southern households is higher than the value of the lower quality varieties imported by the Northern households, and second, the South is more populous than the North.

In the final entry of Table 2 we show the resulting ratio of Northern to Southern GDP, i.e. our measure of relative economic power. In our model, GDP is just the product of the number of effective units of labour employed times the wage rate.²⁷ Thus, in the benchmark free trade equilibrium the two economies are almost equally sized.²⁸ As will become apparent later, the qualitative nature of our results does not depend on the relative size of the two countries as long as the North is not more than 10 times larger than the South.

Table 2: Benchmark Case Free Trade Equilibrium Values

e_d	e_d^*	e_p	e_p^*	t	t^*	ω	GDP/GDP^*
43.9264	89.6492	3.1217	4.3278	0.1965	0.1970	2.0395	1.0207

²² Since $e_p = 3.12$, and ability is uniformly distributed between 2 and 100, the proportion of non-participating households will be equal to $(3.12-2)/98$, or 1.1 percent.

²³ As we explain later, the above parameterizations imply an almost complete equilibrium pass-through from the tariff to the (relative) consumer prices of imported varieties in the North, which is consistent with recent empirical findings (see, e.g. Amiti et al., 2019; Fajgelbaum et al., 2020; Fajgelbaum and Khandelwal, 2022).

²⁴ In what follows we normalize by setting $w^* = 1$.

²⁵ Estimates of trade elasticities vary widely. According to Boehm, Levchenko and Pandalai-Nayar (2023), the conventional wisdom is that they are between 3 and 7. Their own estimates for the long-run elasticity range from 1.75 to 2.25.

²⁶ Since $e_d = 43.9$, the proportion of Northern households purchasing varieties produced in the South will be equal to 42.8 percent $(= (43.9-2)/98)$ – thus 57.2 percent of the Northern households will be buying locally produced varieties.

²⁷ Relative GDP is just the ratio of the effective units of labour supplied in the two countries times the relative wage rate.

²⁸ According to the World Bank data, in 2024 China's GDP was 36 percent smaller than US GDP if measured using the nominal exchange rate in constant 2015 US dollars, but in PPP terms China's GDP was 30 percent larger than US GDP.

4. Unilateral Tariffs

In this section we examine the effects of unilateral tariffs (imposed by either the North, or the South). Given the focus of the paper, the effects on household welfare are shown for households at different points in the ability (income) distribution.

In all Tables of this Section, the first line (denoted by A) depicts the free trade ($\tau = \tau^* = 0$) equilibrium outcomes, lines B and C show the effects of modest unilateral tariffs by either the North ($\tau = 0.05, \tau^* = 0$), or the South ($\tau = 0, \tau^* = 0.05$), and lines D and E depict the impact of larger unilateral tariffs (D: $\tau = 0.25, \tau^* = 0$; E: $\tau = 0, \tau^* = 0.25$).

4.1 Northern Tariff

4.1.1 North and South are of Similar Size ($h = 0.5$)

We start by examining the effects of a unilateral tariff of 5 percent by the North.

Table 3
Unilateral Tariffs ($h=0.5$)
(a) Effects on Equilibrium Values
(b) Percentage Deviations of Household Utility from the Free Trade Equilibrium Level

The tariff imposed by the North has the expected effect on its demand for imports, since e_d is reduced from 43.92 to 35.36. This implies a reduction in the share of Northern households purchasing the Southern produced varieties (from (about) 43 percent under free trade to 34 percent (= $(35.36 - 2)/98$).²⁹ But it also acts, in accordance with Lerner's (1936) symmetry theorem, as a tax on Northern exports since the proportion of Southern households buying the Northern produced varieties is reduced by about 5 percentage points. This occurs due to the general equilibrium nature of the model; the initial expansion of demand for Northern produced varieties in the home market leads to a rise in the Northern (relative) wage rate, thus increasing the relative price of Northern exports.

The tariff impacts also on the decision to participate by the low ability, and low income, Northern households - since these are the households that purchase the imported low-quality variety. The partial equilibrium effect of the tariff on the decision to participate is negative (see, equation (13)). However, the general equilibrium effects could, in principle, undo the negative effect on participation since there is a rise in the (relative) wage in the North, as well as the reduction in the income tax rate made possible by the tariff revenue. The results of Table 3a indicate that the joint influence of these variables is small (i.e. the relative wage in the North rises by less than 1 percent, while the income tax rate drops by 1 percentage point), thus resulting in a small decline in labour market participation in the North (by 0.1 percentage points). In contrast, the participation rate in the South remains intact

²⁹ We note that these results imply an almost complete (long-run) equilibrium pass-through from the tariff to the (relative) consumer prices of imported varieties in the North. This obtains since the drop in the relative wage in the South, and thus, in exporter prices, is 0.8 percent, thus the 5 percent tariff increases consumer prices by 4.2 percent. This is close to the (short run) estimated impact of the first Trump administration tariffs on consumer prices of imported goods (see, Amiti et al., 2019; Fajgelbaum et al., 2020; Fajgelbaum and Khandelwal, 2022).

since the low-income Southern households are not impacted by the Northern tariff, while the Southern income tax rate remains the same.

The joint influence of the changes above is to increase North's relative GDP by 0.8 percentage points relative to free trade (from 1.021 to 1.029), since despite the fall of the participation rate in the North, its relative wage rate increases. In other words, the Northern tariff improves the North's terms of trade.

The results reported above on relative economic power remain qualitatively similar if the Northern tariff rate is raised to 25 percent (Table 3, line D) – i.e. North's relative GDP increases further by another percentage point. The further rise in Northern relative GDP is again based on the larger rise of the Northern relative wage rate, which offsets the further fall of the participation rate in the North. Nevertheless, the absolute level of Northern GDP drops further in this case, since the participation rate declines more, while South's GDP remains intact since its participation rate does not change. Thus, the Northern tariff is akin to a Pyrrhic victory; its relative GDP rises but its absolute GDP declines.

But how does this small rise in North's relative economic power affect its households?

Impact on Northern Households

Table 3b indicates that the impact on household welfare is uneven.

Low-income households who continue to purchase the imported varieties suffer a drop in their utility since they must pay a higher price for the imported varieties, thus forcing them to buy lower quality varieties than before. By contrast, high-income households who continue to buy the locally produced varieties (i.e. those with ability higher than 43.92) and thus are not affected by the rise in consumer prices that the tariff entails, gain due to the decline in the income tax rate. Moreover, the drop in utility for the low-income households can be higher than 3 percent, whereas the rise in utility for the high-income households will be about 1 percent.

Northern households that switch from consuming the imported varieties to consuming the locally produced varieties (i.e. for households with ability levels between 35.36 and 43.92), will experience a small decline in utility, e.g. for the household with ability index equal to 40, the drop in utility will be 0.4 percent, as the tariff induces them to switch to the higher cost locally produced varieties.

The above results indicate that the Northern tariff has a regressive effect on the distribution of household welfare in the North - even after accounting for the reduction in income tax rates that the tariff revenue can allow for. Nevertheless, the tariff would be beneficial for the majority of the population in the North, since 57 ($= (100-43.92)/98$) percent of the population (i.e. those with ability higher than 43.92) will benefit from it.

Table 3b shows that if the North raises its tariff further to 25 percent, then *all* Northern households will be worse off relative to the 5 percent rate. The drop in utility will be particularly onerous for the low-to-medium-ability households. Indeed, by comparing lines B and D of Table 3b, we see that the decline in utility is larger with the 25 percent tariff than with the smaller tariff, e.g. households with ability equal to 3.5 suffer extra losses of 19.6 ($=23.28-3.67$) percent as the tariff rate is increased. This is mostly because these households are consuming imported varieties, whose consumer prices increase further with the higher tariff; the rise in the Northern relative wage rate is not enough to reverse the effect of the higher tariff on consumer prices.

For the rest of the Northern households, the decline in utility (relative to the 5 percent tariff) will be smaller (about 0.3 percent), and it will be entirely due to the rise in the income tax rate. This is the result of two forces: first, the reduction in the tax base on which the tariff is applied as imports decline far more with the larger tariff, and second, the larger reduction in the participation rate due to the higher tariff, which implies higher welfare payments and a smaller base on which the income tax is applied. The decline in tariff revenue is a manifestation of a “Laffer curve” type phenomenon, and it suggests that high unilateral tariff rates imposed by the North are unlikely to generate sufficient revenue to finance reductions in income tax rates.³⁰

We conclude that *all* Northern households will become worse off as a result of a unilateral Northern tariff hike from 5 to 25 percent.

Impact on Southern Households

The impact of the Northern tariff on the welfare of Southern households is also uneven, but different than the impact on Northern households. Starting with the 5 percent Northern tariff (Table 3b, line B), for Southern households, which, both before and after the Northern tariff, continue to consume the locally produced variety (i.e. for those with ability index up to 89.64, which is almost 90% of the Southern households), welfare will remain the same. This is expected, given that their after-tax real income remains unchanged. Southern households that continue to consume the imported (Northern produced) variety even after the policy change (i.e. for those with ability index higher than 93.95, welfare will decline (by about 1 percent) since the price of the Northern varieties will increase relative to their after-tax income due to the rise in the Northern relative wage rate. For the Southern households that switch from consuming the imported (Northern produced) varieties to consuming the locally produced varieties (i.e. for households with ability levels between 89.64 and 93.95), there will be a small decline in utility (less than 0.1 percent).

As expected, no Southern household gains if the North raises its tariff rate to 25 percent (line D). Although most Southern households will not be impacted, there will be some small extra losses incurred by households that switch from imported to locally produced varieties (e.g. for the household with ability index equal to 99 the extra decline in utility will be 0.9 percent), as well as for the few high-income households that continue to buy the imported varieties due to the further fall in the Southern relative wage rate.

A summary of our results thus far regarding the effects of increasing the unilateral Northern tariff from 5 to 25 percent is that it harms all Northern households, as well as the highest-income Southern households, without providing any benefits to any other household.

The larger Northern tariff impacts more positively on Northern relative economic power, despite the larger fall in the Northern participation rate, due to the larger increase in the Northern relative wage rate. If a policymaker is concerned only about relative economic power, he/she may consider the more adverse effects of a rise in the *unilateral* tariff on the welfare of the less well-off to be of little importance to his/her pursuit of “national greatness”.

³⁰ Lashkaripour (2020) provides calculations regarding the maximum percentage of tax revenue that can be provided by tariffs.

How do the results stated above depend on the (initial) relative size of the two countries? In the following two subsections we vary the relative size of North, by varying the relative size of the population in the North.

4.1.2 North and South are of Unequal Size

Tables 4 and 5 portray the consequences from the imposition of tariffs for two cases. In the first case (Table 4), the North (South) is relatively large (small), with $h = 80$, and Northern GDP is 120 times larger than Southern GDP. In the second case (Table 5) the North (South) is relatively small (large), with its population being 1.25 percent of the South's ($h = 0.0125$), and Northern GDP being 2.6 percent of Southern GDP under free trade.

Table 4
Unilateral Tariffs ($h=80$)
(a) Effects on Equilibrium Values
(b) Percentage Deviations of Household Utility from the Free Trade Equilibrium Level

To be sure, when the size of the two countries differs as much as in the cases considered in this section, questions of relative economic power do not arise naturally in the form of Great Powers competition. However, the effects of trade policies on the other country's GDP may still be of interest if by its actions one of the countries can coerce, through the threat of economic damage imposed upon the other country, non-economic actions which the other country might not be willing to undertake otherwise.

When the North is small (Table 5), Northern tariffs (be they 5 or 25 percent) have a very small effect on relative economic power. In this case, the imposition of even a 25 percent tariff by the North hardly impacts on the relative size of Northern GDP.³¹ In contrast, when the North is relatively large and Northern GDP is 120 times Southern GDP under free trade, a 25 percent tariff by the North makes its GDP 150 times larger than the South's. Moreover, in this case the absolute level of Northern GDP will not decline. Thus -ceteris paribus- the larger is the North, the larger is the positive impact of its tariff on its relative economic power. Moreover, the larger is the tariff by the North, the larger is the rise in its relative GDP.

Table 5
Unilateral Tariffs ($h=0.0125$)
(a) Effects on Equilibrium Values
(b) Percentage Deviations of Household Utility from the Free Trade Equilibrium Level

The explanation for this result hinges on movements in relative wages. When the North is large, Southern exports constitute a large share of Southern GDP. A unilateral Northern tariff induces a sharp decline in the relative demand for Southern labour, which in turn depresses the Southern

³¹ The level of Northern GDP declines as employment declines due to the fall in the participation rate.

relative wage and raises the North's relative GDP. The increase in Northern GDP is further supported by a rise in labour market participation, as the increase in the North's relative wage offsets the tariff's otherwise negative effect on participation.

Impact on Northern Households

Relative size impacts also on the distributional consequences of tariffs. Thus, when the relative size of the North is at par with the South (i.e. $h = 0.5$ - our benchmark case), or smaller, the household with ability index equal to 40 experiences a decline in utility after the imposition of a Northern tariff (relative to free trade). In contrast, when Northern relative GDP is significantly higher (Table 4), then the same-ability household would be better off with the tariff (irrespective of whether the tariff is 5 or 25 percent). This result follows from the fact that when the relative size of the North is large, the proportion of Northern households purchasing Southern-produced varieties is smaller, thus more Northern households would not be affected by the rise in (consumer) prices that the tariff brings about but would be better-off due to the decline in the income tax rate that the tariff revenue facilitates.

The size of the Northern tariff impacts differentially on Northern households when the North is large (Table 4b). Whereas low-ability households benefit from a 5 percent tariff, when the tariff is 25 percent, they suffer utility losses (e.g. the household with ability index equal to 3.5 gains 0.2 percent with the 5 percent tariff and loses 0.3 percent with the larger tariff -). In contrast, high-ability households gain more from the 25 percent tariff (e.g. the household with ability index equal to 90 gains 0.07 with the lower tariff, and 0.31 with the larger tariff).

We thus conclude that when the North is relatively large, *all* Northern households gain from the imposition of a small Northern tariff - a result which may be considered as akin to traditional trade theory. If the tariff is raised to 25 percent, most Northern households would benefit further. However, the low-ability households that purchase the imported varieties will be harmed by the tariff hike from 5 to 25 percent - for these households their utility will drop below than under free trade if the larger tariff is applied.

When the North is relatively small (Table 5), the majority of Northern households *benefit* from the 5 percent tariff rate (relative to free trade) due to the reduction in the income tax rate that the tariff revenue facilitates (Table 5). However, low-to-medium-ability households - the ones consuming the imported varieties - are harmed. If the Northern tariff is raised further to 25 percent, *all* Northern households become worse off (relative to the 5 percent tariff, and relative to free trade), and the further losses are particularly large (up to 20 percent relative to the lower tariff) for the low-to-medium-ability households which will be burdened with the higher tariff rate. The loss for the high-ability households will be again due to the decline in the tariff revenue, and the concomitant rise in the income tax rate, because of the large drop in imports and in the participation rate.

Impact on Southern Households

When the North is large, the majority of Southern households will lose more from the imposition of the Northern tariff than in the case the two countries were of similar size (Table 4b). This is because when the North is large, the proportion of Southern households purchasing Northern varieties is larger. Thus, the decrease in the Southern relative wage rate - brought about by the Northern tariff - affects a larger proportion of Southern households. Moreover, the larger is the Northern tariff, the larger are the losses for the vast majority of Southern households due, not only, to the higher tariff

but also to the larger fall in the Southern relative wage rate; e.g. the utility loss for the household with ability index equal to 60 is 5.3 percent with the smaller tariff, and 20.7 percent with the 25 percent tariff -see lines B and D of Table 4b).

When the North is small (Table 5), the imposition of the Northern tariff (be it 5 or 25 percent) has no impact on almost all (99.7 percent) of Southern households since they continue to consume Southern varieties and the income tax rate does not change as the volume of imports and tariff revenue are very small. The only Southern households that stand to lose from the trade war are the very high-ability households (i.e. the top 0.3 percent) that either switch to domestically produced varieties, or continue to buy Northern varieties, mainly due to the tariff-induced rise in consumer prices.³²

4.2 Southern tariff

4.2.1 North and South are of Similar Size ($h = 0.5$)

A unilateral 5 percent tariff by the South has significantly higher impact on relative economic power than the same tariff by the North; if the South imposes the tariff its relative GDP increases by 4.3 percentage points, whereas if the North imposes the same tariff its relative GDP increases by just 0.8 points. This differential response to tariffs, despite the similar size of the two economies, is due to the differential impact of the tariffs on participation rates and relative wage rates.

Unlike the (unilateral) Northern tariff, which reduces the Northern participation rate while leaving the Southern participation rate intact, the Southern tariff reduces the Northern participation rate by more, and it *increases* the Southern participation rate. The main reason for the differential (i.e. non-symmetric) response of the participation rates is that Northern imports are consumed by low-income households, whereas Southern imports are consumed by high-income households. Since the participation decision concerns low-income households in both countries, it follows that Northern tariffs directly affect (negatively) participation decisions in the North, whereas Southern tariffs do not directly impact participation decisions in the South.

Northern tariffs raise the Northern relative wage, whereas Southern tariffs have the opposite effect. Moreover, the impact on relative wage rates from Southern tariffs is larger than from Northern tariffs.³³ The reason for the larger impact of Southern tariffs on the relative wage rate is that -ceteris paribus- a Southern tariff increases labour demand in the South for (some of) the high-quality varieties which were previously imported from the North; in contrast, a Northern tariff increases labour demand in the North for (some of) the low (or, medium) quality varieties which were previously imported from the South. Since each unit of a high-quality variety requires more labour to be produced than each unit of a low-quality variety, the direct effect on Southern labour demand from a Southern tariff will be larger than the direct effect on Northern labour demand from a Northern tariff; as a result, the rise in the relative demand for Southern labour with the Southern tariff will be larger than the rise in the relative demand for Northern labour with the Northern tariff - thus the adjustment of the relative wage rate will be higher in the former case than in the latter. If the South implements the larger (25 percent) tariff, the qualitative nature of the effects regarding relative economic power stated above remain intact, but their strength intensifies.

³² In this case the relative wage rate remains largely intact.

³³ A Northern tariff of 5 percent increases North's relative wage rate by 1.6 percentage points (relative to free trade), while the same Southern tariff reduces North's relative wage rate by 8.4 percentage points.

Impact on Southern Households

Much like the Northern tariff, the effects of the Southern tariff on Southern households are differentiated according to household ability. Starting with the 5 percent tariff, we find that it has no effect on the welfare of non-participating households in the South, it increases utility (by about 0.5 to 0.6 percent) for participating households that continue to consume the locally produced variety (and, are thus not burdened with the tariff), and it decreases utility (by about 0.1 percent) for the highest-ability Southern households that continue to consume the imported (Northern produced) variety (Table 3b, line C).

If the South implements the higher (25 percent) tariff, the qualitative nature of the effects on Southern households described in the previous paragraph continues to hold, but the gains become slightly smaller and the losses slightly larger (Table 4b, line E). The reason the gains are smaller for households that continue to consume the locally produced variety —and are therefore not directly affected by the tariff — is that tariff revenue declines as the tariff rate increases, thereby permitting only a smaller reduction in the income tax rate.

We note that unlike the effect of the Northern tariff on Northern households, the effect of the Southern tariff on Southern households is not regressive since it is the high-income households in the South that consume the tariff-burdened imported varieties, whereas the vast majority (about 85 percent) of the households gain from the reduction in the income tax rate that the tariff revenue can allow for.

However, it remains true that, as with the case of the effect of Northern tariffs on Northern households, the rise in the Southern tariff rate from 5 to 25 percent will harm the majority of Southern households while benefitting none of them.

Impact on Northern Households

The Southern tariff has a detrimental effect on *all* Northern households. It does so because it reduces the Northern relative wage rate, thus decreasing the purchasing power of Northern low-ability households which consume imported low-quality varieties. This also induces some households to stop participating, which in turn necessitates through the government budget constraint a rise in the income tax rate, thereby hurting and the rest of the Northern households who consume the locally produced varieties. However, the losses for the medium-to-high ability households that are buyers of Northern varieties are far smaller since they are not affected by the reduction in the Northern relative wage rate.

Considering a much higher Southern tariff rate ($\tau^* = 0.25$), leaves the qualitative nature of the results stated above unchanged, but makes the losses larger, especially for the low-income households which face not only a higher tariff rate but also a larger reduction in their relative wage rate.

4.2.2 North and South are of Unequal Size

The effects of (unilateral) Southern tariffs on relative economic power are not differentiated by the relative size of the two countries. For example, even when the South is either very small ($h = 80$), or very large ($h = 0.0125$), a Southern tariff of (either 5, or 25, percent) succeeds in increasing South's relative GDP.

We note that not only does the South's relative GDP increase when the South is small compared to the North (Table 4a), but its absolute GDP rises as well, as its participation rate increases. The rise in South's participation rate is due to the fall in the Southern income tax rate which is facilitated by the rise in tariff revenue. Thus, unlike the negative impact of the Northern tariff on the Northern participation rate when the North is small, there is a positive impact of the Southern tariff on the Southern participation rate when the South is small. The ability of the small country to affect its relative (and absolute) GDP and prices is due to the existence of national technology differentiation and general equilibrium linkages; in such cases even a small country can gain unilaterally from substituting part of its income tax revenue with trade taxes (see, Alvarez and Lucas, 2007).³⁴

Impact on Southern Households

In the benchmark case, more than 90 percent of the Southern households either gain from the imposition of the tariff or do not suffer a loss in utility (the latter are the non-participating ones), while almost 10 percent of the top ability households lose.

When the South is large (Table 5), the vast majority of Southern households experiences no welfare decrease after the Southern tariff- they either receive the same utility (these are the lowest ability households who do not participate) or they gain (these are the households with ability greater than 4.33).³⁵ Moreover, the changes in utility are similar independently of whether the applied tariff rate is 5 or 25 percent.

When the South is small (Table 4), most Southern households experience very small losses (0.02 percent) from the Southern tariff (i.e. those with ability greater than 17.94).³⁶ However, these losses become substantial when the applied rate is 25 percent, e.g. for the household in the middle of the ability distribution the utility loss is 2.4 percent (relative to free trade).

The difference in outcomes as a function of economic size is generated by the implications of relative economic size on the proportion of Southern households purchasing imported varieties. When the North is large (i.e. the South is small), most Southern households (almost 85 percent under free trade) are purchasing imported varieties.³⁷ This implies that most households will be burdened by the rise in consumer prices due to the tariff. Moreover, the rise in the Southern relative wage rate will be small in this case (by about 0.2 percent), thus failing to reverse the effects of the tariff on the consumer prices of imported varieties.³⁸

Impact on Northern Households

When the North is large (Table 4) the impact of a 5 percent Southern tariff on Northern households is very small, and it affects only the lowest ability households (the ones with ability index below 9.42) which continue to purchase the imported varieties. When the larger tariff is applied, the drop in

³⁴ Gross (1987) and Helpman and Krugman (1989) have also made a similar point in imperfectly competitive settings.

³⁵ Only the top 0.3 percent of households who buy the Northern produced (i.e. imported) varieties lose.

³⁶ The non-participating households maintain their free trade utility level.

³⁷ This is an implication of trade balance equilibrium; the small country has to spend a larger share of domestic income to imports to balance its trade with the large country.

³⁸ The Southern tax rate drops as well, but its effect on household disposable income is not strong enough to reverse the effect of the tariff.

utility for the same group of households becomes substantial, i.e. their utility loss is 1.37 percent, caused by the larger drop in the Northern relative wage rate.

When the North is small (Table 5), the impact of Southern tariffs is far more pronounced, i.e. *all* Northern households are negatively affected, with the low-to-medium ability ones suffering more substantial losses. This outcome arises because these households consume imported varieties, the prices of which increase in response to the substantial rise in the Southern relative wage rate. Unsurprisingly, the losses for Northern households are significantly larger under the 25 percent Southern tariff, as the corresponding decline in the Northern relative wage rate is more pronounced. Higher-ability Northern households also experience modest utility losses, primarily due to the increase in the income tax rate resulting from the reduced labour market participation in the North.

5. Trade Wars

In the previous section we examined the effects of unilateral tariffs. Would either the North, or the South, be willing to retaliate if the other country decided to hike its tariff from 5 to 25 percent? In what follows, unless otherwise stated, the comparisons are made with the pre-Trump 2.0 status quo (i.e. 5 percent reciprocal tariffs).

5.1 North and South are of Similar Size ($h = 0.5$)

Table 6 below shows that if the policymaker is concerned with relative economic power, the answer is clear for both countries: in response to a tariff hike by the other country, the country can improve its relative economic power by retaliating.

Table 6
Tariff War ($h=0.5$)
(a) Effects on Equilibrium Values
(b) Percentage Deviations of Household Utility from the Free Trade Equilibrium Level

However, the benefits of retaliation vary significantly between the North and the South. For example, if the North hikes its tariff to 25 percent, its relative GDP increases by 0.5 percentage points (from 0.984 to 0.989). If the South retaliates by imposing the same tariff, North's relative GDP falls by 17 percentage points (from 0.989 to 0.831). In contrast, if the South first hikes its tariff, North's relative GDP falls by 15 percentage points. If the North retaliates by imposing the same tariff, North's relative GDP hardly rises, i.e. it rises by a mere 0.035 percentage points (from 0.83081 to 0.83116).

The above imply that a trade war will be harmful (beneficial) to North's (South's) relative economic power. Moreover, the damage to North's relative economic standing will be substantial since a trade war involving 25 percent tariff rates will decrease North's relative GDP from being 2 percent smaller than South's, to being 17 percent smaller. We note that the conclusion above holds also if the trade war involves smaller increases in reciprocal tariff rates. For example, if the tariff rates involved were 10 percent (instead of 25 percent), South's GDP would become 6 percent larger than North's.

It bears noting that the tariff war induced changes in relative GDP arise from two sources. The first source is due to the fundamental asymmetry in the effects of tariffs on the participation rates in the

two countries: Northern tariffs raise the cost of living for the lowest ability Northern workers who consume the low quality Southern varieties, thus inducing increases in *non*-participation; in contrast, Southern tariffs do not raise the cost of living for the lowest ability types Southern households since they do not consume the high quality varieties produced in the North. Thus, *ceteris paribus*, we expect the participation rate in the North to fall relative to the Southern participation rate.³⁹ The second, and quantitatively much more important, factor behind the decline in North's relative GDP is the increase in the relative Southern wage rate induced by the reciprocal tariff hike. As explained in Section 4.2.1, a reciprocal tariff increase raises the relative demand for Southern labour. Indeed, our results show that the decline in the Northern relative wage rate accounts for almost the entire 15-percentage-point drop in North's relative GDP.

Impact on Northern Households

Trade wars have also implications for the intra-country distribution of utility among households. In what follows, unless otherwise stated, the comparisons will be made between the pre-Trump 2.0 situation to a tariff war involving 25 percent reciprocal tariff rates.

Relative to the pre-Trump 2.0 situation (line F), the tariff war (line I) harms *all* Northern households. It induces large reductions in utility for the low-income Northern households, which reach up to 30 percent for households with ability index equal to 3.5; these are the households that not only have to shoulder the price increases that the tariff hike brings, but also to face the decrease in their purchasing power that their new non-employment status and the reduction in the Northern relative wage implies.⁴⁰ We note that even moderately low-income households (e.g. those with ability index 15) will be significantly impacted by the trade war, registering utility decreases of 12 percent. For the rest of the Northern households, the utility losses will be smaller – up to 0.8 percent.

We note that percentage of Northern households that benefit from the pre-Trump 2.0 situation relative to free trade is close to 57 percent ($= (100-43.92)/98$), since these households continue to purchase domestic varieties both before and after the trade war and are thus influenced only by the reduction in the income tax rate. What is the reason that the shift to the trade war induces losses for all Northern households? The explanation for this rests on the influence of the tariff rate on tariff revenue, since it is the latter that allows for a reduction in the income tax rate and thus on household utility. Table 6 indicates that tariff revenues are equal to 0.61 percent of (Northern) GDP when the common tariff rate is 5 percent, but only 0.05 percent of GDP if the common tariff rate is 25 percent. Thus, the pre-Trump 2.0 situation allows for a smaller income tax rate and higher after-tax incomes and utility.

What if the trade war involved smaller increases in tariff rates? Figures 1a-1c depict (for three ability levels) the percentage reductions in household utility levels relative to the pre-Trump 2.0 utility benchmark for trade wars involving either 10, 15 or 25 percent reciprocal tariff rates. Thus, for the Northern household with ability index equal to 15 (Figure 1a), the percentage decline in its utility if the common tariff rate is raised from 5 to 10 percent will be equal to 8.2 percent, with the decline in its utility rising to 11.8 percent if the tariff rates are 15 percent, and to 12.1 percent if the tariff rate is raised to 25 percent. This escalation in utility losses for the households as the tariff war intensifies holds also for the larger ability households (Figures 1b and 1c). We conclude that the “larger” is the

³⁹ The equilibrium effect on participation rates will also be determined by the changes in the income tax rates.

⁴⁰ The Northern relative wage rate drops from 1.97 to 1.66.

tariff war, the larger will be the losses suffered by all Northern households; moreover, the losses will be substantially larger for the lower-income households.

Figures 1a-c HERE

Would Northern households be in favour of Northern retaliation if the South hiked its tariff rate from 5 to 25 percent? Comparing lines H and I, we see that all Northern households would be worse off if the North retaliated. The drop in utility would be large for the lowest ability households (up to 11 percent), but for the majority of the households the utility loss would be small (less than 0.1 percent). We note that the same results are obtained if retaliation is partial, i.e. the Northern tariff rate is raised to less than 25 percent.

Impact on Southern Households

The impact of the trade war will also be detrimental (relative to pre-Trump 2.0) to almost all⁴¹ Southern households, although the losses will be far smaller than for the Northern households - up to 0.8 percent for the highest ability Southern households. The reason for the far smaller losses of the Southern households is the substantial rise (fall) in the Southern (Northern) relative wage rate⁴², which offsets most of the rise in consumer prices that the large tariff would otherwise entail.

Figures 1a-c show that, as in the case of Northern households, if the trade war involved smaller increases in tariff rates, the utility losses for Southern households (relative to the pre-Trump 2.0 benchmark) would have been smaller. Thus, the percentage decline in utility for the Southern household with the ability index equal to 15 will be 0.11 percent if the tariff rates are raised to 10 percent, 0.23 percent if the tariff rates are raised to 15 percent, and 0.35 percent if they are raised to 25 percent. We note that unlike Northern households, there are no substantial differences in utility losses across the income distribution among Southern households (e.g. when the tariff rates are 25 percent, the utility loss for households with ability index 15 is only 0.07 percentage points larger than for households with ability index 90 in the South, whereas the same difference is 11.35 percentage points in the North).

Southern households would be almost indifferent to retaliation if the North hiked its tariff rate from 5 to 25 percent. Comparing lines G and I, we see that no Southern household would lose more than 0.02 percent. The same results are obtained if retaliation is partial, i.e. the Southern tariff rate is raised to less than 25 percent.

Summary

We found that the shift from the pre-Trump 2.0 world trading system of moderate reciprocal tariffs to a 25 percent tariffs trade war will generate losses for almost all households in both countries, without benefitting any household. Moreover, the losses for Northern households will be substantially larger than for the Southern households. Combining these results with the beneficial consequences that a trade war will have for Southern relative economic power, we conclude that from a political economic perspective the South will not be particularly hesitant to retaliate in the case of a tariff hike initiated by the North.

⁴¹ Utility will be the same for the non-participating households.

⁴² The Southern relative wage rate rises from 0.51 ($=1/1.97$) under the pre-Trump 2.0 situation to 0.60 with the trade war.

5.2 North and South are of Unequal Size

If the North is very large (Table 7), the tariff war will increase its relative economic power, and more so if the tariffs involved are 25 percent. If the North is very small (Table 8), the trade war will reduce its relative economic power in comparison with the free trade outcome, and more so if the tariffs involved are 25 percent. These results are reminiscent of the terms of trade argument of traditional trade theory.

Impact on Northern Households

The distributional implications of trade wars depend also on country size.

If the North is large (Table 7), all Northern households gain by moving from free trade to the pre-Trump 2.0 situation.⁴³ The reason that even low-ability Northern households benefit from these moderate reciprocal tariffs is that it leads to a rise in the Northern relative wage by 5.1 percent and a reduction in the income tax rate, which offset the rise in consumer prices of the imported varieties due to the tariff. However, if the countries shift to the trade war all Northern households will lose (relative to pre-Trump 2.0) as the rise in their relative wage rate will not be enough to reverse the rise in the income tax rate (due to the drop in the tariff revenue) and the rise in consumer prices due to the large tariff.⁴⁴

Table 7

Tariff War ($h=80$)

(a) Effects on Equilibrium Values

(b) Percentage Deviations of Household Utility from the Free Trade Equilibrium Level

Table 8

Tariff War ($h=0.0125$)

(a) Effects on Equilibrium Values

(b) Percentage Deviations of Household Utility from the Free Trade Equilibrium Level

If the North is small (Table 8), moderate reciprocal tariffs of 5 percent will benefit the majority of the population (relative to free trade); indeed, as we discuss in the following section, this will be true for *both* countries. This surprising outcome rests on the fact that in the initial free-trade equilibrium the majority of the population in both countries was purchasing domestically produced varieties. As explained above, due to the large difference in the size of the two countries the vast majority (i.e. more than 99 percent) of Southern households buy both before, and after, the imposition of moderate reciprocal tariffs domestically produced varieties – thus, these households can benefit from the reduction in the income tax rate induced by the extra tariff revenue. The same is true to a lesser extent for the middle-to-high ability Northern households (about 53 percent of them) that both before, and after, are purchasing Northern varieties, which can also benefit from the induced income tax cuts. We note that for the significant share of low-to-middle ability Northern households that buy Southern produced varieties the modest reciprocal tariffs are onerous since not only are they burdened with the tariff but must also face the increased cost of Southern varieties due to the fall in the Northern relative

⁴³ However, the gains are smaller than 0.1 percent.

⁴⁴ Again, the losses will be substantial for the lowest-ability households (up to 10 percent relative to the pre-Trump 2.0 situation), and less than 0.1 percent for the majority of the Northern households.

wage. For example, for the Northern household with ability equal to 15, the proportional drop in utility is 8 percent when the tariff imposed is only 5 percent. In contrast the gain in utility for the medium-to-high ability households that gain from the modest reciprocal tariffs is under 1 percent.

When we move from the pre-Trump 2.0 situation to the trade war, we again find that all Northern households suffer utility losses from it. As Table 8b reveals, the extra utility drop will be particularly onerous for the lowest ability Northern households, whose *extra* utility losses can reach up to 30 percent.

The conclusion reached in the previous paragraphs stands still. Escalation from moderate reciprocal tariffs of 5 percent to a trade war involving 25 percent tariffs generates losses for *all* Northern households which can be as high as 30 percent for the low-ability ones.

Impact on Southern Households

When the North is large (Table 7), the majority of the population in the South loses from a shift away from free trade, irrespective of the size of the tariffs involved. As noted earlier, this is a direct implication of the fact that in the small country the majority of the population under free trade purchases imported varieties – thus the majority of the population is impacted by the rise in consumer prices resulting not only from the tariff, but also from the decline in South’s relative wage.⁴⁵ The decline in utility for these households can be sizable; about 5 percent on average when the reciprocal tariff is 5 percent, and can reach up to 25 percent when the trade war involves tariffs of 25 percent. Thus, yet again, escalation from modest reciprocal tariffs to a trade war harms most Southern households without benefiting any of them.

When the North is small (Table 8), reciprocal tariffs (be they 5 or 25 percent) will increase South’s relative wage rate relative to the free trade outcome. As a result, no Southern household will suffer a utility loss, and there will be small gains in utility (at most 0.01 percent) for all but the lowest ability households when the reciprocal tariff is 5 percent. However, these gains become extinct as tariffs escalate to 25 percent. Thus, escalation from modest reciprocal tariffs to a trade war harms most Southern households without benefiting any of them; nevertheless, the harm suffered is very small (up to 0.01 percent).

Taking all things together, the analysis of this section suggests that a Northern policymaker that cares either about (relative) national economic power, or about the welfare of the majority of the country’s population – including the less-well off - should not be willing to instigate a trade war. Conversely, a Southern policymaker that either prioritizes national economic power, or does not mind if a minority of the better-off households becomes worse off, would not be frightened by the prospect of a trade war.

6. Sensitivity Analysis

In this section we examine to what extent the main results presented in the previous two sections depend on the specific parameter values adopted. Following extensive experimentation we concluded that the most impactful parameter is the one measuring the extent to which the North’s technological superiority over the South expands as quality increases (parameter γ).

⁴⁵ The income tax rate drops as well, but its decrease is not enough to prevent the decline in utility.

One of the main results of the previous sections is that if the North and the South are of similar size, a trade war is detrimental to North's relative economic power. Does this result continue to hold as parameter γ varies?

Focusing on the case that the North and the South are comparable in terms of economic size, Tables 9 (for which $\gamma = 1.15$) and 10 (for which $\gamma = 1.3$) reveal that that this conclusion remains intact as parameter γ varies: as the situation moves from free trade to modest tariffs, to a trade war, South's relative economic power expands. The main mechanism for this result continues to hold, and it is the asymmetrical response of the participation rate in the two countries, as it increases in the South, and it decreases in the North.

Table 9
Tariff War ($h=0.5$, $\gamma=1.15$)
(a) Effects on Equilibrium Values
(b) Percentage Deviations of Household Utility from the Free Trade Equilibrium Level

Table 10
Tariff War ($h=0.5$, $\gamma=1.3$)
(a) Effects on Equilibrium Values
(b) Percentage Deviations of Household Utility from the Free Trade Equilibrium Level

The results remain similar as well regarding the benefits of a unilateral hike in tariffs (from 5 to 25 percent) for relative economic power, i.e. both countries can increase their relative economic power if they place a tariff irrespective of the value of γ . This obtains not only for the South, but for the North as well despite the fall in North's participation rate as a result of its tariff since the Northern (Southern) relative wage rate increases as a result of the unilateral Northern (Southern) tariff.

Retaliation to the other country's tariff continues to be the best response as far as relative economic power is concerned for the South, and this holds for both tariff rates examined. For the North, retaliation in response to a tariff hike by the South does not result in higher relative GDP (lines H and I in Table 9a) if the North's comparative advantage does not increase very fast as quality increases (i.e. when $\gamma=1.15$). An implication of this finding is that as the South erodes the North's comparative advantage in high quality varieties, it will not be in North's interest (in both absolute and relative terms) to retaliate against Southern tariff hikes.

We now examine whether the conclusions of the previous sections continue to hold regarding the distribution of economic welfare across households.

Impact on Northern Households

Tables 9b and 10b reveal that the Northern (unilateral) tariff continues to have a regressive effect on the distribution of household welfare in the North, with the low-ability households suffering substantial utility losses, while the medium-to-high-ability households experience smaller gains. It

remains the case that the majority of Northern households benefit from the Northern tariff, and that the gains are smaller, and the losses larger, when the larger tariff rate is applied.

The Tables reveal also that the Southern (unilateral) tariff continues to have a detrimental effect on *all* Northern households, and it still holds that the higher Southern tariff rate makes the losses significantly larger.

The effects of trade wars remain also similar to the ones presented in Section 5, i.e. moving from pre-Trump 2.0 to the trade war harms *all* Northern households.

Impact on Southern Households

Tables 9b and 10b reveal that the highest ability Southern households (i.e. ability index equal to 99) continue to suffer welfare losses due to *any* type of trade intervention; they suffer losses independently of whether a unilateral tariff is imposed by the North or the South, and the same is true when both countries impose tariffs. Moreover, the losses for the highest ability households increase in the size of the tariffs involved.

The Tables reveal also that the majority of Southern households continue to benefit when the South unilaterally raises its tariff from 5 to 25 percent (lines F and H). However, the shift from the pre-Trump 2.0 situation to the trade war (line I) still benefits no Southern household while making most of them worse off.

7. Conclusion

We have constructed a North-South general equilibrium model in which trade is conducted in vertically differentiated products in which the North produces and exports high quality, high-cost varieties, while the South exports low-quality, low-cost varieties.

We find that if the North and the South are not too dissimilar in size, and countries care only about relative economic power, it pays for both countries to retaliate in response to a tariff hike by the other country. The effect of retaliation on relative GDP comes mainly from the positive effect that a country's tariff has on its relative wage rate (another manifestation of Lerner's symmetry theorem). The implication of this is that if countries predominantly care about their relative economic power, they will retaliate in response to the other country's tariff – thus a tariff war will commence.

The shift from the pre-Trump 2.0 situation of modest reciprocal tariffs to a tariff war involving reciprocal tariffs of 25 percent will result, if the two-countries are of similar size, in a 15 percentage points decline in the relative size of the North. Moreover, no household in either the North, or the South, will benefit from the trade war. However, the utility losses for Northern households will be far larger – especially for the low-income households which may suffer losses up to 30 percent. In contrast, the losses for the Southern households will be only up to 0.8 percent. In addition, we find that Southern households will suffer very small utility losses (up to 0.02 percent) if the South retaliates by hiking up its tariff to 25 percent in response to the Northern tariff hike.

The upshot of these findings is that the North should not expect that a similar sized South would not retaliate in the face of a unilateral tariff hike by the North; this is indeed what we have seen between April and September 2025 regarding the bilateral US-China tariff gyrations.

In our framework, North's ability to raise its relative economic power is restored if its economic size is much larger than South's. Moreover, in this case the utility losses to high-income Southern households from the tariff war will be very large (up to 20 percent), while the losses from retaliating to the Northern tariff hike remain substantial (up to 5 percent for the same group). Nevertheless, even in this case, the South can increase its relative economic power by retaliating (relative to non-retaliating to the increase in the Northern tariff) – but obviously at some welfare cost for its high-income households.⁴⁶

⁴⁶ To be sure, South's decision regarding retaliation will be influenced by explicit or implicit promises and threats related to non-economic issues (e.g. national security) which the large North can leverage to South's benefit or detriment.

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APPENDIX

TABLES AND FIGURES

TABLES

Table 3**Unilateral Tariffs ($h = 0.5$)****A** ($\tau = \tau^* = 0$) ; **B** ($\tau = 0.05, \tau^* = 0$) ; **C** ($\tau = 0, \tau^* = 0.05$) ; **D** ($\tau = 0.25, \tau^* = 0$) ; **E** ($\tau = 0, \tau^* = 0.25$)**(a)****Effects on Equilibrium Values**

	e_d	e_d^*	e_p	e_p^*	t	t^*	w / w^*	Y/y^*	I/Y	I^*/Y^*	T/Y	T^*/Y^*
A	43.92	89.64	3.12172	4.32782	19.65	19.70	2.03958	1.02071	30.91	15.79	0	0
B	35.36	93.95	3.1343	4.32782	18.68	19.70	2.0556	1.02871	20.23	9.43	0.96	0
C	35.75	93.27	3.17216	4.3009	19.65	19.19	1.95736	0.97950	20.43	10.52	0	0.50
D	15.52	99.25	3.36278	4.32782	18.90	19.70	2.07448	1.03801	3.76	1.19	0.75	0
E	15.66	98.75	3.39439	4.30637	19.66	19.30	1.65957	0.83037	3.80	1.99	0	0.39

(b)**Percentage Deviations of Household Utility from the Free Trade Equilibrium Level**

e	2.5		3.5		15		40		51		60		90		99	
	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
B	-3.35	0	-3.67	0	-2.67	0	-0.38	0	1.24	0	1.23	0	1.22	-0.06	1.22	-0.80
C	-3.37	0	-5.18	0	-3.76	0.64	-1.62	0.56	-0.002	0.55	-0.002	0.55	-0.002	0.47	-0.002	-0.14
D	-15.78	0	-23.28	0	-16.89	0	-0.66	0	0.96	0	0.95	0	0.94	-0.06	0.94	-1.70
E	-15.78	0	-24.29	0	-17.63	0.51	-1.63	0.45	-0.01	0.44	-0.01	0.44	-0.01	0.36	-0.01	-1.23

Table 4**Unilateral Tariffs (($h = 80$))**

A ($\tau = \tau^* = 0$) ; **B** ($\tau = 0.05, \tau^* = 0$) ; **C** ($\tau = 0, \tau^* = 0.05$) ; **D** ($\tau = 0.25, \tau^* = 0$) ; **E** ($\tau = 0, \tau^* = 0.25$)

(a)**Effects on Equilibrium Values**

	e_d	e_d^*	e_p	e_p^*	t	t^*	w / w^*	Y/Y^*	I/Y	I^*/Y^*	T/Y	T^*/Y^*
A	9.42	14.13	3.54872	4.32782	19.66	19.70	1.49918	120.008	1.27	78.84	0	0
B	9.54	19.24	3.54182	4.32782	19.60	19.70	1.57826	126.339	1.30	77.46	0.06	0
C	9.37	17.94	3.55058	4.12757	19.66	15.80	1.49743	119.848	1.25	81.62	0	3.88
D	9.24	52.88	3.54318	4.32782	19.42	19.70	1.86782	149.518	1.21	57.95	0.24	0
E	8.67	40.64	3.57533	3.60257	19.66	3.54	1.47449	117.961	1.04	80.62	0	16.12

(b)**Percentage Deviations of Household Utility from the Free Trade Equilibrium Level**

e	2.5		3.5		15		40		51		60		90		99	
	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
B	0.21	0	0.21	0	0.08	-1.20	0.08	-5.38	0.08	-5.30	0.08	-5.25	0.07	-5.17	0.07	-5.15
C	-0.09	0	-0.09	0	0	3.69	0	-0.02	0	-0.02	0	-0.02	0	-0.02	0	-0.02
D	-0.27	0	-0.27	0	0.34	-1.20	0.31	-17.1	0.31	-20.3	0.31	-20.7	0.31	-20.3	0.30	-20.3
E	-1.37	0	-1.37	0	-0.001	18.8	-0.001	-2.18	-0.001	-2.42	-0.001	-2.40	-0.001	-2.36	-0.001	-2.36

Table 5

Unilateral Tariffs ($h = 0.0125$)

A ($\tau = \tau^* = 0$) ; **B** ($\tau = 0.05, \tau^* = 0$) ; **C** ($\tau = 0, \tau^* = 0.05$) ; **D** ($\tau = 0.25, \tau^* = 0$) ; **E** ($\tau = 0, \tau^* = 0.25$)

(a)

Effects on Equilibrium Values

	e_d	e_d^*	e_p	e_p^*	t	t^*	w / w^*	Y/Y^*	I/Y	I^*/Y^*	T/Y	T^*/Y^*
A	47.99	99.70	3.10057	4.32782	19.64	19.70	2.07603	0.0259741	36.92	0.47	0	0
B	37.15	99.83	3.11796	4.32782	18.58	19.70	2.0765	0.0259797	22.37	0.26	1.06	0
C	37.64	99.81	3.15937	4.32706	19.65	19.68	1.97761	0.0247418	22.67	0.29	0	0.01
D	15.61	99.98	3.36064	4.32782	18.89	19.70	2.077	0.0259819	3.81	0.03	0.76	0
E	15.76	99.96	3.39262	4.32727	19.66	19.69	1.6616	0.020785	3.85	0.05	0	0.01

(b)

Percentage Deviations of Household Utility from the Free Trade Equilibrium Level

e	2.5		3.5		15		40		51		60		90		99	
	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
B	-3.96	0	-4.43	0	-3.23	0	-1.78	0	1.37	0	1.36	0	1.35	0	1.35	0
C	-3.96	0	-6.05	0	-4.42	0.01	-3.13	0.01	-0.003	0.01	-0.003	0.01	-0.003	0.01	-0.003	0.01
D	-16.93	0	-24.85	0	-18.15	0	-2.18	0	0.97	0	0.96	0	0.95	0	0.95	0
E	-16.93	0	-25.86	0	-18.88	0.01	-3.14	0.01	-0.01	0.01	-0.01	0.01	-0.01	0.01	-0.01	0.01

Table 6

Trade Wars ($h = 0.5$)

A ($\tau = \tau^* = 0$) ; **F** ($\tau = \tau^* = 0.05$) ; **J** ($\tau = \tau^* = 0.10$) ; **K** ($\tau = \tau^* = 0.15$) ; **I** ($\tau = \tau^* = 0.25$)

G ($\tau = 0.25, \tau^* = 0.05$), **H** ($\tau = 0.05, \tau^* = 0.25$) ; **L** ($\tau = 0.25, \tau^* = 0.15$) ; **M** ($\tau = 0.15, \tau^* = 0.25$)

(a)

Effects on Equilibrium Values

	e_d	e_d^*	e_p	e_p^*	t	t^*	w / w^*	Y/Y^*	I/Y	I^*/Y^*	T/Y	T^*/Y^*
A	43.92	89.64	3.12172	4.32782	19.65	19.70	2.03958	1.02071	30.91	15.79	0	0
F	28.45	96.15	3.2037	4.3122	19.03	19.41	1.96646	0.98404	12.99	6.09	0.61	0.29
J	18.26	98.60	3.3291	4.3168	19.18	19.50	1.8846	0.94301	5.26	2.25	0.48	0.20
K	11.82	99.49	3.4654	4.3220	19.39	19.59	1.805	0.90310	2.10	0.83	0.27	0.11
G	12.24	99.54	3.4463	4.3259	19.20	19.66	1.97680	0.98907	2.27	0.72	0.45	0.03
L	7.82	99.83	3.6013	4.3259	19.51	19.67	1.80576	0.9034	0.82	0.28	0.16	0.04
H	12.29	99.31	3.4611	4.3160	19.55	19.48	1.66052	0.83081	2.28	1.09	0.10	0.21
M	7.82	99.79	3.6039	4.3242	19.56	19.63	1.6613	0.83113	0.82	0.34	0.11	0.07
I	5.16	99.93	3.7485	4.32669	19.62	19.68	1.66155	0.83116	0.25	0.10	0.05	0.02

(b)

Percentage Deviations of Household Utility from the Free Trade Equilibrium Level

e	2.5		3.5		15		40		51		60		90		99	
	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
F	-6.86	0	-9.64	0	-6.99	0.37	-0.83	0.32	0.79	0.32	0.79	0.32	0.78	0.24	0.78	-0.89
J	-13.52	0	-20.15	0	-14.62	0.26	-1.02	0.23	0.61	0.23	0.60	0.23	0.60	0.15	0.60	-1.42
K	-19.61	0	-29.83	0	-18.00	0.14	-1.29	0.12	0.34	0.12	0.33	0.12	0.33	0.05	0.33	-1.59
G	-19.10	0	-28.82	0	-17.79	0.04	-1.06	0.04	0.57	0.04	0.57	0.04	0.56	-0.03	0.56	-1.67
L	-24.98	0	-24.98	0	-18.13	0.05	-1.44	0.04	0.19	0.04	0.19	0.04	0.18	-0.03	0.18	-1.67
H	-19.10	0	-29.26	0	-21.23	0.28	-1.50	0.25	0.12	0.24	0.12	0.24	0.12	0.17	0.12	-1.47
M	-24.98	0	-24.98	0	-18.20	0.09	-1.51	0.08	0.11	0.08	0.11	0.07	0.11	0.06	0.11	-1.63
I	-30.00	0	-39.79	0	-18.27	0.02	-1.59	0.02	0.03	0.02	0.03	0.02	0.03	-0.04	0.03	-1.68

Table 7**Trade Wars ($h = 80$)****A** ($\tau = \tau^* = 0$) ; **F** ($\tau = \tau^* = 0.05$) ; **G** ($\tau = 0.25, \tau^* = 0.05$) ; **H** ($\tau = 0.05, \tau^* = 0.25$) ; **I** ($\tau = \tau^* = 0.25$)**(a)****Effects on Equilibrium Values**

	e_d	e_d^*	e_p	e_p^*	t	t^*	w / w^*	Y/Y^*	I/Y	I^*/Y^*	T/Y	T^*/Y^*
A	9.42	14.13	3.54872	4.32782	19.66	19.70	1.49918	120.008	1.27	78.84	0	0
F	9.44	24.31	3.54535	4.13313	19.60	15.91	1.57482	126.043	1.27	79.24	0.06	3.77
G	8.54	62.53	3.5705	4.2018	19.46	17.29	1.83831	147.137	1.01	50.45	0.20	2.40
H	8.24	52.64	3.5897	3.7000	19.62	6.07	1.53266	122.622	0.93	67.98	0.04	13.59
I	4.91	90.92	3.7665	4.17722	19.63	16.80	1.6452	131.659	0.20	14.44	0.04	2.88

(b)**Percentage Deviations of Household Utility from the Free Trade Equilibrium Level**

e	2.5		3.5		15		40		51		60		90		99	
	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
F	0.03	0	0.03	0	0.08	3.55	0.07	-5.44	0.07	-5.36	0.07	-5.31	0.07	-5.22	0.07	-5.21
G	-1.59	0	-1.59	0	0.29	1.83	0.26	-14.9	0.26	-18.2	0.26	-20.4	0.26	-20.6	0.26	-20.6
H	-2.20	0	-2.20	0	0.06	15.8	0.06	-4.49	0.055	-8.45	0.055	-8.89	0.054	-8.74	0.054	-8.72
I	-10.2	0	-10.2	0	0.04	2.44	0.04	-14.4	0.04	-17.8	0.04	-19.9	0.04	-25.1	0.04	-25.1

Table 8

Trade Wars ($h = 0.0125$)

A ($\tau = \tau^* = 0$) ; **F** ($\tau = \tau^* = 0.05$) ; **G** ($\tau = 0.25, \tau^* = 0.05$); **H** ($\tau = 0.05, \tau^* = 0.25$) ; **I** ($\tau = \tau^* = 0.25$)

(a)

Effects on Equilibrium Values

	e_d	e_d^*	e_p	e_p^*	t	t^*	w / w^*	Y/Y^*	I/Y	I^*/Y^*	T/Y	T^*/Y^*
A	47.99	99.70	3.10057	4.32782	19.64	19.70	2.07603	0.0259741	36.92	0.47	0	0
F	29.27	99.89	3.19481	4.3274	18.99	19.69	1.97786	0.0247443	13.76	0.16	0.65	0.007
G	12.28	99.98	3.44515	4.3277	19.20	19.70	1.97813	0.0247436	2.28	0.02	0.45	0.001
H	12.33	99.98	3.46010	4.3275	19.55	19.69	1.66163	0.0207844	2.30	0.03	0.11	0.006
I	5.16	99.99	3.74838	4.32779	19.62	19.70	1.66165	0.0207804	0.25	0.002	0.05	0.0005

(b)

Percentage Deviations of Household Utility from the Free Trade Equilibrium Level

e	2.5		3.5		15		40		51		60		90		99	
	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
F	-7.78	0	-10.92	0	-7.97	0.01	-2.30	0.01	0.84	0.01	0.83	0.008	0.82	0.008	0.82	0.008
G	-20.25	0	-30.34	0	-19.13	0.001	-2.57	0.001	0.57	0	0.57	0	0.56	0	0.56	0.001
H	-20.24	0	-18.89	0	-19.53	0.007	-3.01	0.006	0.12	0.006	0.12	0.006	0.12	0.006	0.12	0.006
I	-31.02	0	-41.13	0	-19.60	0	-3.10	0	0.03	0	0.03	0	0.03	0	0.03	0

Table 9

Trade Wars ($h = 0.5$, $\gamma = 1.15$)

A ($\tau = \tau^* = 0$) ; F ($\tau = \tau^* = 0.05$) ; G ($\tau = 0.25, \tau^* = 0.05$); H ($\tau = 0.05, \tau^* = 0.25$) ; I ($\tau = \tau^* = 0.25$)

(a)

Effects on Equilibrium Values

	e_d	e_d^*	e_p	e_p^*	t	t^*	w / w^*	Y/Y^*	I/Y	I^*/Y^*	T/Y	T^*/Y^*
A	50.56	88.18	3.18702	4.13567	19.65	19.69	1.74309	0.872153	40.99	17.89	0	0
F	28.45	96.72	3.27723	4.12292	19.03	19.44	1.68091	0.840981	12.98	5.20	0.61	0.24
G	9.16	99.79	3.55278	4.13484	19.42	19.67	1.68713	0.843944	1.19	0.33	0.23	0.02
H	9.18	99.68	3.56083	4.13051	19.61	19.59	1.41720	0.708909	1.20	0.50	0.06	0.01
I	3.87	99.97	3.87546	4.13528	19.67	19.68	1.41752	0.708906	0.05	0.03	0.01	0.007

(b)

Percentage Deviations of Household Utility from the Free Trade Equilibrium Level

e	2.5		3.5		15		40		51		60		90		99	
	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
F	-7.13	0	-10.45	0	-7.29	0.32	-2.37	0.29	0.79	0.28	0.78	0.28	0.78	0.002	0.77	-0.96
G	-19.94	0	-29.99	0	-16.13	0.02	-2.87	0.019	0.29	0.019	0.29	0.019	0.28	-0.26	0.28	-1.53
H	-19.94	0	-29.99	0	-16.35	0.13	-3.10	0.12	0.05	0.12	0.05	0.11	0.05	-0.16	0.05	-1.44
I	-31.19	0	-39.82	0	-16.42	0.01	-3.17	0.008	-0.02	0.008	-0.02	0.008	-0.02	-0.26	-0.02	-1.54

Table 10**Trade Wars ($h = 0.5$, $\gamma = 1.3$)****A ($\tau = \tau^* = 0$) ; F ($\tau = \tau^* = 0.05$) ; G ($\tau = 0.25, \tau^* = 0.05$); H ($\tau = 0.05, \tau^* = 0.25$) ; I ($\tau = \tau^* = 0.25$)****(a)****Effects on Equilibrium Values**

	e_d	e_d^*	e_p	e_p^*	t	t^*	w / w^*	Y/Y^*	I/Y	I [*] /Y [*]	T/Y	T [*] /Y [*]
A	34.02	91.89	3.05336	4.73998	19.64	19.72	2.69805	1.3508	18.50	12.51	0	0
F	25.33	95.98	3.13069	4.72212	19.16	19.41	2.59778	1.30051	10.26	6.36	0.48	0.30
G	14.46	99.14	3.33070	4.73613	19.01	19.65	2.61552	1.30925	3.25	1.36	0.65	0.06
H	14.55	98.71	3.35120	4.71571	19.50	19.30	2.19702	1.09972	3.27	2.06	0.15	0.41
I	8.17	99.74	3.59805	4.73515	19.48	19.63	2.20019	1.10114	0.91	0.40	0.18	0.08

(b)**Percentage Deviations of Household Utility from the Free Trade Equilibrium Level**

e	2.5		3.5		15		40		51		60		90		99	
	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
F	-6.44	0	-8.78	0	-6.70	0.37	0.63	0.32	0.62	0.31	0.62	0.31	0.61	0.30	0.61	-0.74
G	-17.76	0	-25.21	0	-18.46	0.08	0.83	0.07	0.83	0.07	0.82	0.07	0.81	0.07	0.81	-1.73
H	-17.76	0	-25.78	0	-19.03	0.50	0.18	0.44	0.18	0.43	0.18	0.42	0.18	0.42	0.18	-1.31
I	-28.00	0	-38.49	0	-19.01	0.10	0.20	0.08	0.20	0.08	0.20	0.08	0.20	0.08	0.20	-1.71

FIGURES

Figure 1a
Percentage Losses in Household Utility Relative to the Pre-Trump 2.0 Benchmark (Ability Level 15)

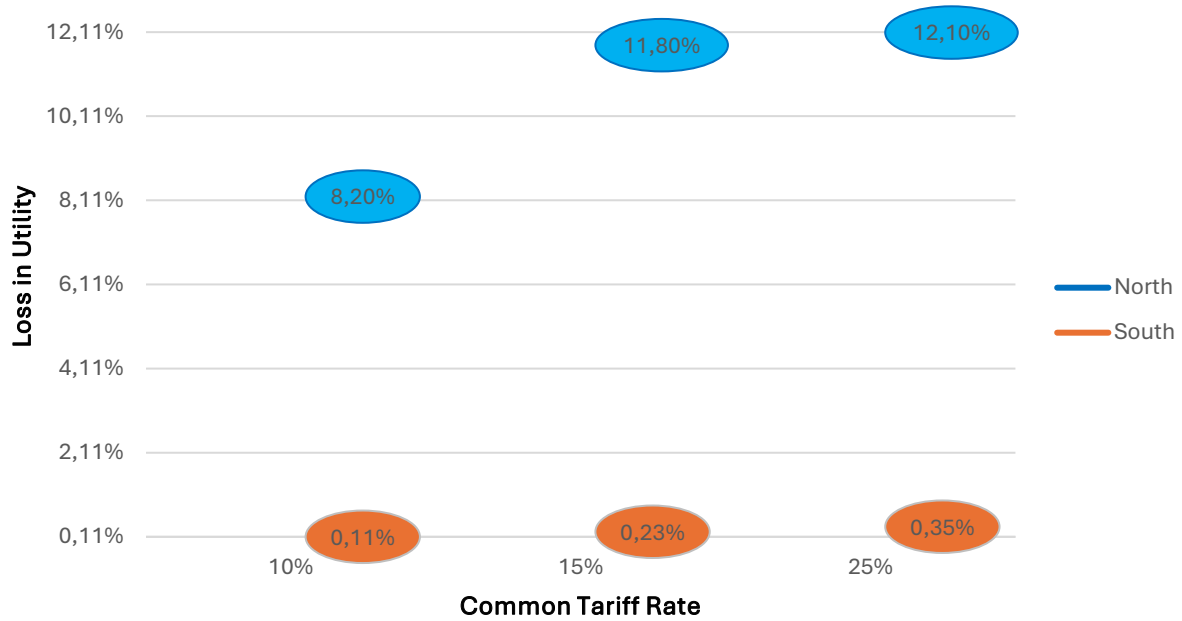


Figure 1b
Percentage Losses in Household Utility Relative to the Pre-Trump 2.0 Benchmark (Ability Level 51)

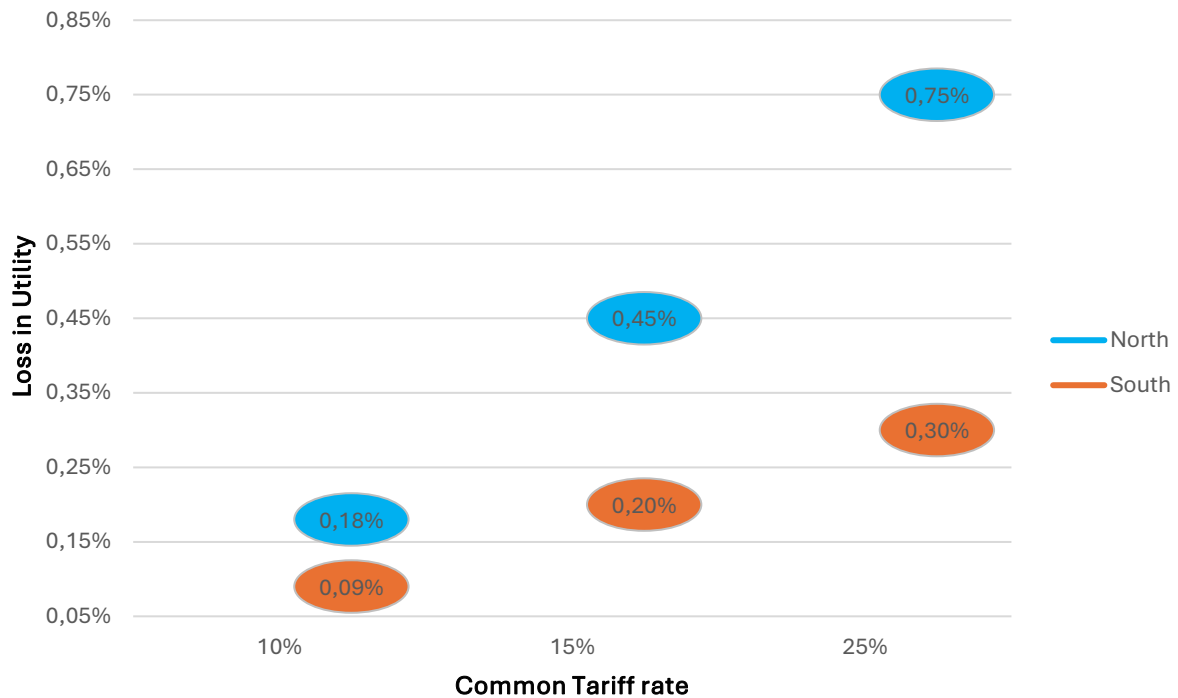


Figure 1c
Percentage Losses in Household Utility Relative to the Pre–Trump 2.0
Benchmark (Ability Level 90)

