Appendix

A Diplomatic Game

This section outlines the key stages and outcomes of the diplomatic game resolution. We skip the proof that the second-best protocol takes the form of the Nash bargaining protocol displayed on page 12. The proof is in Appendix A of Martin et al. (2008), referred to as MMT henceforth, which extends the setup covered in the claims B and C of Compte and Jehiel (2009).[1] We invite the reader to refer to these two articles to get a comprehensive understanding of the resolution process. Two results from MMT are particularly relevant for our analysis. In their Appendix A.1, they derive the optimal announcement strategy of each player in the diplomatic game, as well as the resulting post-transfer utility in the case of a successful agreement.

Optimal announcement. Our presentation of the model in Section 2.2 emphasizes the role of $\widetilde{\mathtt{UCW}}$, which represents the utility *differential* between peace and war. In this respect, in the diplomatic game, rather than announcing a *level* of wartime utility, it is equivalent for the player to announce a utility differential:

$$\widetilde{\mathtt{UCW}}_n^a \equiv U_n(\text{peace}) - a(\widetilde{U}_n^W), \tag{A1}$$

where $a(\widetilde{U}_n^W)$ denotes the optimal announcement of wartime utility level derived in footnote 27 of MMT. Translated into our notation, this corresponds to:

$$\begin{aligned} a(\widetilde{U}_n^W) = \min \widetilde{U}_n(\text{war}) &+ \frac{1}{4}\left(U_n(\text{peace}) + U_m(\text{peace}) - \min \widetilde{U}_n(\text{war}) - \min \widetilde{U}_m(\text{war})\right) \\ &+ \frac{2}{3}\left(\widetilde{U}_n(\text{war}) - \min \widetilde{U}_n(\text{war})\right). \end{aligned} \tag{A2}$$

Combining the two previous relations, rearranging the terms and using the definition $\widetilde{\mathtt{UCW}}_n \equiv U_n(\text{peace}) - \widetilde{U}_n(\text{war})$, yields:

$$\widetilde{\mathtt{UCW}}_n^a = \frac{2}{3}\widetilde{\mathtt{UCW}}_n + \frac{1}{12}\max \widetilde{\mathtt{UCW}}_n - \frac{1}{4}\max \widetilde{\mathtt{UCW}}_m. \tag{A3}$$

[1] Compte and Jehiel (2009) assume that the sum of the outside options of the two players is bounded between 0 and the value of the joint surplus to be shared (V in their notation). MMT relax this restriction and allow the joint outside options to vary within a range $[\underline{v}_n + \underline{v}_m, \bar{v}_n + \bar{v}_m]$.

Under the parametric assumption $\tilde{u}_n \in [-3\eta/4, 0]$, equation (3) implies that $\max \widetilde{\mathtt{UCW}}_n = \mathtt{OCW}_n$. Equation (A3) thus becomes:

$$\widetilde{\mathtt{UCW}}_n^a = \frac{2}{3}\widetilde{\mathtt{UCW}}_n + \frac{1}{12}\mathtt{OCW}_n - \frac{1}{4}\mathtt{OCW}_m. \tag{A4}$$

which corresponds to equation (8) in the main text.

Geoeconomic factors. To save on notation in the remaining computations, we define the random variables $x = -\tilde{u}_n$ and $y = -\tilde{u}_m$ and the cutoff value $\bar{x} \equiv \frac{3}{4}(\mathtt{OCW}_n + \mathtt{OCW}_m)$. The parameterization retained in Section 2.2 implies that x and y both vary in the interval $[0, \bar{u}]$ with $\bar{u} = 3\eta/4$. Moreover, we assume that (x, y) are jointly uniformly distributed over a triangle in $\mathbb{R}^2$, so that the joint distribution of the utility costs of war is uniform over the black triangle represented in Figure 1 in the main text. Note that this triangle is the translation to our setting of the Figure 3 in MMT, with the important extension that we allow for asymmetric $\mathtt{OCW}$s. Finally, the joint probability density function (pdf) of (x, y) is equal to the inverse of the surface of the black triangle: $\phi(x, y) = \frac{2}{\bar{u}^2}$ for (x, y) located in the triangle and $\phi(x, y) = 0$ otherwise.

In the Nash bargaining protocol, reaching an agreement requires the announcements of players n and m to be compatible with equation (5):

$$0 < \widetilde{\mathtt{UCW}}_n^a + \widetilde{\mathtt{UCW}}_m^a. \tag{A5}$$

Inserting (A4) into the previous relation characterizes the war shocks which are conducive to a peace-preserving agreement:

$$0 < \frac{3}{4}(\mathtt{OCW}_n + \mathtt{OCW}_m) + \tilde{u}_n + \tilde{u}_m. \tag{A6}$$

In figure 1, a peace-preserving agreement happens for all realizations of $(\widetilde{\mathtt{UCW}}_n, \widetilde{\mathtt{UCW}}_m)$ that are located in the blue triangle. The probability of peace s_{nm} is given by the ratio of the surface of the blue over that of the outer black triangle. The previous condition can be compactly rewritten as $x + y < \bar{x}$ and we get:

$$s_{nm} = \mathtt{Pr}\left(x + y < \bar{x}\right) = \int\int_{x+y<\bar{x}} \phi(x, y)dxdy = \begin{cases} \frac{\bar{x}^2}{\bar{u}^2} = \frac{(\mathtt{OCW}_n + \mathtt{OCW}_m)^2}{\eta^2} & \text{if} \quad \mathtt{OCW}_n + \mathtt{OCW}_m \leq \eta \\ 1 & \text{otherwise,} \end{cases} \tag{A7}$$

which corresponds to equation (11) in the main text.

<u>Peace-Keeping Cost:</u>

The Nash bargaining protocol (Appendix A.1 in MMT) implements a peace-preserving transfer equal to:

$$\widetilde{T}_{nm} = \frac{(U_n(\text{peace}) - a(\widetilde{U}_n^W)) - (U_m(\text{peace}) - a(\widetilde{U}_m^W))}{2}$$

Using (A1), this transfer can be expressed in terms of announced utility differentials:

$$\widetilde{T}_{nm} = \frac{\widetilde{\texttt{UCW}}_n^a - \widetilde{\texttt{UCW}}_m^a}{2}.$$

This relation corresponds to Equation (7) in the main text. In turn, we combine it with (A4) to get:

$$\widetilde{T}_{nm} = \frac{\texttt{OCW}_n - \texttt{OCW}_m}{2} + \frac{\tilde{u}_n - \tilde{u}_m}{3} = \frac{\texttt{OCW}_n - \texttt{OCW}_m}{2} - \frac{x - y}{3}. \tag{A8}$$

The first equality in the preceding relation corresponds to equation (12) in the main text.

The next step consists in computing the expected value of $\widetilde{T}_{nm}$ conditional on peace. In Figure 1 this boils down to averaging $\widetilde{T}_{nm}$ over all realizations (x, y) that are located in the blue triangle. Importantly, the two random variables are assumed to be uniformly distributed over the isosceles blue triangle. As a consequence, their expected values conditional on peace are identical:

$$\mathbb{E}\left[x|\text{peace}\right] = \mathbb{E}\left[y|\text{peace}\right].$$

Combining the last two relations leads to the characterization of the peace-keeping cost (equation (13) in the text):

$$\mathbb{E}\left[\widetilde{T}_{nm}|\text{peace}\right] \equiv \texttt{PKC}_{nm} = \frac{\texttt{OCW}_n - \texttt{OCW}_m}{2}. \tag{A9}$$

<u>True Cost of War:</u>

The True Cost of War is equal to:

$$\texttt{TCW}_n = \mathbb{E}\left[\widetilde{\texttt{UCW}}_n|\text{war}\right] = \texttt{OCW}_n + \mathbb{E}\left[\tilde{u}_n|\text{war}\right] = \texttt{OCW}_n - \mathbb{E}\left[x|\text{war}\right] \tag{A10}$$

As depicted in Figure 1, war happens whenever the joint realization of (x, y) is located in the red trapezoid. Hence, their joint pdf conditional on war, denoted $\psi(x, y)$, is a constant term ψ equal to the inverse of the surface of the red trapezoid, itself equal to the difference in the surfaces of the black and the blue triangles. Thus, $\psi(x,y) = \psi = \frac{2}{\bar{u}^2 - \bar{x}^2}$. This leads to:

$$
\begin{aligned}
\mathbb{E}\left[x|\text{war}\right] &= \int\int_{(x,y)\in\Theta} x\psi(x,y)dxdy = \int_0^{\bar{x}}\int_{\bar{x}-x}^{\bar{u}-x} x\psi dxdy + \int_{\bar{x}}^{\bar{u}}\int_0^{\bar{u}-x} x\psi dxdy \\
&= \psi\int_0^{\bar{x}} xdx \int_{\bar{x}-x}^{\bar{u}-x} dy + \psi\int_{\bar{x}}^{\bar{u}} xdx\int_0^{\bar{u}-x} dy = \psi\int_0^{\bar{x}} x(\bar{u}-\bar{x})dx + \psi\int_{\bar{x}}^{\bar{u}} x(\bar{u}-x)dx \\
&= \psi(\bar{u}-\bar{x})\frac{\bar{x}^2}{2} + \psi\left[\bar{u}\frac{\bar{u}^2-\bar{x}^2}{2} - \frac{\bar{u}^3-\bar{x}^3}{3}\right] = \psi\frac{\bar{u}^3-\bar{x}^3}{6} = \frac{\bar{u}^3-\bar{x}^3}{3\left(\bar{u}^2-\bar{x}^2\right)}.
\end{aligned}
$$

Inserting this relation into (A10) and substituting $(\bar{u},\bar{x})$ with their underlying values, we obtain:

$$
\mathtt{TCW}_n = \mathbb{E}\left[\widetilde{\mathtt{UCW}}_n|\text{war}\right] = \mathtt{OCW}_n - \frac{1}{4}\times\frac{\eta^3 - \left(\mathtt{OCW}_n + \mathtt{OCW}_m\right)^3}{\eta^2 - \left(\mathtt{OCW}_n + \mathtt{OCW}_m\right)^2} \tag{A11}
$$

It is useful to compare the previous relation with its unconditional expectation:

$$
\mathbb{E}\left[\widetilde{\mathtt{UCW}}_n\right] = \mathtt{OCW}_n + \mathbb{E}\left[\tilde{u}_n\right] = \mathtt{OCW}_n - \mathbb{E}\left[x\right], \tag{A12}
$$

where the last term is computed by integrating x over the entire triangle:

$$
\mathbb{E}\left[x\right] = \int_0^{\bar{u}}\int_0^{\bar{u}} x\phi(x,y)dxdy = \int_0^{\bar{u}} x\frac{2}{\bar{u}^2}dx\int_0^{\bar{u}-x} dy = \int_0^{\bar{u}} x(\bar{u}-x)\frac{2}{\bar{u}^2}dx = \frac{\bar{u}}{3} = \frac{\eta}{4}.
$$

Plugging (A12) into (A11) and using the preceding relation yields:

$$
\mathtt{TCW}_n = \mathbb{E}\left[\widetilde{\mathtt{UCW}}_n|\text{war}\right] = \underbrace{\mathtt{OCW}_n - \frac{\eta}{4}}_{=\mathbb{E}\left[\widetilde{\mathtt{UCW}}_n\right]} - \frac{1}{4}\frac{\left[\mathtt{OCW}_n + \mathtt{OCW}_m\right]^2}{\left[\eta + \mathtt{OCW}_n + \mathtt{OCW}_m\right]}, \tag{A13}
$$

which corresponds to equation (14) in the main text.

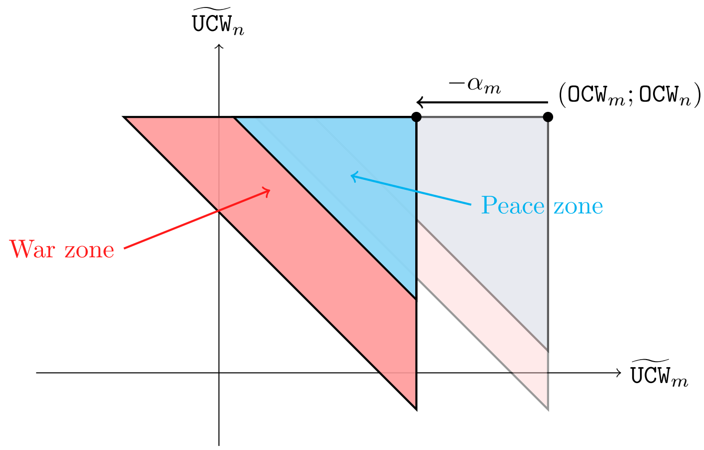
B Extensions

In this section, we present three natural extensions of our benchmark model. First, allowing one of the leaders to be autocratic, i.e. having a specific tolerance for conflict. Second, letting special interest groups which benefit differently from war, influence policy making. Third, account for military spending and how it influences the probability of "winning" the war. Those three extensions are meant to show how those realistic features can be introduced without changing the fundamental mechanics of the model, and in particular the diplomacy module, and the fact that `OCW` is a sufficient statistic for geoeonomic factors.

B.1 An autocratic leader

The baseline model treats the leaders of the geopolitical rivals symmetrically, in terms of their objective functions. In this section, we discuss what happens when a country is led by an autocrat, supposedly with a fundamental taste for armed conflicts.

Figure B1: The diplomatic game with an autocratic country m



Notes: $\widetilde{\texttt{UCW}}_n$ and $\widetilde{\texttt{UCW}}_m$ are assumed jointly uniformly distributed. Leader in country m is assumed to recover an ego rent α_m in wartime.

In this extension, the "democratic" country n retains the same objective function as in the baseline model, whereas the "autocratic" country m derives an additional ego rent from waging war against n. The corresponding ex-ante utility cost of wars are therefore given by the following equations:

$$\widetilde{\texttt{UCW}}_n = \texttt{OCW}_n + \tilde{u}_n, \tag{B14}$$

$$\widetilde{\texttt{UCW}}_m = \texttt{OCW}_m - \alpha_m + \tilde{u}_m, \tag{B15}$$

where α_m denotes the (positive) ego rent which reduces the perceived utility cost of war.[2] This ego rent is assumed to be public information and sufficiently small to ensure that peace remains Pareto-superior to war, i.e. condition (5) holds and $\widetilde{\texttt{UCW}}_n + \widetilde{\texttt{UCW}}_m > 0$ for all realizations of the war shocks. This condition is satisfied whenever $\alpha_m < \texttt{OCW}_n + \texttt{OCW}_m + \min(\tilde{u}_n + \tilde{u}_m)$ with $\min(\tilde{u}_n + \tilde{u}_m) = -\frac{3\eta}{4}$ under the parameterization adopted in Section 2.2. Geometrically, the ego rent shifts the support of the autocrat's utility cost of war to the left along the x-axis, but this shift remains moderate

[2] The ego rent α_m is distinct from the war-induced TFP loss α, and the two should not be conflated.

enough so that the hypotenuse of the resulting triangle in Figure B1 never lies in the south-west quadrant, preserving the Pareto-ranking. By contrast, for larger values of α_m, condition (5) may be violated, rendering the set of peace-preserving transfers empty for some realization of war shocks (see footnote 4). In such instances, the compensation required to deter the autocracy from war exceeds the democratic country's willingness to pay, making conflict unavoidable. We assume that α_m is sufficiently small to rule out such cases for the remainder of the analysis. As long as this ego rent is public information across countries, the solution of the bargaining protocol is unchanged, and each country continues to misreport its true cost of war as in equation (8):

$$\widetilde{\texttt{UCW}}^a_n = \frac{2}{3}\widetilde{\texttt{UCW}}_n + \frac{1}{12}\texttt{OCW}_n - \frac{1}{4}\left(\texttt{OCW}_m - \alpha_m\right) \quad \text{and} \quad \widetilde{\texttt{UCW}}^a_m = \frac{2}{3}\widetilde{\texttt{UCW}}_m + \frac{1}{12}\left(\texttt{OCW}_m - \alpha_m\right) - \frac{1}{4}\texttt{OCW}_n.$$

Announcements must be large enough to avoid a negotiation breakdown and the outbreak of war. This requires that the compatibility condition holds:

$$\frac{1}{4}\left(\texttt{OCW}_n + \texttt{OCW}_m - \alpha_m\right) < \widetilde{\texttt{UCW}}_n + \widetilde{\texttt{UCW}}_m. \tag{B16}$$

Exactly as in the baseline model, this condition is violated when the joint realization of the $\widetilde{\texttt{UCW}}$s is low. Graphically, the break-even line separating the peace zone (blue) and the war zone (red) in Figure B1 is shifted by less than α_m. As a result, the area of the war zone expands relative to the peace zone. This can be seen formally by computing the new probability of appeasement:

$$s_{nm} = \begin{cases} \frac{(\texttt{OCW}_n + \texttt{OCW}_m - \alpha_m)^2}{\eta^2} & \text{if} \quad \texttt{OCW}_n + \texttt{OCW}_m - \alpha_m \leq \eta \\ 1 & \text{otherwise.} \end{cases} \tag{B17}$$

Thus, the probability of appeasement is strictly lower than in the baseline case: on average, the joint utility cost of war is shifted downward by the value of the ego rent. The true costs of war for both leaders are now given by:

$$\texttt{TCW}_n = \texttt{OCW}_n - \frac{\eta}{4} - \frac{1}{4}\frac{\left[\texttt{OCW}_n + \texttt{OCW}_m - \alpha_m\right]^2}{\left[\eta + \texttt{OCW}_n + \texttt{OCW}_m - \alpha_m\right]} \tag{B18}$$

$$\texttt{TCW}_m = \texttt{OCW}_m - \alpha_m - \frac{\eta}{4} - \frac{1}{4}\frac{\left[\texttt{OCW}_n + \texttt{OCW}_m - \alpha_m\right]^2}{\left[\eta + \texttt{OCW}_n + \texttt{OCW}_m - \alpha_m\right]} \tag{B19}$$

The peace-keeping cost now reflects the asymmetry in utility costs of war, requiring the democratic leader to compensate further the warlike autocrat who now faces a lower utility cost of entering into war:

$$\texttt{PKC}_{nm} = \frac{\texttt{OCW}_n - \texttt{OCW}_m + \alpha_m}{2}. \tag{B20}$$

In this extended model, all geoeconomic factors can still be expressed as functions of sufficient statistics, namely $\{\texttt{OCW}_n, \texttt{OCW}_m\}$ and the ego rent parameter α_m. The formulas are actually identical to the baseline ones when expressed with the re-scaled opportunity cost of war of the autocrat: $\texttt{OCW}_m^{\text{autoc}} = \texttt{OCW}_m - \alpha_m$. Since the ego parameter is difficult to measure in the data, we abstract from it in our quantitative exercises. However, it is important to note that this additive ego rent does not affect the marginal welfare effect of trade policy, including the optimal level of decoupling analyzed in section 4.2. As we discuss next, this invariance result extends to any additive shift in utility costs that is both public information and independent of the structure of trade.

B.2 Special interest groups and war for sale

In the presence of special interest groups, leaders may no longer maximize the utility of representative consumers during diplomatic negotiations. In particular, some industries may benefit from war outcomes and thus lobby the government in pursuit of these specific interests. We consider this possibility by extending the model to incorporate lobbying contributions additively in leader of country m's objective function, following Grossman and Helpman (1994). Equation (1) becomes:

$$\begin{aligned} U_m(\text{peace}) &= \beta_m \log \Pi_m(\text{peace}) + \log C_m(\text{peace}) + v_m, \\ \widetilde{U}_m(\text{war}) &= \beta_m \log \Pi_m(\text{war}) + \log C_m(\text{war}) + v_m - \tilde{u}_m, \end{aligned}$$

where β_m denotes the weight placed by country m's leader on the profits of special interest groups, and Π_m represents their real profits in peace and war. The quantitative trade model used in the empirical application assumes perfect competition and constant returns to scale, which implies zero profits. However, a minimal departure from these assumptions—monopolistic competition with constant markups and restricted entry, which belongs to the class of models of Arkolakis et al. (2012)—restores non-zero profits. Under CES monopolistic competition, aggregate profits are proportional to income, regardless of the level of trade barriers (see the NBER working paper version of Arkolakis et al., 2012). Let us consider a situation where the proportionality factor depends on the peace/war situation, such that

$$\Pi_m(\text{peace}) = \omega_m(\text{peace}) C_m(\text{peace}) \quad \text{and} \quad \Pi_m(\text{war}) = \omega_m(\text{war}) C_m(\text{war}),$$

where the ω_m terms capture in a reduced-form way how profits differ between peace and war, reflecting sector-specific demand and supply shifts. For example, the military-industrial complex may experience profit increases in wartime, whereas sectors of non-essential goods (like tourism) typically benefit more in peacetime. Aggregating across sectors, the net effect is ambiguous, so we allow $\omega_m(\text{peace})$ and $\omega_m(\text{war})$ to differ without imposing a specific ranking. Under these assumptions, the ex-ante utility costs of war become:

$$\widetilde{\texttt{UCW}}_n = \texttt{OCW}_n + \tilde{u}_n, \tag{B21}$$

$$\widetilde{\texttt{UCW}}_m = \texttt{OCW}_m + \beta_m \left(\texttt{OCW}_m + \log \frac{\omega_m(\text{peace})}{\omega_m(\text{war})} \right) + \tilde{u}_m. \tag{B22}$$

As long as the β_m and ω_m parameters are public information, the solution of the bargaining protocol remains identical to the baseline model. Moreover, the diplomatic game unfolds as in the preceding appendix section once we notice the formal equivalence between the ego rent $(-\alpha_m)$ in equation (B15) and the special interests $\beta_m \left(\texttt{OCW}_m + \log \frac{\omega_m(\text{peace})}{\omega_m(\text{war})} \right)$ in equation (B22). Figure B1 can now be used to illustrate the diplomatic impact of special interests in country m: the depicted leftward shift of the triangle corresponds to a parameter regime in which pro-war interests dominate pro-peace interests such that $\texttt{OCW}_m + \log \omega_m(\text{peace}) < \log \omega_m(\text{war})$.
All geoeconomic factors are given by the baseline model's formulas, using the following rescaled opportunity costs of war:

$$\texttt{OCW}_n^{\text{sp}} \equiv \texttt{OCW}_n, \tag{B23}$$

$$\texttt{OCW}_m^{\text{sp}} \equiv \texttt{OCW}_m + \beta_m \left(\texttt{OCW}_m + \log \frac{\omega_m(\text{peace})}{\omega_m(\text{war})} \right). \tag{B24}$$

These expressions highlight two geoeconomic effects of special interests. First, they increase the joint opportunity costs of war—through the term $\beta_m \texttt{OCW}_m$—which raises the probability of appeasement. Intuitively, the leaders' objective function now includes profits which decrease in wartime (like real income). This channel is amplified when pro-peace dominate pro-war special interests at the country-level (i.e. when $\omega_m(\text{peace})/\omega_m(\text{war}) > 1$) and is dampened in the opposite case. Second, they affect relative bargaining power and the peace-keeping cost, by modifying the cross-country differential in rescaled opportunity costs. The direction of this effect depends on both the strength of lobbying influence (β_m) and the nature of sectoral interests (pro-peace vs. pro-war, as captured by the ω_m ratio). While a full taxonomy of these effects would yield novel and policy-relevant insights, we leave such an investigation to future work.

In line with the preceding appendix section, we abstract from special interest groups in our quantitative exercises: measuring the β_m and ω_m parameters is empirically challenging; moreover, because lobbying enters additively in equations (B21) and (B22), it does not affect the marginal effect of trade policy on welfare–including the optimal degree of decoupling analyzed in Section 4.2.

B.3 Who wins the war and military capacities

Our baseline model does not include a defense sector or military capacities, which obviously can influence the outcome of military conflicts. In order to consider how those affect our findings, let us introduce a minimal set of changes to the baseline setup:

1. Countries commit to (exogenous) respective military capacities G_n and G_m before the dispute arises.[3] Both G_n and G_m are publicly observable.

2. We model the probability of winning the war as the CES version of a Contest Success Function of military capacity (Couttenier et al., 2024), such that

$$\mathbb{P}(n \text{ beats } m) = \mathbb{P}\left(\log(G_m) + \varepsilon_m \leq \log(G_n) + \varepsilon_n\right)$$

   where ε_n is a military efficiency shock of country n. We assume that this is revealed to both players only after the diplomatic protocol has taken place (and failed). If distributed Gumbel, this probability of winning the war simplifies into:

$$\mathbb{P}(n \text{ beats } m) = \frac{G_n^\theta}{G_n^\theta + G_m^\theta},$$

   with θ being the shape parameter of the Gumbel distribution. A larger θ means that the random part of military efficiency has low variance, which means that winning a conflict depends critically on military capacities rather than chance.[4]

3. The privately observed war shocks $\tilde{u}_n$ and $\tilde{u}_m$ are suffered in case of a conflict, independently of the outcome on the battlefield.[5]

4. The contest if war happens is about the full appropriation of the opponent's public good. Country n leaves the contest with $v_n + v_m$ if it wins the war, and 0 otherwise. As a result, the expected post-war transfer of the contested good from n to m is given by

$$W_{nm} \equiv [1 - \mathbb{P}(n \text{ beats } m)]v_n - \mathbb{P}(n \text{ beats } m)v_m = \frac{G_m^\theta v_n - G_n^\theta v_m}{G_n^\theta + G_m^\theta}, \tag{B25}$$

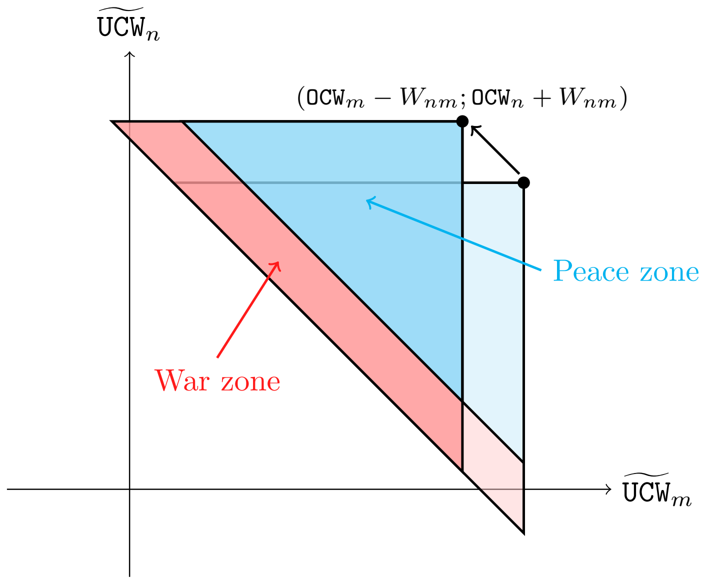
   which can be positive or negative.

[3] This reflects time-to-build constraints on weaponry.

[4] This means that θ also is the elasticity of winning the war to military capacity. Couttenier et al. (2024) and Alekseev and Lin (2024) estimate this to be around 0.5.

[5] The intuition is that v_n is a material resource at stake during the conflict, while $\tilde{u}_n$ can be seen as the political, psychological and/or social cost of going at war for the population.

Figure B2: The diplomatic game when country m has higher military capacities



Notes: $\widetilde{\texttt{UCW}}_n$ and $\widetilde{\texttt{UCW}}_m$ are assumed jointly uniformly distributed. We assume a positive post-war transfer from n to m, in expectation: $W_{nm} > 0$.

Under these assumptions, the ex-ante utility cost of war can be decomposed as follows:

$$\widetilde{\texttt{UCW}}_n = [\log C_n(\text{peace}) + \nu_n] - [\log C_n(\text{war}) + \nu_n - \tilde{u}_n - W_{nm}] = \texttt{OCW}_n + W_{nm} + \tilde{u}_n \quad \text{(B26)}$$

Like in the preceding extensions, it is convenient to work with a rescaled version of the opportunity cost of war: accordingly we define $\texttt{OCW}_n^{\text{inc}} \equiv \texttt{OCW}_n + W_{nm}$ which corresponds to the opportunity cost of war , *inclusive* of the expected post-war transfer of the contested good. By symmetry, we have that $W_{nm} = -W_{mn}$ and $\texttt{OCW}_m^{\text{inc}} = \texttt{OCW}_m - W_{nm}$.

Figure B2 illustrates how the introduction of a post-war transfer of the contested good affects the support of the utility costs of war and the diplomatic game. When $W_{nm} > 0$, the expected post-war transfer from n to m is positive, and $\widetilde{\texttt{UCW}}_n$ is augmented by the same amount that $\widetilde{\texttt{UCW}}_m$ is reduced. The new negotiation triangle slides in the North-West direction, compared to the baseline (transparent) one. The structure of the game is therefore the same as in Section 2, since the functional form of (B26) expressed with $\texttt{OCW}_m^{\text{inc}}$ is the same as in (3) and the information structure is identical: $\texttt{OCW}_n^{\text{inc}}$ being public information, while $\tilde{u}_n$ is privately observed. As a consequence , the second-best protocol remains unchanged, and all geoeconomic factors can still be written as function of two sufficient statistics, $\texttt{OCW}_n^{\text{inc}}$, and $\texttt{OCW}_m^{\text{inc}}$. More specifically, the announcement made by each party under the second-best protocol writes:

$$\widetilde{\texttt{UCW}}_n^a = \frac{3}{4}\texttt{OCW}_n^{\text{inc}} - \frac{1}{4}\texttt{OCW}_m^{\text{inc}} + \frac{2}{3}\tilde{u}_n = \frac{3}{4}\texttt{OCW}_n - \frac{1}{4}\texttt{OCW}_m + W_{nm} + \frac{2}{3}\tilde{u}_n, \tag{B27}$$

where the second line uses the definition of $\texttt{OCW}_n^{\text{inc}}$ and the fact that $W_{nm} = -W_{mn}$. The joint announcement compatibility condition to avoid war is still $\left(\widetilde{\texttt{UCW}}_n^a + \widetilde{\texttt{UCW}}_m^a\right) > 0$, which writes as

$$\frac{\texttt{OCW}_n + \texttt{OCW}_m}{2} + \frac{2(\tilde{u}_n + \tilde{u}_m)}{3} > W_{nm} + W_{mn} = 0.$$

Thus, the set of realization of war shocks $(\tilde{u}_n, \tilde{u}_m)$ that lead to negotiation breakdown is identical to the one of the baseline model, and the probability of escalation is unchanged:

$$s_{nm} = \begin{cases} \frac{(\texttt{OCW}_n + \texttt{OCW}_m)^2}{\eta^2} & \text{if} \quad \texttt{OCW}_n + \texttt{OCW}_m \leq \eta \\ 1 & \text{otherwise} \end{cases}$$

The peace-compatible transfer is defined as before:

$$\widetilde{T}_{nm} \quad = \quad \frac{\widetilde{\texttt{UCW}}_n^a - \widetilde{\texttt{UCW}}_m^a}{2} = \frac{\texttt{OCW}_n - \texttt{OCW}_m}{2} + W_{nm} + \frac{\tilde{u}_n - \tilde{u}_m}{3}. \tag{B28}$$

And the peace-keeping cost is equal to:

$$\texttt{PKC}_{nm} = \mathbb{E}\left[\widetilde{T}_{nm}|\text{peace}\right] = \frac{\texttt{OCW}_n - \texttt{OCW}_m}{2} + W_{nm}. \tag{B29}$$

Compared to the baseline case, when country m is best positioned after the war (a larger and positive W_{nm}), it receives a larger transfer in peacetime, in exchange of agreeing on a peaceful solution. Finally, the true cost of war is also inflated by the post-war transfer:

$$\texttt{TCW}_n = \mathbb{E}\left[\widetilde{\texttt{UCW}}_n|\text{war}\right] = \texttt{OCW}_n + W_{nm} + \mathbb{E}\left[\tilde{u}_n|\text{war}\right], \quad \text{with} \quad \mathbb{E}\left[\tilde{u}_n|\text{war}\right] = -\frac{\eta}{4} - \frac{1}{4}\frac{[\texttt{OCW}_n + \texttt{OCW}_m]^2}{[\eta + \texttt{OCW}_n + \texttt{OCW}_m]},$$

where the expectation of the war shock $\tilde{u}_n$ conditional on negotiation failure is unchanged compared to the baseline.

The model thus retains its tractability as the geoeconomic factors still depend on a small set of sufficient statistics. Besides $\texttt{OCW}_n$ and $\texttt{OCW}_m$, quantifying this extended model requires a measure of the expected post-war transfer (W_{nm}), which in theory depends on both relative military capacities and the values of the contested public good through equation (B25). In the absence of good data on the latter, our quantification exercise neglects this element.

What are the consequences of predetermined military capacity for the design of trade policy?

The expected post-war transfer entering additively in equation (B26), the level of military capacity has no effect on the marginal welfare impact of trade policy and, consequently, does not influence the optimal degree of decoupling. When trade policy and military spending are instead decided jointly, the leader needs to take into consideration the interdependence of both policies. In particular, decoupling reduces peacetime production and, in consequence, is likely to harm the country's ability to build military capabilities; which in turn decreases the expected post-war transfer. We leave the analysis of these interactions to future work.

C Equilibrium prices

Under the production function (18) introduced in Section 2.4, the vector of FOB prices changes can be written as:

$$\Delta \log \mathbf{p} = -\Delta \log \mathbf{A} + \Omega' \Delta \log \mathbf{p} + Diag\left(\Omega' \Delta \log \boldsymbol{\tau}\right) + \Omega^{F'} \Delta \log \mathbf{w},$$

where $\mathbf{A}$ denotes the $(G, 1)$ vector of productivities, $\mathbf{w}$ the $(F, 1)$ vector of external factor prices, and $\boldsymbol{\tau}$ is the (G, G) matrix of trade costs. $Diag(.)$ is the matrix-to-vector diagonal operator, i.e. we keep the diagonal terms of the $\Omega' \Delta \log \boldsymbol{\tau}$ matrix. Solving out for FOB prices implies:

$$\Delta \log \mathbf{p} \quad = \quad \Psi \left[-\Delta \log \mathbf{A} + Diag\left(\Omega' \Delta \log \boldsymbol{\tau}^{rep}\right) + \Omega^{F'} \Delta \log \mathbf{w} \right],$$

where $\Psi = (I - \Omega')^{-1}$ is the cost-based Leontief inverse.

D OCW and the Geography of Import Sourcing

Under the assumptions on war damages detailed in Section 2.4, equation (22) simplifies into:

$$\begin{aligned} \mathtt{OCW}_n \quad &= \quad -\alpha_n \tilde{\pi}_{nn} - \alpha_m \tilde{\pi}_{mn} + \tau^{bil}\left(\pi_{mn} + \breve{\pi}_{mn,n} + \breve{\pi}_{nm,n}\right) \\ &+ \quad \tau^{mul}\left[\sum_{\ell \neq n,m} \left(\pi_{\ell n} + \breve{\pi}_{\ell n,n} + \breve{\pi}_{\ell m,n} + \breve{\pi}_{n\ell,n} + \breve{\pi}_{m\ell,n}\right)\right] \\ &- \quad \sum_{f \in F_n} \tilde{\Lambda}_{fn} \Gamma_f + \sum_{f \in F} \left(\Lambda_{fn} - \tilde{\Lambda}_{fn}\right) \Delta \log w_f, \end{aligned} \tag{D30}$$

where $\pi_{\ell n} \equiv \sum_{i \in G_\ell} b_{in}$ is the consumption share of goods produced in ℓ on n's consumption, $\tilde{\pi}_{\ell n} \equiv \sum_{i \in G_\ell} \lambda_{in}$ measures the overall incidence of these goods on consumption, directly and through input-output relationships. Likewise, $\breve{\pi}_{\ell \ell', n} \equiv \sum_{i \in G_{\ell'}} \lambda_{in} \sum_{l \in G_\ell} \Omega_{li}$ denotes the exposure of country n to trade shocks affecting inputs from ℓ incorporated in goods produced in country ℓ'.

Finally, recall that $\Gamma_f \equiv \Delta \log L_f$. This equation has a straightforward quantitative interpretation, with all variables scaled in percentage-points.

In (D30), all components are exogenous, except for the last one, which is scaled by (endogenous) wage adjustments. To recover intuitions about the direction of wage adjustments, one can use the labor-market clearing conditions, which in hat terms can be written as follows:

$$\hat{w}_f \widehat{\bar{L}}_f = \sum_{i \in G} \sum_m \frac{\Omega^F_{fi} y_{im}}{w_f \bar{L}_f} \hat{\Omega}^F_{fi} \hat{y}_{im}$$

where y_{im} denotes the (nominal) sales of firm i in market m, aggregated between final consumers and intermediate consumptions. This equation links wage adjustments to changes in the labor demand of all firms that use factor f, which depend on adjustments to their market potential.

In growth terms:

$$\Delta \log w_f = -\Gamma_f + \log \sum_{i \in G} \sum_m \frac{\Omega^F_{fi} y_{im}}{w_f \bar{L}_f} \hat{\Omega}^F_{fi} \hat{y}_{im} = -\Gamma_f + \log \sum_{i \in G} \sum_m \frac{l_{fi}}{\bar{L}_f} \xi_{im} \hat{\Omega}^F_{fi} \hat{y}_{im}$$

where $\frac{l_{fi}}{\bar{L}_f} = \frac{\Omega^F_{fi} y_i}{w_f \bar{L}_f}$ and $\xi_{im} \equiv \frac{y_{im}}{y_i}$ respectively denote the share of i in the overall demand of factor f and the share of market m in i's sales, both evaluated at the baseline period.

GIS in the absence of IO linkages. To build intuition, it is useful to compare the formula with a simpler world without production linkages and a single firm per country. In such a world, the Leontief inverse is the identity matrix and thus $\tilde{\pi}_{mn} = \pi_{mn}$ and $\breve{\pi}_{\ell\ell',n} = 0$. We further assume that economic and factor damages are symmetric ($\alpha_n = \alpha_m$ and $\Gamma_f = \Gamma$).[6] Finally, we will alleviate notations by considering a single factor of production per country, which we can think of as equipped labor. With a single factor of production, $\tilde{\Lambda}_{fn} = 1$ by definition. Moreover, wage adjustments are transmitted to country n in proportion to the country's exposure to domestic and foreign value added, which is also equal to the consumption share of domestic and foreign goods: $\Lambda_{\ell n} = \sum_{j \in G_\ell} \lambda_{jn} \Omega^F_j = \pi_{\ell n}$.

[6]The assumption that economic damages are equal can be interpreted as symmetry in military power.

Under these assumptions, we have:

$$\texttt{OCW}_n^{\text{noIO}} = -(\Gamma+\alpha) + \pi_{mn}\left(\tau^{bil} + d\log\frac{w_m^{\text{noIO}}}{w_n^{\text{noIO}}}\right) + \sum_{\ell\neq m,n}\pi_{\ell n}\left(\alpha+\tau^{mul} + d\log\frac{w_\ell^{\text{noIO}}}{w_n^{\text{noIO}}}\right) \tag{D31}$$

$$\begin{aligned} s_{nm}^{\text{noIO}} =& \min\left\{1; \frac{1}{\eta^2}\left[-2(\Gamma+\alpha) + \tau^{bil}(\pi_{mn}+\pi_{nm}) + (\alpha+\tau^{mul})\left(\sum_{\ell\neq m,n}(\pi_{\ell n}+\pi_{\ell m})\right)\right.\right.\\ &\left.\left. +(\pi_{mn}-\pi_{nm})\Delta\log\frac{w_m^{\text{noIO}}}{w_n^{\text{noIO}}} + \sum_{\ell\neq m,n}\left(\pi_{\ell n}\Delta\log\frac{w_\ell^{\text{noIO}}}{w_n^{\text{noIO}}} + \pi_{\ell m}\Delta\log\frac{w_\ell^{\text{noIO}}}{w_m^{\text{noIO}}}\right)\right]^2\right\} \end{aligned} \tag{D32}$$

$$\begin{aligned} \texttt{PKC}_{nm}^{\text{noIO}} =& \frac{1}{2}\left[\tau^{bil}(\pi_{mn}-\pi_{nm}) + (\alpha+\tau^{mul})\left(\sum_{\ell\neq m,n}(\pi_{\ell n}-\pi_{\ell m})\right)\right.\\ &\left. +(\pi_{mn}+\pi_{nm})\Delta\log\frac{w_m^{\text{noIO}}}{w_n^{\text{noIO}}} + \sum_{\ell\neq m,n}\left(\pi_{\ell n}\Delta\log\frac{w_\ell^{\text{noIO}}}{w_n^{\text{noIO}}} - \pi_{\ell m}\Delta\log\frac{w_\ell^{\text{noIO}}}{w_m^{\text{noIO}}}\right)\right] \end{aligned} \tag{D33}$$

Moreover, one can recover a standard labor-market clearing condition linking wage adjustments to changes in domestic firms' real market potential, used as a fixed point equation to solve for wages:

$$\hat{w}_n^{\text{noIO}}\widehat{\overline{L}}_n = \sum_\ell \xi_{n\ell}\hat{\pi}_{n\ell}\hat{w}_\ell^{\text{noIO}}\widehat{\overline{L}}_\ell$$

with $\xi_{n\ell}$ the share of market ℓ in total sales of firms in country n and $\hat{\pi}_{n\ell}$ capturing adjustments in the market share of n's firms in country ℓ. A standard assumption in trade models, which we later use in our calibration, is of CES preferences vis-à-vis different final consumption goods. Under this assumption, $\hat{\pi}_{n\ell} = \left(\frac{\hat{\tau}_{n\ell}\hat{w}_n}{\hat{A}_n\hat{P}_\ell}\right)^{1-\sigma}$ where σ is the elasticity of substitution. Using an approximation that is valid for small enough adjustments, the equation finally simplifies into:

$$\sigma\Delta\log w_n^{\text{noIO}} = -\Gamma_n + (\sigma-1)\alpha_n + \sum_\ell \xi_{n\ell}\left[(1-\sigma)\Delta\log\tau_{n\ell} + (\sigma-1)\Delta\log P_\ell + \Delta\log w_\ell^{\text{noIO}} + \Gamma_\ell\right]$$

Noting $\Delta\log B_\ell \equiv (\sigma-1)\Delta\log P_\ell + \Delta\log w_\ell^{\text{noIO}} + \Gamma_\ell$ the aggregate demand adjustment in country ℓ, we can use this equation to gather insights about the relative change in wages between belligerent countries:

$$\begin{aligned} d\log\frac{w_m^{\text{noIO}}}{w_n^{\text{noIO}}} &= -(\xi_{mn}-\xi_{nm})\frac{\sigma-1}{\sigma}\tau^{bil} - (\xi_{nn}+\xi_{nm}-\xi_{mm}-\xi_{mn})\frac{\sigma-1}{\sigma}\tau^{mul}\\ &\quad +\frac{1}{\sigma}\sum_\ell(\xi_{m\ell}-\xi_{n\ell})\Delta\log B_\ell \end{aligned} \tag{D34}$$

and between belligerent and third-countries:

$$d\log\frac{w_n^{\text{noIO}}}{w_o^{\text{noIO}}} = -\frac{1}{\sigma}\Gamma + \frac{\sigma-1}{\sigma}\alpha - \xi_{nm}\frac{\sigma-1}{\sigma}\tau^{bil} - (1-\xi_{on}-\xi_{om}-\xi_{nn}-\xi_{nm})\frac{\sigma-1}{\sigma}\tau^{mul} + \frac{1}{\sigma}\sum_{\ell}(\xi_{n\ell}-\xi_{o\ell})\Delta\log B_\ell \quad \text{(D35)}$$

From equation (D34), we see that wage adjustments in the belligerent countries cancel each other if and only if their export portfolios are symmetric. This is no longer the case whenever the belligerent countries display heterogeneous export shares. Everything else equal, a country's relative dependence on it rival's demand ($\xi_{mn} > \xi_{nm}$) thus exerts negative pressure on its wage, through a larger exposure to trade disruptions that depresses labor demand. For the same reason, a country that is relatively more opened to trade ($\xi_{mm} < \xi_{nn}$) is more exposed to multilateral trade disruptions, which exerts negative pressure on its wages in wartime. Finally, heterogeneous exposures to individual destinations depress wages in the country that is relatively more exposed to countries which aggregate demand is more severely affected by the war shock. Likewise, equation (D35) implies that human losses exert a positive impact on the relative wage of belligerent countries, compared to the rest of the world, when productivity losses and trade disruptions instead push relative wages down.

Equations (D31) and (D32) convey insights for the mechanisms already present in Martin et al. (2008). A country's trade openess has ambiguous effects on the opportunity cost of wars. On the one hand, more opened countries (with high $\sum_{\ell\neq m,n}\pi_{\ell n}$) suffer less from domestic economic damages, as foreign sourcing serves as a consumption insurance. The decrease in wartime productivity leads to an increase in the relative price of domestically-produced goods, which effect is attenuated through substitution away from domestic consumption. However, trade integration increases the country's exposure to trade logistics disruption affecting the belligerent country (proportionally to π_{mn}) and the rest of the world (in proportion to $\sum_{\ell\neq m,n}\pi_{\ell n}$). The impact of trade integration on exposure to domestic and foreign shocks is somewhat counteracted by general-equilibrium wage adjustments as exposure to negative shocks exert downward pressures on relative wages, through their effect on the labor demand. Finally, the direct impact of factor losses (Γ) cannot be diversified through international markets, and thus does not depend to the first order on the structure of trade dependencies.

As the opportunity cost of war is unambiguously increasing in bilateral trade dependencies, the probability of appeasement (s_{nm}^{noIO}) also rises with bilateral trade shares ($\pi_{mn}+\pi_{nm}$), i.e. bilateral sourcing facilitates diplomacy. Instead, multilateral openness goes against it, if economic damages are large in comparison with multilateral disruptions ($-\alpha > \tau^{mul}$).[7] One direct implication of

[7] The assumption that $-\alpha > \tau^{mul}$ implies that economic damages overturn the disruption of multilateral trade.

this result is that the impact of regional and multilateral trade liberalization on the prevalence of war can differ significantly. While RTAs may lower the incidence of regional conflicts, they may increase conflict with other regions. On the other hand, multilateral trade liberalization may lead to an increase in the occurrence of bilateral conflicts.

Finally, equation (D33) underlines the consequences of *asymmetric* trade dependencies on diplomacy. Everything else equal, these asymmetries lead to a transfer from the most to the least trade dependent country, i.e. $\texttt{PKC}_{nm}^{\text{noIO}}$ is increasing in the difference between the share of country m's products in country n's consumption and the reliance of m on country produced in n $(\pi_{mn} - \pi_{nm})$. Countries that are more reliant on foreign products have a stronger incentive to maintain peace, which forces them to compensate their foreign partners in order to maintain peace. This last conflict-related consequence of trade interdependence was not modeled in Martin et al. (2008).

Impact of global sourcing. The comparison of $\texttt{OCW}_n^{\text{noIO}}$ and $\texttt{OCW}_n$ shows the influence of input-output linkages. While the qualitative insights are left unchanged, the full impact of economic damages and trade logistic disruptions will tend to be amplified through their indirect effect on all production costs. As a consequence, the opportunity cost of wars is magnified by input-output relationships. On the other hand, the impact of trade integration may be bigger or smaller depending on the geography of production networks, summarized in the vector of Domar weights.

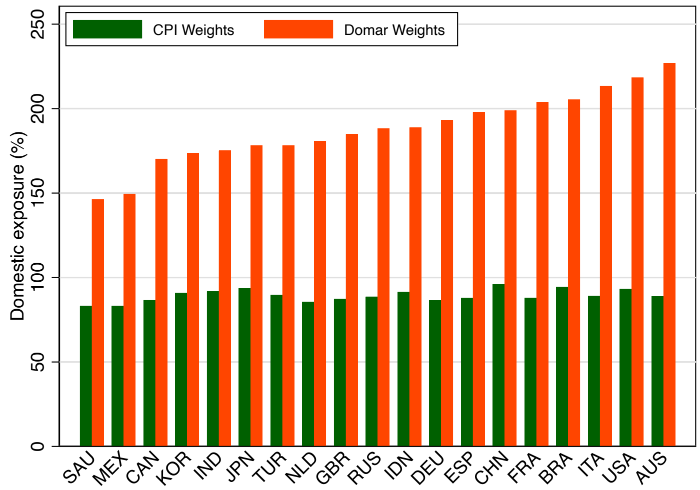
To provide an idea for the magnitude of the size of the amplification through IO networks, Figure D3 compares the sum of Domar weights for domestically-produced goods for the 20 largest economies in the world, in the full model and in the counterfactual world without any IO amplification (i.e. $\tilde{\pi}_{nn}$ against π_{nn}).[8] As emphasized by the comparison of $\texttt{OCW}_n$ and $\texttt{OCW}_n^{\text{noIO}}$, these shares interpret as the elasticity of $\texttt{OCW}$ to domestic productivity shocks. Without IO amplification, a domestic productivity shock translates to the real GDP in proportion to the contribution of domestic products in consumption (π_{nn}). In the data, this contribution lies between .62 and .96 and thus the direct elasticity of real GDP to domestic TFP shock is around .8. With IO amplification, the elasticity is substantially larger, between 1.10 and 2.71.

Likewise, Figure D4 compares the incidence of trade cost shocks, in the full model and without IO. The interpretation is the incidence of a 1% shock on all bilateral trade costs. Without IO linkages, this is equal to the share of non-domestic products in consumption $(1 - \pi_{nn})$. With IO linkages, there is an amplification through the indirect incidence of the shock on the whole vector of prices (including domestic prices), captured by $\sum_{\ell \neq n} (\pi_{\ell n} + \breve{\pi}_{mn,n} + \breve{\pi}_{nm,n})$. Quantitatively, the

MMT originally derived this theoretical prediction in a less general modeling setup. Empirical tests of the prediction have been performed in several papers, which are surveyed in Thoenig (2024).

[8] Here, we use data from the OECD-TiVA database, for the year 2018, which we also use in the baseline calibration of the parameterized model as explained in Appendix F.

Figure D3: Incidence of domestic productivity shocks: Full model and counterfactual without IO amplification



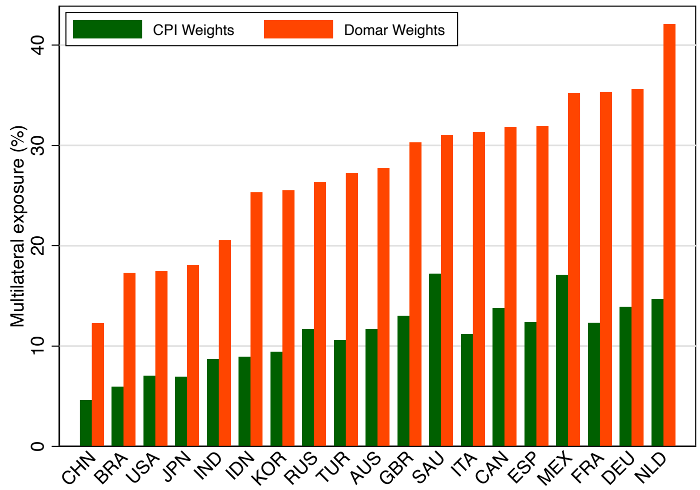
Notes: The figure compares the elasticity of real GDP to productivity shocks, in the full model ("Domar weights") and in a counterfactual without IO linkages ("CPI weights"). "CPI weights" is simply defined as the sum of b_{int} weights, across domestically produced goods (π_{nn}). Likewise, "Domar weights" is the sum of Domar weights λ_{in} across domestically produced goods ($\tilde{\pi}_{nn}$). Source: TiVA, 2018. The figure is restricted to the 20 largest economies in the world.

amplification represents between one third and 80% of the overall exposure of countries to trade shocks. With IO linkages, a 1% multilateral trade cost shock has an impact on countries in Figure D4 which varies between 12% for China to 42% for the Netherlands.

Finally, Figure D5 shows estimates of the bilateral dependence, for a subset of the 30 most dependent country pairs. Again, the figure compares the full model ("Domar weights", $\pi_{mn}+\breve{\pi}_{mn}$) with the counterfactual without IO linkages ("CPI weights", π_{mn}). Here, the interpretation is in terms of the elasticity of a country's real GDP to a 1% productivity shock affecting all sectors in its partner's country. The highest effect is found for the Irish exposure to US-specific trade cost shocks, at .40. The difference with and without IO linkages is sizeable because countries that tend to trade more together, also have more intertwined IO relationships which amplifies the direct effect of any foreign shock.

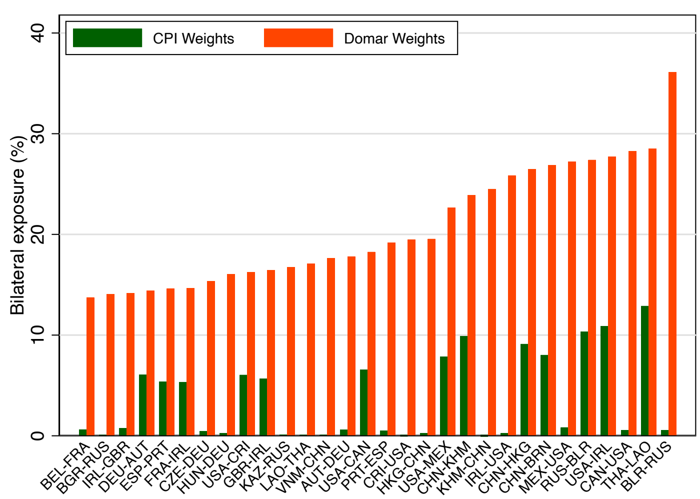
As an illustration of the evolution of amplification forces, Figure D6(a) compares the US direct exposure to Chinese shocks (a 1% productivity increase) through final consumption (green dots) and the country's overall exposure, through direct and indirect trade (orange dots). Compared to a world without input-output linkages, the US exposure to Chinese shocks is more than three times higher in 2020. This multiplicative factor is also quite high and increasing over time in the other

Figure D4: Incidence of foreign shocks: Full model and counterfactual without IO amplification



Notes: The figure compares the elasticity of real GDP to uniform trade cost shocks, in the full model ("Domar weights") and in a counterfactual without IO linkages ("CPI weights"). "CPI weights" is simply defined as the sum of b_{int} weights, across foreign produced goods $(1 - \pi_{nn})$. The "Domar weights" term is defined as $\sum_{\ell \neq n}(\pi_{\ell n} + \breve{\pi}_{\ell n,n})$. Source: TiVA, 2018. The figure is restricted to the 20 largest economies in the world.

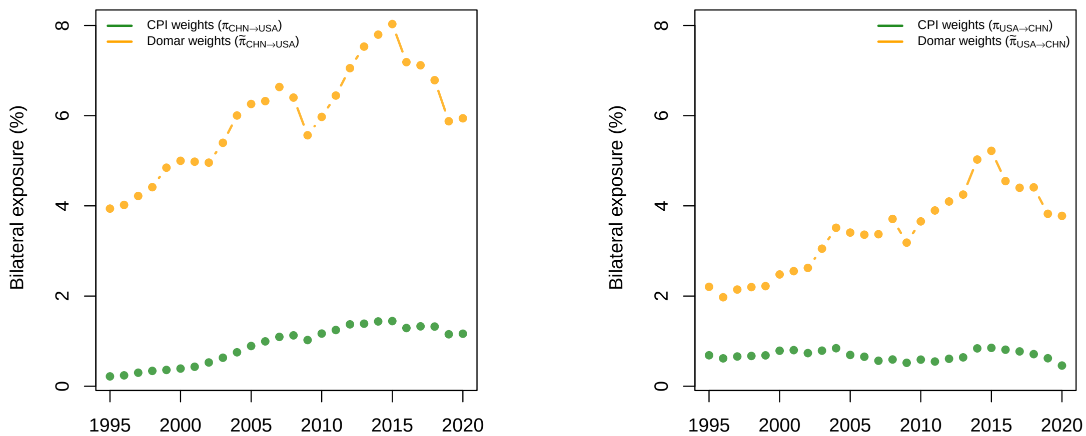
Figure D5: Incidence of bilateral shocks: 30 most dependent pairs



Notes: The figure shows the elasticity of real GDP to a bilateral trade cost shock, among the 30 most dependent country pairs in the data. Dependence is measured by bilateral Domar weights ("Domar weights", defined as $\pi_{mn} + \breve{\pi}_{mn}$) and in terms of "CPI weights" (π_{mn}. Source: TiVA, 2018.

direction. Although trade in intermediates does not affect the qualitative relationship between trade and geoeconomic factors, accounting for the development of global value chains since the mid-1990s is quantitatively important.

Figure D6: Amplification of a 1% productivity shock along value chains



US exposure to China — Chinese exposure to the US

Notes: The figure compares the contribution of Chinese products to US final consumption ("CPI weights") and the overall exposure of the US to Chinese products, directly or indirectly through value chains ("Domar weights"). Source: TiVA.

E Parametric assumptions of the simulated trade model

In this section, we parametrize the model in section 2.3 in a way that is amenable to calibration with global IO data. The world is composed of a set N of countries and J sectors. Countries are indexed by m and n, sectors by i and j. Each sector×country is composed of a representative firm that produces out of domestic value added and inputs. The sector×country pairs are thus the data counterpart of the producers $i \in G$ in the general model. Countries trade both intermediate and final goods. The notation follows the convention that the first subscript always denotes the exporting (source) country, and the second subscript the importing (destination) country. Finally, the set of factors is restricted to one factor per country, which we interpret as equipped labor. Labor is perfectly mobile across sectors and immobile across countries.

Households. There is a household of size $\overline{L}_n$ in country n. The final consumption aggregate is a CES aggregator of goods j, with expenditure shares $\vartheta_{n,j}$: $C_n = \left[\sum_j \vartheta_{n,j}^{\frac{1}{\theta}} C_{n,j}^{\frac{\theta-1}{\theta}}\right]^{\frac{\theta}{\theta-1}}$, where $C_{n,j}$ is final consumption of sector j. Therefore, the ideal consumption price index is: $P_n =$

$\left[\sum_j \vartheta_{n,j} P_{n,j}^{1-\theta}\right]^{\frac{1}{1-\theta}}$, where $P_{n,j}$ is the price index of sector j goods in country n. Each sector's consumption is an Armington aggregate of origin-specific components: $C_{n,j} = \left[\sum_m \mu_{mn,j}^{\frac{1}{\sigma_j}} c_{mn,j}^{\frac{\sigma_j - 1}{\sigma_j}}\right]^{\frac{\sigma_j}{\sigma_j - 1}}$, where $c_{mn,j}$ is final consumption in country n of sector j imports from country m. Then the price index for sector j consumption in country n is: $P_{n,j} = \left[\sum_m \mu_{mn,j} P_{mn,j}^{1-\sigma_j}\right]^{\frac{1}{1-\sigma_j}}$, where $P_{mn,j}$ is the price index for exports from m to n in sector j, defined below. Final expenditure in n on goods coming from country m sector j is:

$$P_{mn,j} c_{mn,j} = \frac{\mu_{mn,j} P_{mn,j}^{1-\sigma_j}}{P_{n,j}^{1-\sigma_j}} \frac{\vartheta_{n,j} P_{n,j}^{1-\theta}}{P_n^{1-\theta}} w_n \overline{L}_n = \pi_{mn,j}^c \pi_{n,j}^c w_n \overline{L}_n,$$

where $\pi_{mn,j}^c$ denotes the share of country m in the consumption of sector j by consumers located in n and $\pi_{n,j}^c$ is the share of sector j in their overall (nominal) consumption. The product of $\pi_{n,j}^c$ and $\pi_{mn,j}^c$ corresponds to the CPI weight b_{jn} in the general model of section 2.3.

Firms. The representative firm in each sector faces downward-sloping demand and sets price equal to a constant markup over the marginal cost.[9] The representative firm in sector j located in m faces an iceberg cost $\tau_{mn,j}$ to export to n. $A_{m,j}$ denotes total factor productivity. The production functions involves a quantity $l_{m,j}$ of equipped labor and a bundle of inputs $X_{m,j}$:

$$q_{m,j} = A_{m,j} \left[\alpha_{m,j}^{\frac{1}{\lambda}} l_{m,j}^{\frac{\lambda-1}{\lambda}} + (1-\alpha_{m,j})^{\frac{1}{\lambda}} X_{m,j}^{\frac{\lambda-1}{\lambda}}\right]^{\frac{\lambda}{\lambda-1}},$$

where $\alpha_{m,j}$ is a parameter governing the firm's labor share. The intermediate input bundle writes:

$$X_{m,j} = \left[\sum_i \gamma_{m,ij}^{\frac{1}{\omega}} X_{m,ij}^{\frac{\omega-1}{\omega}}\right]^{\frac{\omega}{\omega-1}},$$

where $X_{m,ij}$ is the use of inputs from sector i by firm j in country m, and $\gamma_{m,ij}$ is the parameter governing the use of inputs sourced from sector i. $X_{m,ij}$ is again a CES aggregator of country-specific flows:

$$X_{m,ij} = \left[\sum_n \beta_{nm,ij}^{\frac{1}{\sigma_j}} x_{nm,ij}^{\frac{\sigma_j-1}{\sigma_j}}\right]^{\frac{\sigma_j}{\sigma_j-1}}.$$

Note that we assume that the sector-specific elasticity of substitution across countries is the same in intermediate and final consumption (σ_j). Sectoral elasticities are later calibrated with trade

[9] The general model presented in main text has marginal cost pricing. This is immaterial for the log changes that drive all equilibrium relationships in our theory.

elasticities, that do not distinguish between final and intermediate good trade flows.

It follows that the cost of the input bundle is

$$P^I_{m,j} = \left[\alpha_{m,j} w_m^{1-\lambda} + (1-\alpha_{m,j})\left(P^X_{m,j}\right)^{1-\lambda}\right]^{\frac{1}{1-\lambda}}, \tag{E36}$$

and the sector-specific cost of intermediate inputs $P^X_{m,j}$ is given by:

$$P^X_{m,j} = \left[\sum_i \gamma_{m,ij}\ {P^X_{m,ij}}^{1-\omega}\right]^{\frac{1}{1-\omega}}, \text{ where } P^X_{m,ij} = \left[\sum_n \beta_{nm,ij}\ {P_{nm,i}}^{1-\sigma_j}\right]^{\frac{1}{1-\sigma_j}}.$$

The equilibrium price set by the representative firm in sector j, country m is

$$P_{nm,j} = \frac{\sigma_j}{\sigma_j - 1}\frac{\tau_{nm,j} P^I_{n,j}}{A_{n,j}} \tag{E37}$$

Equilibrium. Market clearing for exports from m to n in sector j is:

$$y_{mn,j} = \pi^c_{mn,j}\pi^c_{n,j}\left[w_n \overline{L}_n + \Pi_n\right] + \sum_i \frac{\sigma_i - 1}{\sigma_i}(1-\pi^l_{n,i})\pi^M_{mn,ij}\pi^M_{n,ij}\sum_k y_{nk,i}, \tag{E38}$$

where $\pi^l_{n,i}$, $\pi^M_{n,ij}$ and $\pi^M_{mn,ij}$ are sectoral expenditure shares on labor and inputs, respectively:

$$\pi^l_{n,i} = \frac{\alpha_{n,i} w_n^{1-\lambda}}{\alpha_{n,i} w_n^{1-\lambda} + (1-\alpha_{n,i})\left(P^X_{n,i}\right)^{1-\lambda}}$$

$$\pi^X_{n,ij} = \frac{\gamma_{n,ij}\ {P^X_{n,ij}}^{1-\omega}}{\sum_i \gamma_{n,ij}\ {P^X_{n,ij}}^{1-\omega}},$$

$$\pi^X_{mn,ij} = \frac{\beta_{mn,ij} P^{1-\sigma_j}_{mn,i}}{\sum_m \beta_{mn,ij} P^{1-\sigma_j}_{mn,i}}.$$

In equation (E38), the first line is the final demand, and the second is the intermediate demand. Note that the intermediate demand is a summation of sectoral intermediate demands, and thus captures the notion that not all sectors will import inputs from a particular foreign sector-country with the same intensity. The factor shares map with the cost-based input-output matrix in section 2.3:

$$\Omega_{mn,ij} \equiv \pi^X_{n,ij} * \pi^X_{mn,ij} * (1-\pi^l_{n,i}), \quad \Omega^F_{n,i} \equiv \pi^l_{n,i}.$$

Finally, total labor compensation in the sector writes: $w_n L_{n,j} = \frac{\sigma_j - 1}{\sigma_j} \pi^l_{n,j} \sum_m y_{nm,j}$, which implies the following labor market clearing condition:

$$w_n \overline{L}_n = \sum_j \frac{\sigma_j - 1}{\sigma_j} \pi^l_{n,j} \sum_m y_{nm,j}. \tag{E39}$$

Equations (E37), (E38), and (E39) defines equilibrium wages, prices, and expenditures.

F Responses to shocks

F.1 A shock formulation of the model.

We start by re-writing the general equilibrium of the model in proportional change relative to pre-shock values, and denote that change with $\hat{x} = x/x_0$.

- The product market clearing equation (E38) can be written as:

$$\begin{aligned} y_{mn,j,0}\hat{y}_{mn,j} = \hat{\pi}^c_{mn,j}\hat{\pi}^c_{n,j}\left[\hat{w}_n \hat{\overline{L}}_n s^L_{n,0} + \hat{\Pi}_n s^{\Pi}_{n,0}\right] \pi^c_{mn,j,0}\pi^c_{n,j,0} P_{n,0} C_{n,0} \\ + \sum_i \frac{\sigma_i - 1}{\sigma_i} \pi^M_{n,ji,0}\pi^M_{mn,ji,0}(1 - \pi^l_{n,i,0}\hat{\pi}^l_{n,i})\hat{\pi}^M_{n,ji}\hat{\pi}^M_{mn,ji} \sum_k \hat{y}_{nk,i} y_{nk,i,0}, \end{aligned} \tag{F40}$$

  where $s^L_{n,0}$ is the pre-shock share of labor (/ factor payments) in the total final consumption expenditure, and $s^{\Pi}_{n,0}$ is the share of profits.

- The labor market clearing equation (E39), once expressed in terms of proportional changes, becomes:

$$\sum_j \sum_k \frac{\sigma_j - 1}{\sigma_j} \frac{\pi^l_{n,j,0} y_{nk,j,0}}{w_{n,0}\overline{L}_{n,0}} \left[\widehat{\pi}^l_{n,j}\widehat{y}_{nk,j} - \widehat{w}_n \widehat{\overline{L}}_n\right] = 0. \tag{F41}$$

- Changes in prices are:

$$\widehat{P}_{mn,j} = \widehat{\tau}_{mn,j}\widehat{P}^I_{m,j}\widehat{A}^{-1}_{m,j}, \tag{F42}$$

$$\widehat{P}_{n,j} = \left[\sum_m \widehat{P}^{1-\sigma_j}_{mn,j}\pi^c_{mn,j,0}\right]^{\frac{1}{1-\sigma_j}}, \tag{F43}$$

$$\widehat{P}_n = \left[\sum_j \widehat{P}^{1-\theta}_{n,j}\pi^c_{n,j,0}\right]^{\frac{1}{1-\theta}}. \tag{F44}$$

$$\widehat{P}^I_{m,j} = \left[\pi^l_{m,j,0}\widehat{w}^{1-\lambda}_m + (1-\pi^l_{m,j,0})\left(\widehat{P}^M_{m,j}\right)^{1-\lambda}\right]^{\frac{1}{1-\lambda}}, \tag{F45}$$

$$\widehat{P}^X_{m,j} = \left[\sum_i \pi^M_{m,ij,0}\ \widehat{P}^M_{m,ij}{}^{1-\omega}\right]^{\frac{1}{1-\omega}}, \tag{F46}$$

$$\widehat{P}^X_{m,ij} = \left[\sum_n \pi^M_{nm,ij,0}\widehat{P}^{1-\sigma_j}_{nm,i}\right]^{\frac{1}{1-\sigma_j}}, \tag{F47}$$

- Finally, the equations above require knowing adjustements in trade shares (π's). These can be expressed as:

$$\hat{\pi}^c_{mn,j} = \frac{\widehat{P}^{1-\sigma_j}_{mn,j}}{\sum_m \widehat{P}^{1-\sigma_j}_{mn,j}\pi^c_{mn,j,0}}, \tag{F48}$$

$$\hat{\pi}^c_{n,j} = \frac{\widehat{P}^{1-\theta}_{n,j}}{\sum_j \widehat{P}^{1-\theta}_{n,j}\pi^c_{n,j,0}}, \tag{F49}$$

$$\hat{\pi}^l_{m,j} = \frac{\widehat{w}^{1-\lambda}_m}{\pi^l_{m,j,0}\widehat{w}^{1-\lambda}_m + (1-\pi^l_{m,j,0})\left(\widehat{P}^X_{f,m,j}\right)^{1-\lambda}}, \tag{F50}$$

$$\hat{\pi}^X_{m,ij} = \frac{\widehat{P}^X_{m,ij}{}^{1-\omega}}{\sum_i \pi^X_{m,ij,0}\ \widehat{P}^X_{m,ij}{}^{1-\omega}}. \tag{F51}$$

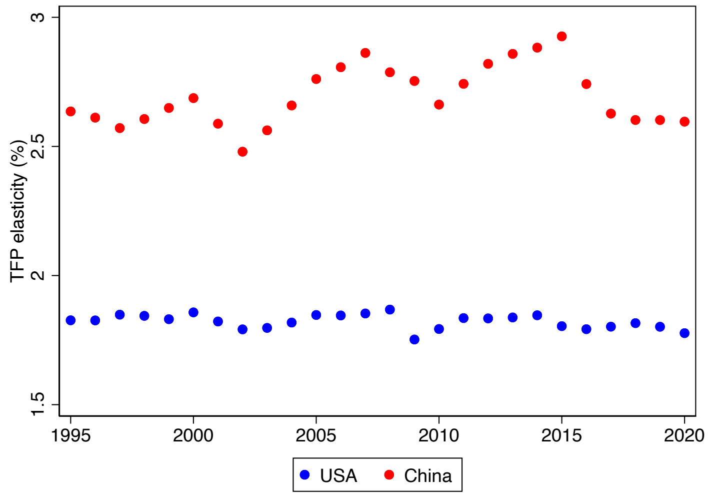
$$\hat{\pi}^X_{nm,ij} = \frac{\widehat{P}^{1-\sigma_j}_{nm,i}}{\sum_n \pi^X_{nm,ij,0}\widehat{P}^{1-\sigma_j}_{nm,i}}. \tag{F52}$$

F.2 Definition of war damages

In our baseline experiment, a war involves the following damages:

1. Economic damages: Economic damages are calibrated using estimates recovered by Federle et al. (2024) using 150 years of data on large interstate wars. Our target is a 13% contraction in real output, which corresponds to the discounted value of the dynamic adjustment recovered in their Figure 5. The average 13% real output contraction is implemented using country-specific TFP shocks, to take into account the fact that TFP losses have heterogeneous consequences on countries that differ by their integration in world trade: $\alpha_\ell = \log \hat{A}_{\ell,j} = \frac{13}{\varepsilon^{TFP}_\ell}, \quad \forall j \quad \text{and} \quad \ell = m, n$, where ε^{TFP}_ℓ measures the real GDP response of the ℓ economy to a uniform 1% shock to sectoral TFPs. Figure F7 illustrates the heterogeneity in TFP elasticities using the US and China as an example.

Figure F7: Elasticity of real output to a 1% TFP loss: US and China over 1995-2020



2. Human damages: In the baseline calibration, human losses are neglected, i.e.

$$\Gamma = \log \widehat{\widehat{L}}_\ell = 0, \quad \ell = m, n.$$

When the leader's utility function involves the (log of) real consumption, human losses have a one-to-one effect on the opportunity cost of wars, whatever the structure of world trade.

3. Trade disruptions: The trade disruption parameters are retrieved from Glick and Taylor (2010) who analyze a sample covering the two world wars. Their gravity estimates indicate that trade between belligerent countries declines by 85% compared to gravity-predicted trade, and by 12% with neutral countries. As a consequence, we simulate the following change in iceberg trade costs: $\tau_{\text{mul}} = \log \hat{\tau}_{m\ell,j} = \log \hat{\tau}_{\ell m,j} = \frac{1}{1-\sigma_j} \times (-.12), \quad \forall j, \ \ell \notin \{m, n\}$, and $\tau_{\text{bil}} = \log \hat{\tau}_{mn,j} = \log \hat{\tau}_{nm,j} = \frac{1}{1-\sigma_j} \times (-.85), \quad \forall j.$

This set of parameters is sufficient for estimating OCWs. However, in order to calculate the other geoeconomic factors, one needs to calibrate one additional parameter, η, that represents informational noise in diplomatic negotiations. This parameter is used as a free parameter, to target the probability of de-escalation in the baseline (factual) equilibrium. We compare results recovered from an increasingly insecure world, in which the probability of de-escalation in the baseline equilibrium varies from 1 to .6.

G Additional results

Figure G8: Evolution of Chinese imports by continent

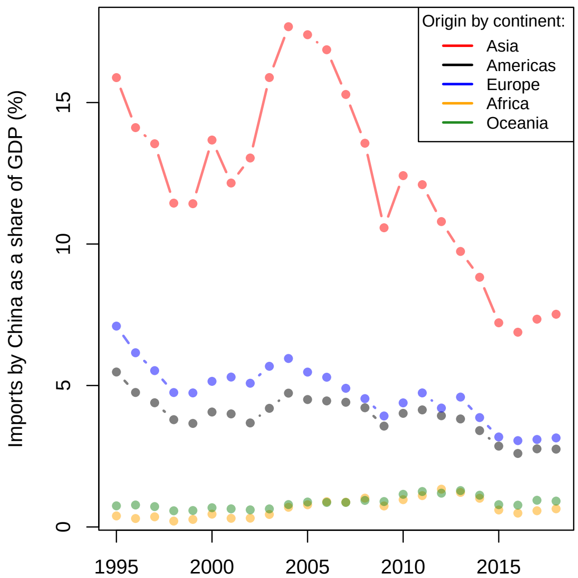


Table G1: Expenditure shares, 2018 vs USA derisking (25%) wrt CHN

Exporter / Importer	USA	China	RoNafta	RoW
		Flows 2018		
USA	91.50	1.68	1.64	5.18
CHN	0.49	94.58	0.11	4.82
RoNAFTA	8.72	3.29	81.11	6.89
RoW	1.38	2.23	0.21	96.19
		Derisking counterfactual		
USA	91.84	0.57	1.75	5.84
CHN	0.41	95.09	0.10	4.40
RoNAFTA	8.39	3.73	80.72	7.16
RoW	1.27	2.43	0.20	96.10

Figure G9: US and Chinese wages: Unilateral US increase in tariffs ($s_{2018} = 1$)