US Tariffs in a Model with Trade and FDI

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January 2025

Abstract

The new US administration has a clear agenda of reducing imports to the US and attract FDI. As a vehicle for achieving this goal the US government considers to impose tariffs on imports and use tariff revenues to support investment in the US. This paper uses a dynamic two country US vs RoW model where firms make export and FDI decisions to study how this additional FDI channel affects the impact of import tariffs on the US and RoW economy. Concerning the use of tariff revenues, we consider both transfers to households and investment subsidies. We also consider zero, partial and full retaliation of the RoW. While in models of international trade the EoS between domestic and foreign products is crucial for the quantitative effects of policies, in models with trade and FDI results depend importantly on the EoS between imports and inward FDI sales (as well as exports and outward FDI sales). In this regard our parametrization is based on estimates by Helpmann et al (2004) and on the outcome of the Trump tariff measures in 2018. In all our experiments we assume an across the board US tariff increase of 10pp. We find that a unilateral US tariff with transfers to households has positive effects on consumption and leads to rising inward FDI and reduces US imports. The same pattern applies to exports and outward FDI. However, there are crowding out effects for investment of domestic firms which make total investment negative. If tariffs are accompanied by investment subsidies total investment becomes positive and the expansionary effects are significantly larger. This is because subsidies target distortions inflicted by monopoly rents and low savings rates of OLG households. In case of full retaliation, the US is worse off against a RoW coalition since higher US openness leads to higher cost for imported intermediate inputs and investment goods in the US. This is reversed in case of subsidies. Here higher openness of the US generates more tariff revenues as a share of GDP and therefore more investment subsidies. However, the Trump 1.0 tariffs were only retaliated by about 25%. For this case we show that in the transfer case the RoW tariffs are insufficient to make the US worse off. (*JEL* F13, F21, F23, F41, O24)

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I. Introduction

With the first presidency of Donald Trump, US trade policy took a sharp protectionist turn. Addressing concerns about the US external imbalance and claiming that unfair trade practices were harming US industries, the Trump Administration imposed tariffs on a broad range of imports, particularly on Chinese goods, which marked the beginning of the trade war in 2018. Besides threatened but unimplemented tariffs, safeguard tariffs on solar panels and washing machines, as well as national security tariffs on steel (25% from most countries) and aluminum (10% from most countries), were the most notable measures. In 2018, 14.9% of total US imports were hit by Trump's special tariffs, with roughly 50% of these targeting Chinese imports (Bown and Zhang 2019). In response, most countries affected by these tariffs enacted retaliatory measures. Nevertheless, analysis from the Congressional Research Service reveals that the estimated annual trade affected by tariff actions on US imports in 2019 was four times larger than that of US exports affected by retaliatory actions (CRS 2020).

This protectionist shift of the world's largest economy caused a growing skepticism about globalization in the US and globally. The aggressive trade policy of the Trump Administration was particularly driven by the intention to decouple the US economy from China. Moreover, the Covid shock and Russia's aggression towards Ukraine further intensified this dynamic, which accelerated the trend of the fragmentation in the global economy and caused a disruption of the global supply chain (Attinasi et al. 2023).

During the 2024 election campaign and after becoming the 47th president in January 2025, Donald Trump signaled an even more protectionist trade policy than in his first term. Right after his inauguration, he announced plans to impose a universal tariff on all imports and threatened to impose tariffs of up to 100% on Chinese goods, 25% on Canadian and Mexican imports, as well as additional tariffs on EU products. This represents a significant escalation in protectionism compared to his first term, with tariff coverage rising from 14.9% to 100% of imports. Besides that, Trump outlined a plan to use the revenue gained from these tariffs for benefiting US citizens: "*Instead of taxing our citizens to enrich other countries, we will tariff and tax foreign countries to enrich our citizens*" (Financial Times 2025). In earlier speeches and interviews he proposed redirecting these tariff revenues toward tax cuts and subsidies for American businesses, with the stated goal of stimulating investment and employment growth (CNBC, 2024). However, critics

argue that this approach could significantly burden consumers through higher prices for imported goods, effectively acting as a regressive tax on households (Gleckman 2024).

Several recent studies discuss the economic costs of these protectionist measures. Bouët et al. (2024) use the MIRAGE model and show that a 10 percentage-point increase in US tariffs on all trading partners – plus an extra 60 percentage points on Chinese imports – would reduce global GDP by 0.5% and US GDP by 1.3% by 2030. McKibbin et al. (2024) estimate that a 10% universal tariff, together with retaliation, could lower US real GDP by about 0.25 percentage points. Their analysis also suggests that an appreciation of the US dollar would offset any price advantage from tariffs. Autor et al. (2024) find that Trump's tariffs in his first term did not create many jobs in the protected sectors, and that China's counter-tariffs significantly harmed US exporters. These findings match earlier work by Furceri et al. (2018), which shows that increasing tariffs weakens competitiveness over time.

While most studies focus on GDP, trade flows, and employment, there is less work on how tariffs affect foreign direct investment (FDI). One theory is that foreign firms might open local production (so-called "tariff-jumping" FDI) to bypass higher tariffs. However, policy uncertainty and retaliatory measures can discourage new investments in the US, particularly due to higher prices for investment and intermediate goods. Our framework incorporates both trade and FDI channels, that allows to analyze long-term shifts and structural dynamics in the global economy including the reallocation of cross-border value chains. By treating the first Trump term as a revealing natural experiment, our aim is to shed new light on the effects of various scenarios for Trump's second term of protectionist trade policies, particularly on the interplay of trade and FDI decisions of multinational enterprises (MNEs) as well as capital flows and supply chain dynamics. To the best of our knowledge, this is the first analysis applying such a framework to investigate the effects of tariffs.

The rest of the paper is organized as follows: Section II presents stylized facts on trade and FDI patterns during Trump's first presidency. Section III explains our trade and FDI model. Section IV describes the calibration strategy and historical simulations for Trump's first term. In Section V, we use the model to explore possible outcomes of "Trump 2.0" scenarios, including retaliation and subsidies. We then conclude by discussing the policy implications of our findings for the US and its trading partners.

II. US Trade and FDI Dynamics during Trump 1.0

During the last decades, the US exports and imports relative to GDP showed a rather stable level at around 9.3%-13.8% and 11.8%-17.4%, respectively – see Figure 1. In contrast, both inward and outward FDI stock in the US demonstrated a substantial increase during the same period. Especially the US outward FDI relative to GDP tremendously gained in importance from about 10% in the mid-90s up to about 31% in 2017, particularly due to the TFP increases of US MNEs (Celebi et al. 2024).

As regards the effects of the Trumpian trade policy it should be noted here, that the impact of the Corona shock on global trade and FDI dynamics affects the interpretation of trends. Nevertheless, there are some developments indicating reaction towards the protectionist policies of the Trump administration. While Chinese imports were hit the most, the overall impact of the Trumpian trade policy seems to be negative but limited. However, there is a more pronounced movement in US FDI stocks. The US outward FDI stock, as a percentage of GDP, decreased from 31.1% to an average of 27.2% during the period from 2018 to 2022. Meanwhile, the inward FDI stock, as a percentage of GDP, slightly increased from 20.2% in 2017 to an average of 20.6% between 2018 and 2022.

To reflect how foreign markets are supplied with products – through exports or via subsidiaries established through FDI – it is crucial to consider the output of inward and outward FDI alongside the trade channel. Figure 2 and Figure 3 show the sales of US and RoW MNEs abroad as well as US imports and exports. More specifically, the relationship between trade and FDI sales are reflected using US imports-to-inward FDI sales and US exports-to-outward FDI sales ratios. Both ratios indicate a decreasing trend after 2016. Relative to 2016, the US imports-to-inward FDI sales ratio declines by an average of approximately 7.5% in the subsequent years, while the US exports-to-outward FDI sales ratio decreases by 5.2%. These trends suggest that both US and RoW MNEs have shown a tariff-jumping behavior during the phase of increasing trade barriers.

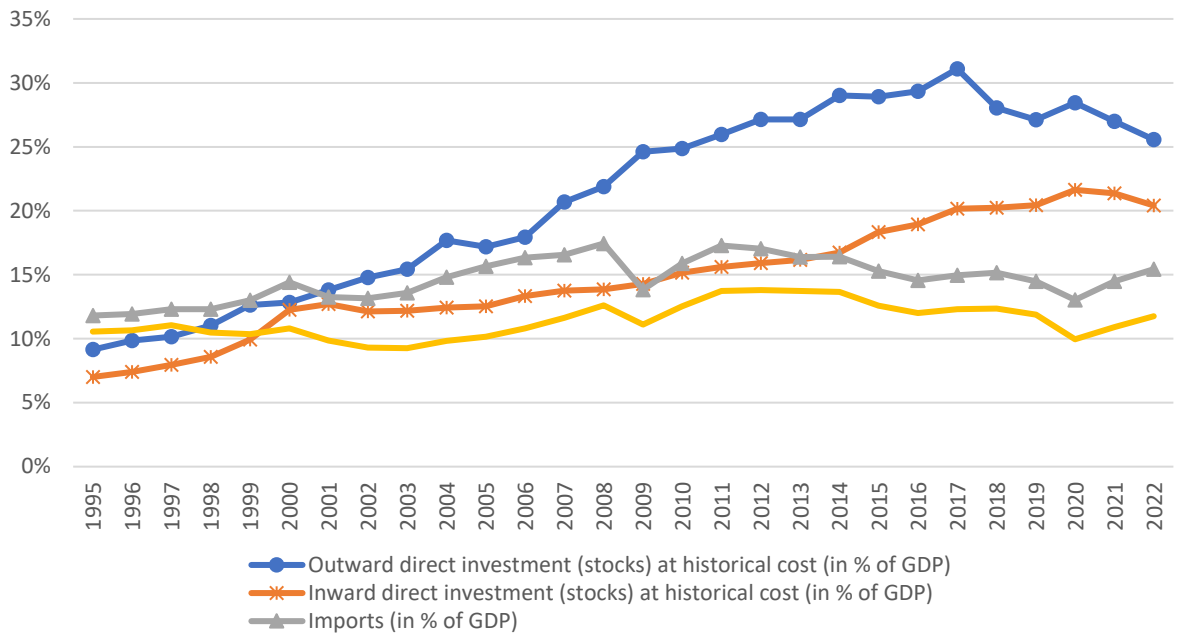


FIGURE 1.US TRADE AND FDI DYNAMICS

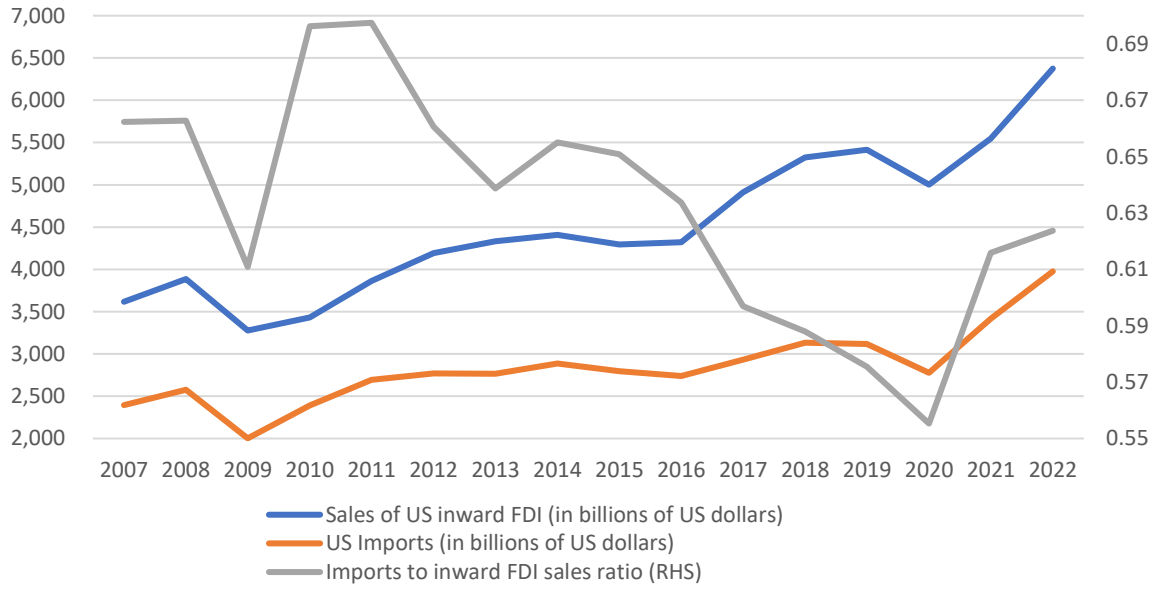


FIGURE 2. US IMPORTS VS. SUBSIDIARY SALES OF ROW MNES OPERATING IN THE US.

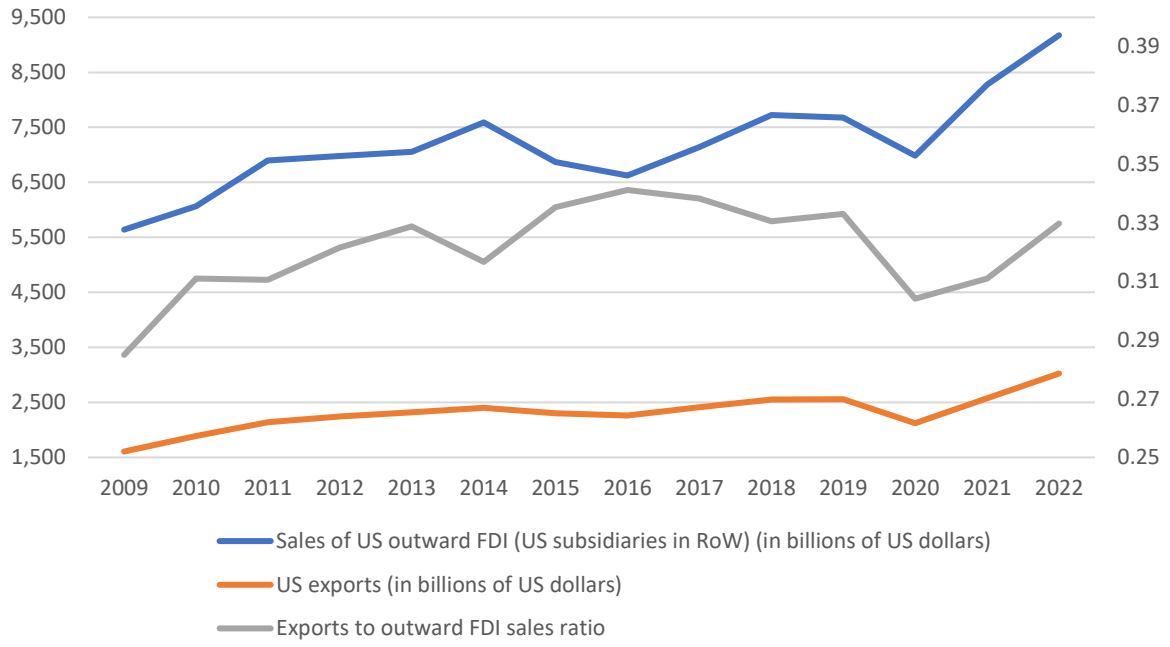


FIGURE 3. US EXPORTS VS. SUBSIDIARY SALES OF US MNES ABROAD.

III. Trade & FDI Model

In this section, we add an FDI decision to a two region model of the world economy consisting of the US and the rest of the world ($c = (US, RoW)$[1]). The model distinguishes between (type 1) firms that conduct international sales via exports and (type 2) firms that sell internationally via foreign subsidiaries, i.e. type 2 firms conduct international transactions with the RoW via FDI. Instead of export revenues, the domestic type 2 firm receives rental income and profits/monopoly rents from its foreign operations. Thus, type 2 firms are dominated by multinational companies which produce internationally. The only trade of type 2 firms is intra-firm trade. The multinational company exports capital produced in the headquarters to its foreign affiliates.

A. Households

We use a discrete-time version of Blanchard's (1985) model of perpetual youth as a tractable OLG model. The economy is populated by different age cohorts of unitary size (born in period s)

[1] In our model discussion, superscript c generally refers to the RoW, while the superscript *c** refers to the US.

which face a constant probability of death ($p = 1 - \gamma$). Given our interest in the effects of permanent shocks and longer-term trends of the current account, we abstract from aggregate uncertainty. Each household in country *c* maximizes an intertemporal utility function over domestic consumption goods produced by type i domestic firms ($i = 1,2$) ($C_{i,s,t}$), as well as imported goods and goods produced by the subsidiary of the foreign type 2 firm, which are denoted by subscripts *m* and *f* respectively ($C_{m,s,t}, C_{f,s,t}$). Preferences over all four categories of goods are characterized by a CES utility function

$$C_{s,t}^{c} = \left[\sum_k s^{k\frac{1}{\sigma}} C_{k,s,t}^{c}{}^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}} \tag{1}$$

with an elasticity of substitution equal to σ and share parameters s^k (with $k = (1,2,m,f)$). We assume home bias $s^{k^d} > s^{k^f}, k^d = (1,2), k^f = (m,f)$. $C_{k,s,t}^{c}$ is itself a CES aggregate across goods produced by a continuum of monopolistically competitive firms, indexed by $l\epsilon[0,1]$

$$C_{k,s,t}^{c} = \left[\int_0^1 C_{k,s,t}^{c}(j,l)^{\frac{\varepsilon-1}{\varepsilon}} dl\right]^{\frac{\varepsilon}{\varepsilon-1}}. \tag{2}$$

The household receives labor income from employment $L_{1,s,t}^{c}$ and $L_{2,s,t}^{c}$ in type 1 and 2 firms as well as from employment by the subsidiary of the foreign type 2 firm $L_{f,s,t}^{c}$ at a common wage rate W_t^c. Asset markets are incomplete[2] and financial transactions in each country are restricted to four assets, namely a domestically traded bond $B_{s,t}^{c}$ in zero net supply each period, which pays one period interest rate i_t^c and (end of period) a number of shares $S_{i,s,t}^{c}$ from domestic type i firms, valued at price $q_{i,t}^{c}$, respectively. Firms pay their net cash flow as dividends $div_{i,t}^{c}$ per share to the representative cohort member. International financial transactions are conducted via an internationally traded bond $B_{s,t}^{W,c}$, which is denominated in US dollars and which pays interest at rate i_t^{US}, and where E_t is the nominal exchange rate (expressed in units of RoW currency, per unit of Dollars ($\Delta E_t > 0$: depreciation of RoW currency).

[2] It is difficult to conceptualize complete financial contracts with as yet unborn future cohorts.

(3) $$F_{s,t}^{c} = B_{s,t}^{W,c} E_t + B_{s,t}^{c} + q_{1,t}^{c} S_{s,t}^{c,1} \; + q_{2,t}^{c} S_{s,t}^{c,2}.$$

In order to distinguish between safe and risky assets in household portfolios, we follow Krishnamurthy and Vissing-Jorgensen (2012) and introduce preferences for domestic bonds in both regions and the dollar denominated bond for RoW households. Similarly, for generating an equity premium we allow for a disutility of holding physical capital,

(4) $$U(.) = \frac{1}{1-\sigma^c} C_{s,t}^{c\ \sigma^c} + \xi_t^{W,c} V^{B,W}\left(\frac{B_{s,t}^{W,c} E_t}{C_{s,t}^{c}}\right) + \xi_t^{c} V^{B}\left(\frac{B_{s,t}^{c}}{C_{s,t}^{c}}\right) - \zeta_t^{c} V^{S}\left(\frac{S_{s,t}^{c,1}+S_{s,t}^{c,2}}{C_{s,t}^{c}}\right)$$

where $V^{B,W}(\cdot)$, $V^{B}(\cdot)$ and $V^{S}(.)$ is increasing and concave and $\xi_t^{W,c} \geq 0,\ \xi_t^{c} \geq 0,\ \zeta_t^{c} \geq 0$, denote exogenous demand shifters, whereas σ^c denotes the inverse of the intertemporal elasticity of substitution of consumption. Importantly, we follow Fisher (2014) who provides conditions under which only $\xi_t^{W,c},\ \xi_t^{c},\ \zeta_t^{c}$ appear in the first order condition for the respective assets. Because the international tradable bond is denominated in dollars, US households only have access to the US bond as a safe asset, while RoW households can diversify their portfolio over domestic and US bonds. Within our model a flight to safety shock is represented by $\xi_t^{W,RoW} \geq 0$, while a global risk premium shock is characterized by $\xi_t^{c} \geq 0, c = US, ROW$. An equity premium shock[3] is given by $\zeta_t^{c} \geq 0, c = US, RoW$.

Households write a contract with an insurance company which pays them a premium equal to $pF_{s,t}$ each period, with the proviso that the insurance company receives the total financial wealth of the household in the case of death. Due to the positive probability of death, the effective discount rate exceeds the rate of time preference

(5) $$U_{s,0}^{c} = \sum_{t=0}^{\infty} (\beta\gamma)^t\, U\left(C_{s,t}^{c}, \frac{B_{s,t}^{W,c} E_t}{C_{s,t}^{c}}, \frac{B_{s,t}^{c}}{C_{s,t}^{c}} \frac{S_{s,t}^{c,1}+S_{s,t}^{c,2}}{C_{s,t}^{c}}\ \right).$$

The cohort budget constraint is given by:

[3] We use the equity premium shock only to generate a constant return differential between the return of stocks and bonds.

(6) $$B_{s,t}^{W,c}E_t + B_{s,t}^{c} + q_{1,t}^{c}S_{s,t}^{c,1} + q_{2,t}^{c}S_{s,t}^{c,2} = \left(1 + i_{t-1}^{c^*}\right)B_{s,t-1}^{W,c}E_t + (1 + i_{t-1}^{c})B_{s,t-1}^{c} + S_{s,t}^{c,1}div_{1,s,t-1}^{c} + q_{1,t}^{c}S_{s,t-1}^{c,1} + S_{s,t}^{c,2}div_{2,s,t}^{c} + q_{2,t}^{c}S_{s,t-1}^{c,2} + pF_{s,t}^{c} - PI_t^{c}C_{s,t}^{c} + W_t^{c}(L_{1,s,t}^{c} + L_{2,s,t}^{c} + L_{f,s,t}^{c})$$

where PI_t^c is the ideal CES price deflator.

The first order conditions w. r. t. financial assets are given by:

(7a) $$\frac{\partial \mathcal{L}}{\partial C_{s,t}^{c}} = {C_{s,t}^{c}}^{-\sigma^c} - \lambda_{s,t}^{c}PI_t^{c} = 0$$

(7b) $$\frac{\partial \mathcal{L}}{\partial B_{s,t}^{c}} = -\lambda_{s,t}^{c} + \xi_t^{c}U_{B_{s,t}^{c}} = \beta\lambda_{s,t+1}^{c}(1 + i_t^{c}) = 0$$

(7c) $$\frac{\partial \mathcal{L}}{\partial S_{s,t}^{c,i}} = -\lambda_{s,t}^{c}q_{i,t}^{c} - \zeta_t^{c}V_{S_{i,t}}^{S} = \beta\lambda_{s,t+1}^{c}(div_{i,t}^{c,i} + q_{i,t+1}^{c}) = 0$$

(7d) $$\frac{\partial \mathcal{L}}{\partial B_{s,t}^{W,c}} = -\lambda_{s,t}^{c}E_t + \xi_t^{W,c}U_{B_{s,t}^{W,c}}E_t + \beta\lambda_{s,t+1}^{c}\left(1 + i_t^{c^*}\right)E_{t+1} = 0.$$

The first order conditions determine wedges in rates of return between different types of assets. For example, with $\xi_t^c = \xi_t^{W,c} = 0$, $\zeta_t^c > 0$ generates an equity premium. No-arbitrage between the internationally-tradable bond and the domestically-tradable bond determines the interest parity condition between the US and the RoW

(8) $$1 + i_t^{RoW} = \frac{1 + i_t^{US}}{1 - \xi_t^{W,RoW}U_{B_{s,t}^{W,RoW}}}\left(\frac{E_{t+1}}{E_t}\right).$$

Preference for the dollar-denominated financial asset of RoW households ($\xi_t^{W,RoW} > 0$) drives a wedge between the interest rate of the domestic tradable bond and the internationally traded bond in the RoW. Given the medium-term focus of our analysis and to simplify the discussion of transmission channels of the diverse shocks we assume inelastic labor supply.

B. Corporate Sector

There are two types of firms in each country, distinguished by the way firms conduct international operations. Type 1 firms sell internationally by exporting and type 2 firms supply the foreign market via foreign subsidiaries, i.e. type 1 firms conduct international transactions with the RoW via FDI.

Type 1 Firms

The representative type 1 firm produces output $Y_{1,\mathrm{t}}^{c}$ which is a CES aggregate of value added $VA_{1,t}^{c}$ and an aggregate of intermediate inputs $Z_{1,t}^{c}$

(9a) $$Y_{1,\mathrm{t}}^{c} = \left(VA_{1,t}^{c}{}^{\frac{\omega-1}{\omega}} + Z_{1,t}^{c}{}^{\frac{\omega-1}{\omega}}\right)^{\frac{\omega}{\omega-1}}$$

Value added is itself a Cobb Douglas function of capital $K_{1,\mathrm{t}}^{c}$ and labor $L_{1,\mathrm{t}}^{c}$ and a labor augmenting technology term A_{1}^{c}

(9b) $$VA_{1,\mathrm{t}}^{c} = (A_{1}^{c}L_{1,\mathrm{t}}^{c})^{\alpha}K_{1,\mathrm{t}}^{c}{}^{1-\alpha}.$$

The capital and intermediate aggregate is a CES composite of domestic and foreign capital and we assume identical elasticity of substitution and share parameters as for consumption

Intermediates

(10) $$Z_{1,t}^{c} = \left[\sum_{k} s_{1}^{k\frac{1}{\sigma}} Z_{1,k,t}^{c}{}^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}} \quad k = (1,2,m,f)$$

Capital

(11) $$K_{1,t}^{c} = \left[\sum_{k} s_{1}^{k\frac{1}{\sigma}} K_{1,k,t}^{c}{}^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}} k = (1,2,m,f)$$

The representative type 1 firm is monopolistically competitive and faces price elasticity ε_{1}^{c} in the domestic market and $\varepsilon_{1}^{c^{*}}$ in the foreign market. In order to simplify, we assume that the firm faces the same price elasticity in domestic and foreign markets, i.e., the firm charges the same markup at home and abroad. Firms conduct domestic cost pricing in export markets. All type 1

firms pay the country-specific wage, i.e., we assume homogenous labor in each country and full mobility of labor across firm types.

The representative type 1 firm seeks to maximize the discounted value of dividends:

(12) $$Max\ V_{1,\mathrm{t}}^{c} = \sum_{j=0}^{\infty} \prod_{k=0}^{j} \left(\frac{1}{1+i_{t+k}^{c}}\right)^{k} div_{1,t+j}^{c}$$

where

(13) $$div_{1,t}^{c} = P_{1,t}^{c}\left(Y_{1,t}^{D,c}; \varepsilon_{1}^{c}\right) Y_{1,t}^{D,c} + P_{1,t}^{c}\left(X_{1,t}^{c}; \varepsilon_{1}^{c}\right) X_{1,t}^{c} - W_{t}^{c} L_{1,t}^{c} - P_{1,t}^{C^{c}} I_{1,t}^{c}. - P_{1,t}^{C^{c}} Z_{1,t}^{c}$$

This objective is consistent with the no-arbitrage conditions of households for type 1 stocks and implies maximizing the value of the households' type 1 equity. Dividends are distributed to individual cohorts in proportion to their stock holdings, and maximization is subject to the technology and capital accumulation constraint as well as the domestic and foreign demand function.

Type 2 Firms

The representative type 2 firm produces output in the domestic and foreign location $j = 2, f$ $Y_{\mathrm{j,t}}^{c}$ using an identical technology across locations. Output is a CES aggregate of value added $VA_{j,t}^{c}$ and an aggregate of intermediate inputs $Z_{j,t}^{c}$

(14a) $$Y_{\mathrm{j,t}}^{c} = \left(VA_{j,t}^{c}{}^{\frac{\omega-1}{\omega}} + Z_{j,t}^{c}{}^{\frac{\omega-1}{\omega}}\right)^{\frac{\omega}{\omega-1}}, j = 1, f$$

Value added is itself a Cobb Douglas function of capital $K_{\mathrm{j,t}}^{c}$ and labor $L_{\mathrm{j,t}}^{c}$ and a labor augmenting technology term A_{j}^{c} (with $A_{2}^{c} = A_{\mathrm{f}}^{c}$

(14b) $$VA_{\mathrm{j,t}}^{c} = (A_{\mathrm{j}}^{c} L_{2,\mathrm{t}}^{c})^{\alpha} K_{\mathrm{j,t}}^{c}{}^{1-\alpha}.$$

The capital and intermediate aggregate is a CES composite of domestic and foreign capital and we assume identical elasticity of substitution and share parameters as for consumption

The capital and intermediate aggregate is itself a CES composite

(15) $$Z_{j,t}^{c} = \left[\sum_k s_j^{j\frac{1}{\sigma}} Z_{j,k,t}^{c}{}^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}, \ j = 2, f \ .$$

(16) $$K_{j,t}^{c} = \left[\sum_k s_j^{j\frac{1}{\sigma}} K_{j,k,t}^{c}{}^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}, \ j = 2, f \ .$$

The MNCs are monopolistically competitive in home and foreign markets and face price elasticity ε_2^c and ε_f^c respectively. Here, elasticities are also assumed to be identical. The MNC maximizes the present discounted value (PDV) of current and future expected cash flows using the discount factor of the domestic owner. In this case, the multinational corporation decides about domestic and foreign production, domestic and foreign investment, and domestic and foreign employment. The optimization is subject to a technological constraint and a capital accumulation constraint. As with type 1 firms, investment is financed from retained earnings.

The representative type 2 firm seeks to maximize the discounted value of dividends.

(17) $$Max\ PDV_{2,0}^{c} = \sum_{t=0}^{\infty} \prod_{k=0}^{t} \left(\frac{1}{1+i_{t+k}}\right)^{k} \left(div_{2,t}^{c,D} + div_{2,t}^{c,S} E_t \right)$$

where $div_{2,t}^{c,D}$ and $div_{2,t}^{c,S}$ denote dividends of the representative type 2 MNC in the home and foreign market respectively

(18a) $$div_{2,t}^{c,D} = P_{2,t}^{c}\left(Y_{2,t}^{c}; \varepsilon_2^c\right) Y_{2,t}^{c} - W_t^c L_{2,t}^{c} - P_{2,t}^{C^c} I_{2,t}^{c} - P_{2,t}^{C^c} Z_{2,t}^{c}$$

(18b) $$div_{2,t}^{c,S} = \left(P_{f,t}^{c^*}\left(Y_{f,t}^{c^*}; \varepsilon_f^c\right) Y_{f,t}^{c^*} - W_t^{c^*} L_{f,t}^{c^*} - P_{f,t}^{C,FDI^{c^*}} I_{f,t}^{c^*} - P_{f,t}^{C,FDI^{c^*}} Z_{f,t}^{c^*}\right) E_t.$$

Total dividends $div_{2,t}^{c} = div_{2,t}^{c,D} + div_{2,t}^{c,S} E_t$ are distributed to individual cohorts in proportion to their stock holdings.

C. Equilibrium

Equilibrium is characterized by a sequence of prices and quantities that satisfy the equilibrium conditions for goods traded by the three firm types and the labor market in each region and the optimality conditions of households and firms.

Goods market

Type 1 firms:

(19) $$Y_{1,t}^{c} = \sum_{j\epsilon(c,c^{*})} C_{1,t}^{j} + \sum_{j\epsilon(1,2,f)} I_{1,,jt}^{c} + \sum_{j\epsilon(1,2,f)} I_{1,,jt}^{c^{*}} + \sum_{j\epsilon(1,2,f)} Z_{1,,jt}^{c} + \sum_{j\epsilon(1,2,f)} Z_{1,,jt}^{c^{*}}$$

Type 2 firms:

(20) $$Y_{2,t}^{c} = C_{2,t}^{c} + \sum_{j\epsilon(1,2)} I_{2,,jt}^{c} + \sum_{j\epsilon(c,c^{*})} I_{2,fjt}^{j} + \sum_{j\epsilon(1,2)} Z_{2,,jt}^{c} + \sum_{j\epsilon(c,c^{*})} Z_{2,fjt}^{j}$$

FDI firms:

(21) $$Y_{f,t}^{c^{*}} = C_{f,t}^{c^{*}} + \sum_{j\epsilon(1,2)} I_{f,,jt}^{c^{*}} + \sum_{j\epsilon(1,2)} Z_{f,,jt}^{c^{*}}$$

Labor market (domestic economy):

(22) $$L_{t}^{c} = L_{1,t}^{c} + L_{2,t}^{c} + L_{f,t}^{c}.$$

D. Current Account

The current account CA_t^c consists of the trade balance of goods and services TB_t^c, interest income balance from the holding of internationally tradable bonds $IntY_t^c$, and the FDI profit balance PRB_t^c

(23) $$CA_{t}^{c} = TB_{t}^{c} + IntY_{t}^{c} + PRB_{t}^{c},$$

with the trade balance

(24) $$TB_{t}^{c} = (P_{1,t}^{c}X_{1,t}^{c} - P_{1,t}^{c^{*}}E_{t}X_{1,t}^{c^{*}}) + (P_{t,2}^{c}X_{2,t}^{c} - P_{t,2}^{c^{*}}E_{t}X_{2,t}^{c^{*}}),$$

the interest income balance

$$IntY_t^c = i_{t-1}^{c^*} B_{t-1}^{W,c} E_t, \tag{25}$$

and the FDI income balance[4]

$$PRB_t^c = (div_{2,t}^{c,S} E_t - div_{2,t}^{c^*,S}). \tag{26}$$

Foreign assets evolve according to

$$B_t^{W,c} E_t + V_{ft}^c - V_{ft}^{c^*} = \left(1 + i_{t-1}^{c^*}\right) B_{t-1}^{W,c} E_t + \left(P_{1,t}^c X_{1,t}^c - P_{1,t}^{c^*} E_t X_{1,t}^{c^*}\right) + \left(P_{t,2}^c X_{2,t}^c - P_{t,2}^{c^*} E_t X_{2,t}^{c^*}\right) + div_{2,t}^{c,S} E_t + V_{f,t-1}^c - div_{2,t}^{c^*,S} - V_{f,t-1}^{c^*}. \tag{27}$$

IV. Calibration

We consider a highly stylized, two-country US-RoW model of the world economy. The two countries are identical concerning preference and technology parameters. The US produces 25% of the World's GDP. The economy is initially (prior to 2016) in a steady state. To be realistic, a home bias is included, i.e. the share parameters in CES aggregates for consumption and investment are consistent with a US import share of 14.6 percent of GDP (of 2016). The share parameters in the CES aggregate for imports and FDI production are consistent with a share of US outward FDI stock of 28.9 percent of US GDP in 2016. This calibration also provides a good match with the US outward FDI-US capital stock ratio of 9.8 percent in 2016. The calibrated values and their corresponding references are detailed in **Fehler! Verweisquelle konnte nicht gefunden werden.**.

The rate of time preference is set to 0.02. The household planning horizon is assumed to be 40 years. Consistent with empirical evidence as surveyed by Thimme (2017), we set the intertemporal elasticity of substitution to 0.5. We assume a constant equity premium of 4% (see Caballero et al. (2017)) prior to 2016. All firm types use a Cobb-Douglas technology with output elasticity for capital and labor of 0.4 and 0.6, respectively. The depreciation rate on capital is set to 5 percent

[4] Note, the FDI income balance as defined here differs from the balance of payments definition of the primary income balance by not including invested earnings. In the empirical section we show results which are consistent with BOP definitions.

p.a.. We set the adjustment cost parameter to 4 which ensures that investment is between 2 and 3 times as volatile as GDP. There is monopolistic competition with a mark-up of 10 percent. This is consistent with estimates for the US provided by Barkai (2020) using a similar production technology.

We assume uniform preferences across the 4 types of goods consumed and invested, with an elasticity of substitution equal to 2. This also makes sure that we are matching the EoS between domestic and foreign goods as reported in empirical studies. (see e. g. Boehm et al. (2023) and Francois and Woerz (2009)). These values have also been used by Klein and Linnemann (2021) and Benigno and Thoenissen (2008).

TABLE 1. PARAMETERS AND REFERENCES FOR MODEL CALIBRATION

Parameter	Calibrated Value	References
US GDP Share	23.7%	Based on World Bank World Development Indicators data, 2016.
US Import Share of GDP	14.6%	Based on BEA, 2016.
US Outward FDI Stock at Historical Cost to Capital Stock Ratio	9.86%	Based on BEA, 2016, using current-cost net stock of fixed assets.
US Outward FDI Stock at Historical Cost as a Share of US GDP	28.93%	Based on BEA, 2016.
Rate of Time Preference	0.02	Matches the average real rate on safe assets before 2016, see Farhi and Gourio (2018).
Household Planning Horizon	40 years	Consistent with standard overlapping generations models.
Intertemporal Elasticity	0.5	Consistent with empirical evidence (Thimme, 2017).
Equity Premium	4%	Constant equity premium, see Caballero et al. (2017).
Output Elasticity of Labor	0.6	Based on US non-farm business sector.
Output Elasticity of Capital	0.4	Implied by constant returns to scale assumption.
Depreciation Rate	5% p.a.	Standard value in the literature.
Adjustment Cost Parameter	4	Ensures investment volatility is 2-3 times GDP volatility.
Markup	10%	Consistent with Barkai (2020) for US data.
Elasticity of Substitution (Domestic vs Foreign)	2	Matches EoS between domestic and foreign goods, as reported by Boehm et al. (2023), Francois and Woerz (2009).
Elasticity of Substitution (Imports vs FDI-Products)	7	Helpman et al (2004, section “Calibration based on Trump 1.0”
Elasticity of Substitution (Type 1 vs Type 2)	7	See discussion in this section, Footnote 6.

Calibration based on Trump 1.0

For our analysis the response of US inward FDI sales to imports and of US outward FDI to exports to a US tariff shock and RoW retaliation is important. This response is determined by relative cost impacts of tariffs for importers/exporters and subsidiaries of foreign and US MNCs. But it also depends on preferences, in particular on the EoS between imports/exports and sales of subsidiaries of foreign/US MNCs. (IM/inFDIS, and EX/outFDIS respectively). For the calibration of this parameter we use two sources of information, namely existing elasticity estimates of trade to FDI sales ratio w. r. t. tariffs and the evolution of these ratos associated with the TRUMP 1.0 tariffs. Helpman et al. (2004) provide a comprehensive assessment of determinants of the US EX/outFDIS ratio. Depending on the sample size, the region considered and the estimation method, they arrive at elasticities in the range between -0.36 and -0.077. We obtain additional information from the Trump 1.0 tariffs. According to our calculations, which are based on a US tariff revenues from 2016 (pre-Trump 1.0 baseline) to 2022 we arrive at an (average) increase of the US import tariffs of 2pp (from 2.3% to 4.3%) and we observe a decline of the US IM/inFDIS of 7.4% (see Figure 2).[5] Based on estimates of the CATO institute (Lincicome 2024) we assume that the RoW retaliated on average by about 25% to US tariffs and we observe a decline of the US export to out/FDI ratio of ca 3.5% (see Figure 3). The evolution of the trade to FDI sales ratios based on Trump 1.0 are within the range of Helpman et al. elasticity estimates and correspond to value of 0.12. We select an EoS parameter between imports and FDI sales of 7[6], which allows our model to replicate the observed decline of these two ratios with the TRUMP 1.0 tariff increase (including retaliation). Figure 4 and Figure 5 show simulation results from the Trump 1.0 tariff (including 25% retaliation) for two alternative uses of the US tariff revenues, namely as an increase of transfers to US households or as a subsidy for US investment[7]. As can be seen, the response of the trade to FDI sales ratios are fairly robust w. r. t. the use of revenues.

[5] Given the Trump Administration's specific tariffs on tradable goods mentioned in the Introduction, we only include a tariff shock of 2pp on type 1 goods for calibration purposes.

[6] We assume that the EoS of 7 between imports and inward FDI sales (which corresponds to the EoS between purchases of foreign type 1 goods and foreign type 2 goods) is identical to the EoS between domestic type 1 and type 2 goods.

[7] For the RoW we assume that tariffs are used as transfers to households.

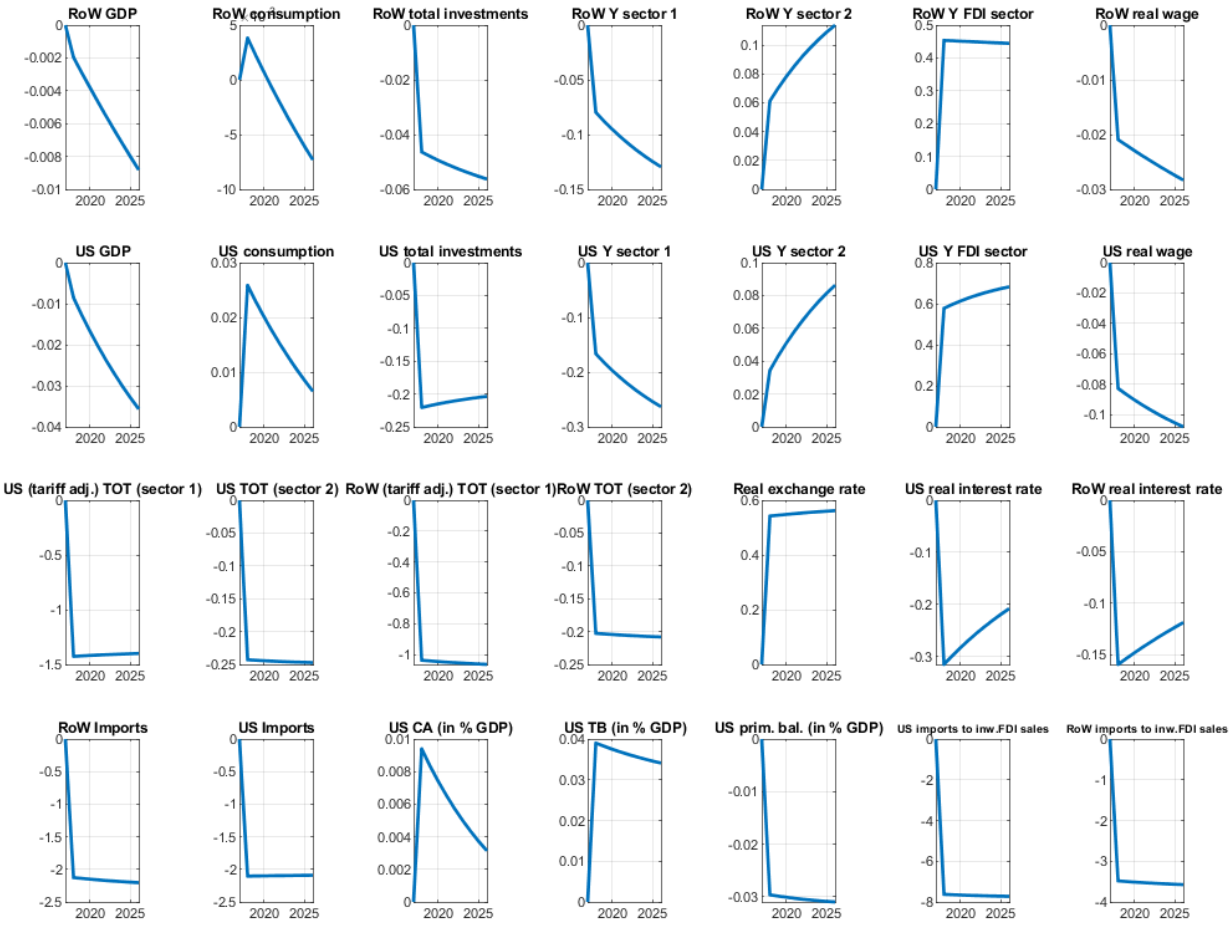


FIGURE 4. TRUMP 1.0 SIMULATIONS WITHOUT INVESTMENT SUBSIDY.

Note: To replicate US trade policy during Donald Trump's first presidency, we consider a US tariff shock of 2% and a US retaliatory tariff shock of 0.5%. The US tariff gains are used for household transfers.

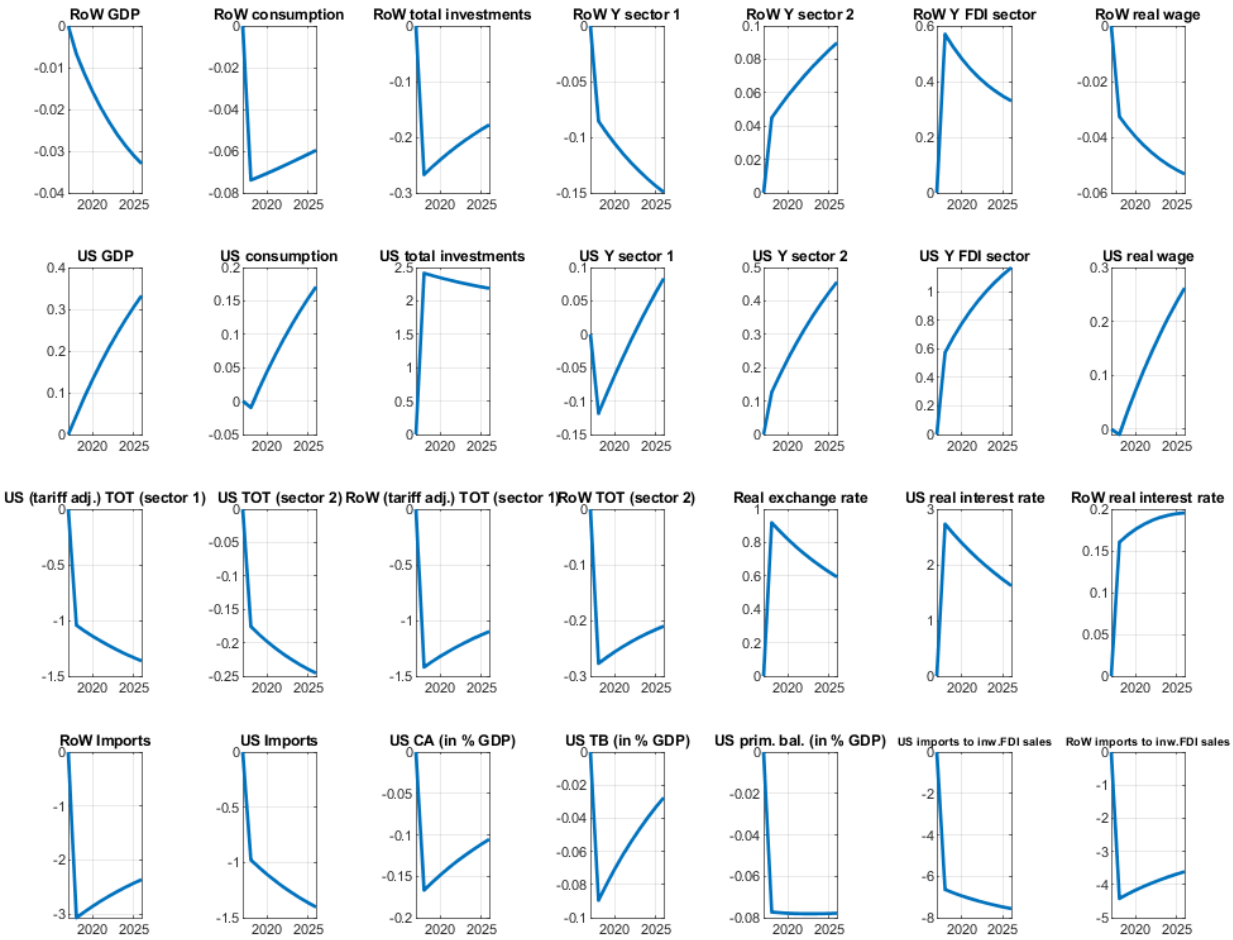


FIGURE 5. TRUMP 1.0 SIMULATIONS INCLUDING US INVESTMENT SUBSIDY.

Note: To replicate US trade policy during Donald Trump's first presidency, we consider a US tariff shock of 2% and a US retaliatory tariff shock of 0.5%. The US tariff gains are used for investment subsidies.

V. Implications of Trump 2.0

We consider fairly stylized scenarios in which the US increases average import tariffs by 10 percentage points, with and without retaliation from the RoW, and with two alternative uses of tariff revenues. Given Donald Trump's statement about imposing tariffs on all imports, we include a tariff shock on both type 1 and type 2 imports for the Trump 2.0 simulations.

As Figure 6 shows, a unilateral US tariff represents a negative demand shock for the RoW, resulting in a real appreciation of the US dollar, which offsets the tariff by about 35%. Nevertheless, the tariff increase dominates the exchange rate effect, resulting a decline in the US (tariff adjusted) terms of trade. A s the higher US tariff revenues are passed on to households, US consumption initially rises by about 0.55%, then declines toward 0.4% by the end of the simulation in 2040. US investments decline by about 0.3% in the long run due to higher import prices, which also cause a decline in US output. RoW consumption and investment also decrease, particularly due to the appreciation of the US dollar, which leads to higher consumer prices and higher capital costs. Since capital costs increase less in the RoW, the negative impact on GDP is smaller than in the US. In both regions, FDI production increases, while sector 1 production declines, particularly due to the loss of export markets. This tariff-jumping behavior is somewhat more pronounced in the RoW since the appreciation of the US dollar makes US outward FDI more attractive – a phenomenon known as the Froot-Stein effect (Froot and Stein 1991). Nevertheless, considering both imports and FDI production, the RoW's overall sales to the US decline more than those of the US: US imports decline by about 7%, while US MNEs' production abroad initially increases by about 1.9%, resulting in a net decline of about 4.9%. For the RoW, total sales to the US drop by around 8.3% (1.7% - 10%). All in all, there is a welfare gain for the US in this scenario, but no investment boom and no benefits for the tradable sector.

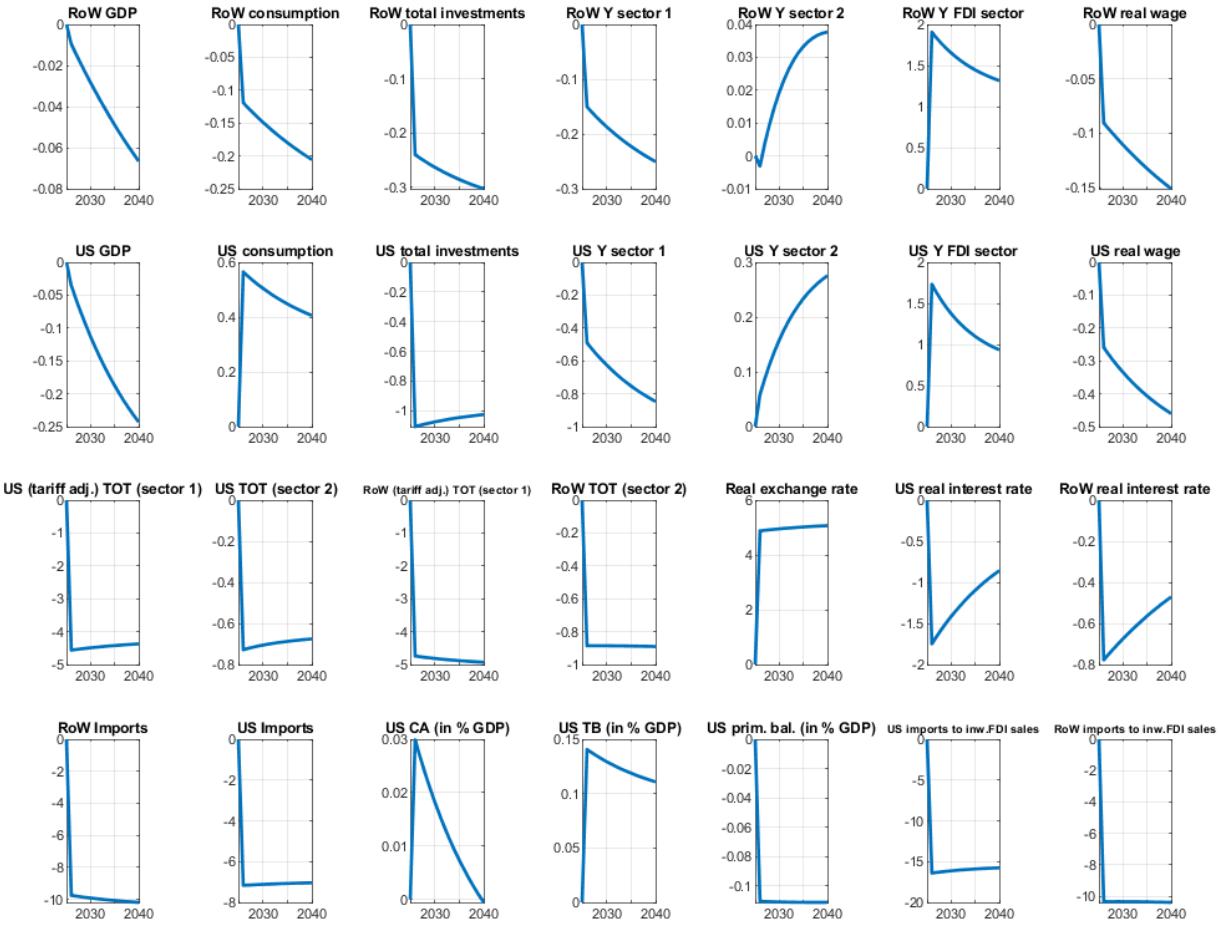


FIGURE 6. UNILATERAL US TARIFF SHOCK (10%).

The second scenario, depicted in Figure 7, shows the simulation results for a 10% tariff shock with full retaliation by the RoW. In contrast to the first scenario, US consumption is negatively affected – more so than RoW consumption – primarily due to the depreciation of the US dollar caused by the retaliatory measures of the RoW. Here, the US is more open compared to a fully coordinated RoW, in which all RoW countries impose tariffs only on US imports. This leads to a smaller effect on capital costs for the RoW, explaining why the decline in RoW investment (-0.32%) is smaller than in the US (-2.4%). Imports in both regions decline by about 15%, while tariff-jumping behavior is again observed among both RoW and US MNEs.

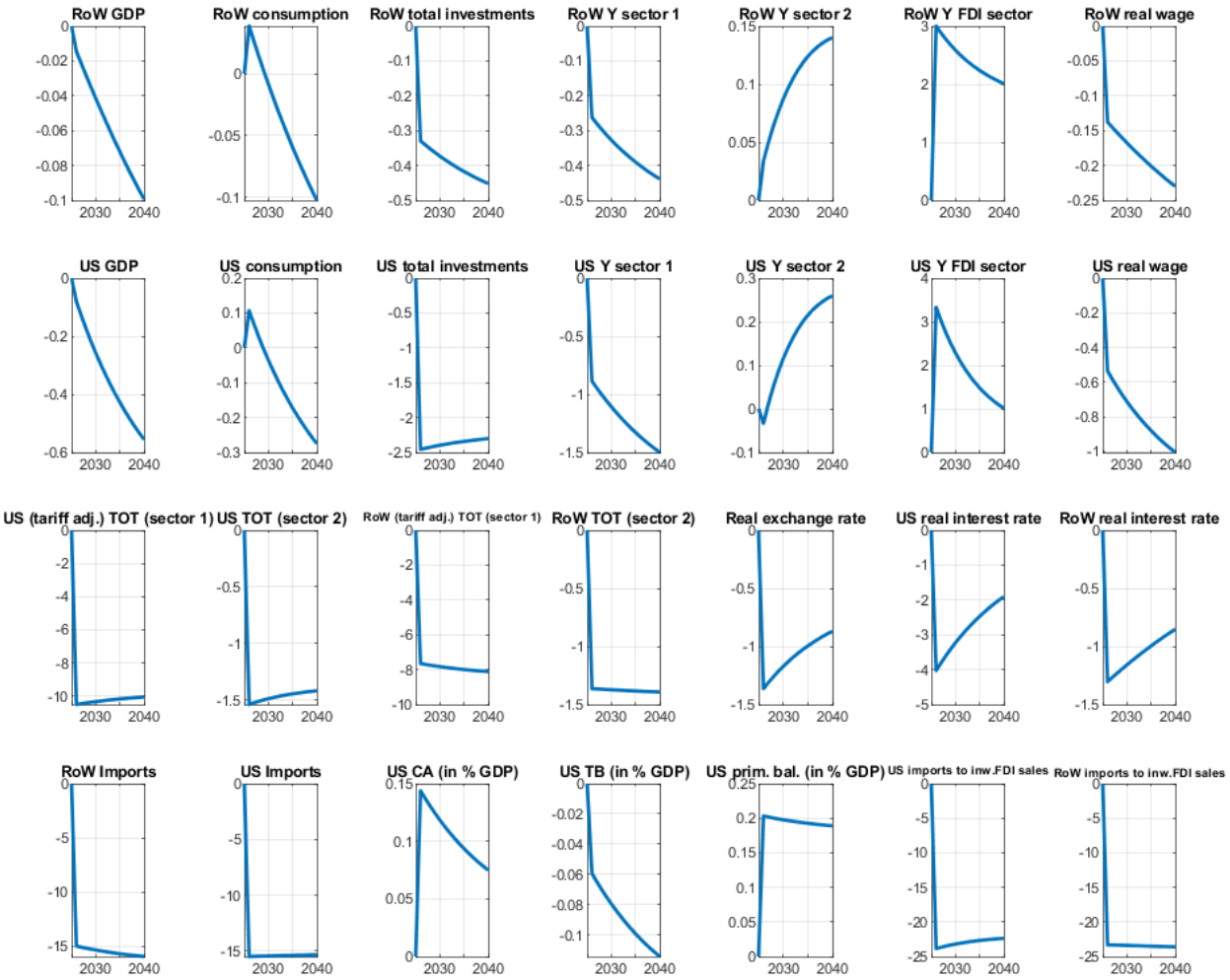


FIGURE 7. TIT FOR TAT TARIFF SHOCK (10%) WITH FULL RETALIATION BY THE ROW.

The third scenario – see Figure 8 – shows the outcome if the RoW partially retaliates, as done during Donald Trump's first term. First, compared to the full retaliation simulation, milder tariff measures by the RoW leads to an appreciation of the US dollar. Compared to the previous simulation, where US consumption declined, it is remarkable that it now increases. However, the positive effects on US welfare are not jeopardized by a rather mild countermeasure from the RoW. Thus, a 25% retaliation is not deterrent to US welfare, whereas the full retaliation would have negative consequences for both the US and the RoW.

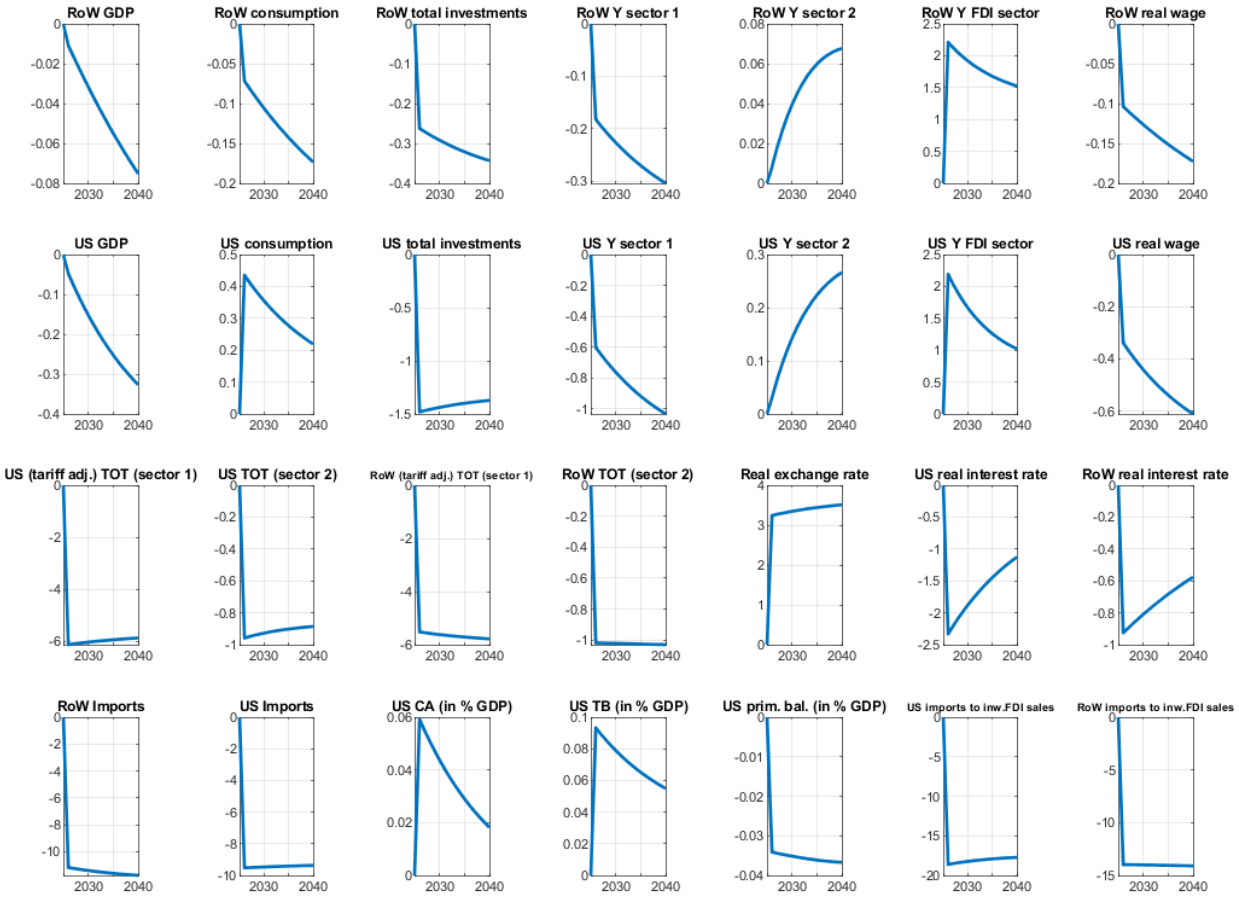


FIGURE 8. TIT FOR TAT TARIFF SHOCK WITH PARTIAL RETALIATION BY THE ROW (10% US TARIFF; 2.5% ROW TARIFF).

Figure 9 illustrates the fourth scenario, in which the RoW again partially retaliates, but the US tariff revenues are used for investment subsidies. Remarkably, the reallocation of tariff revenues from consumption to investment results in substantial changes. In addition to boosting US consumption (by about 1.9% in the long run) and investment (by about 15%), it also leads to increased production across all three US sectors. In this scenario, FDI production in the US increases significantly more than in the RoW, primarily due to investment subsidies that attract MNEs from the RoW. All in all, the US experiences substantial welfare and production gains, whereas the RoW faces negative impacts in both areas.

The simulations in Figure 8 and Figure 9 differ solely in how the US tariff revenues are allocated – either as transfers to households or as investment subsidies. Besides the impact of this reallocation on the US economy, the spillover effects on the Rest of the World (RoW) are particularly noteworthy. Redirecting US tariff revenues toward investment subsidies significantly increases the negative effects of the tariff increase for the RoW. Above all, the RoW welfare loss is about seven times larger. RoW investments decline more sharply: from an initial decrease of about 0.25% to 1.5%. In the long run, the RoW's GDP contraction is increasing by the tariff revenue reallocation, falling by 0.24% instead of the previously estimated 0.075%. These findings highlight that from the RoW perspective, not only the introduction and level of US tariffs play a crucial role, but also how US tariff revenues are utilized.

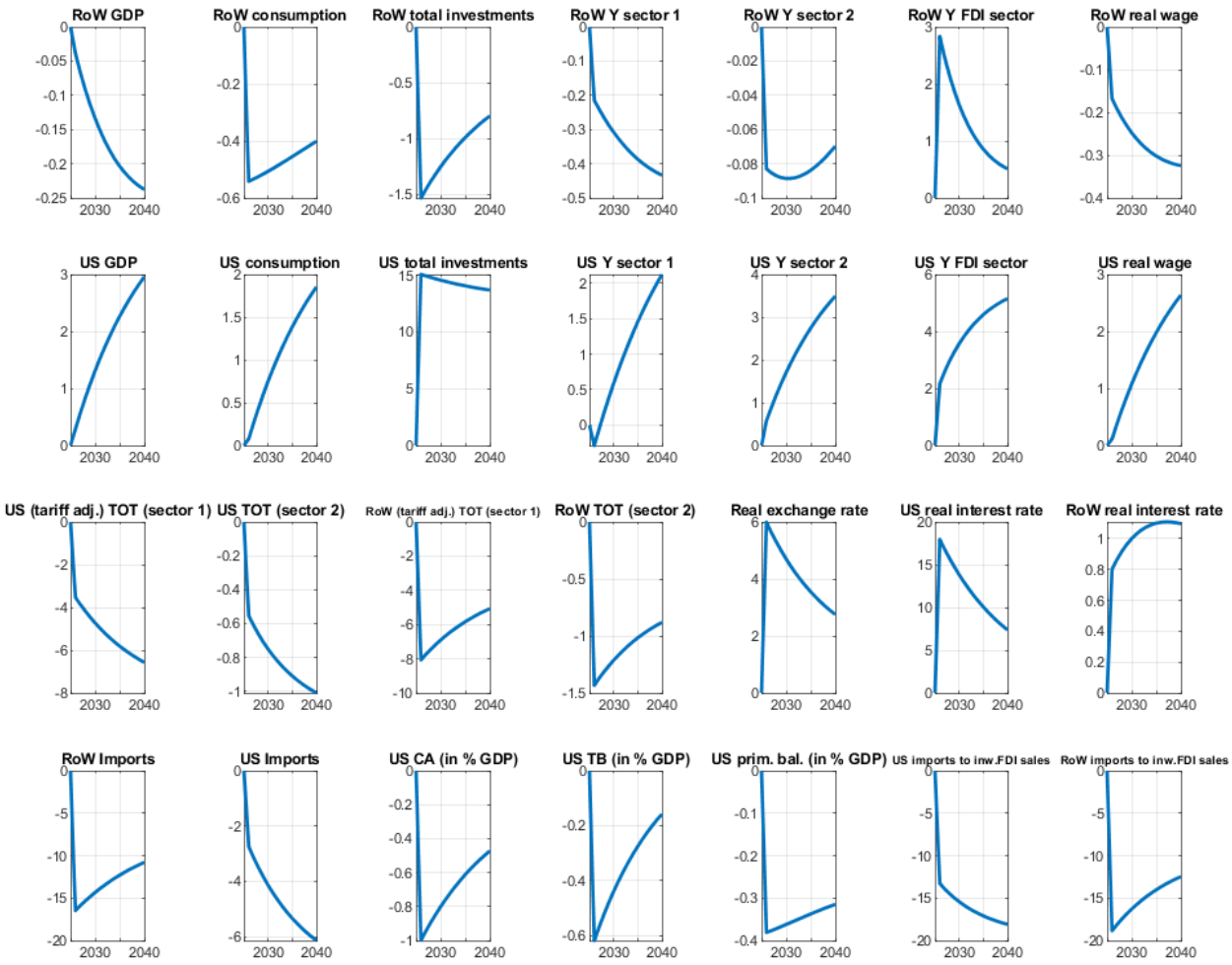


FIGURE 9. TIT FOR TAT TARIFF SHOCK WITH PARTIAL RETALIATION BY THE ROW (10% US TARIFF; 2.5% ROW TARIFF) AND US INVESTMENT SUBSIDIES.

In the last scenario – see Figure 10 – we consider the case in which the RoW fully retaliates, implementing an investment subsidy measure similar to that of the US. Since the US is a more open economy in our model, the positive effects on consumption, investment, and GDP are greater for the US than for the RoW. In both countries, the initial increase in FDI production is around 3.5%. However, in the long run, FDI production in the US (by RoW MNEs) further increases to about 4.8%, whereas it declines in the RoW.

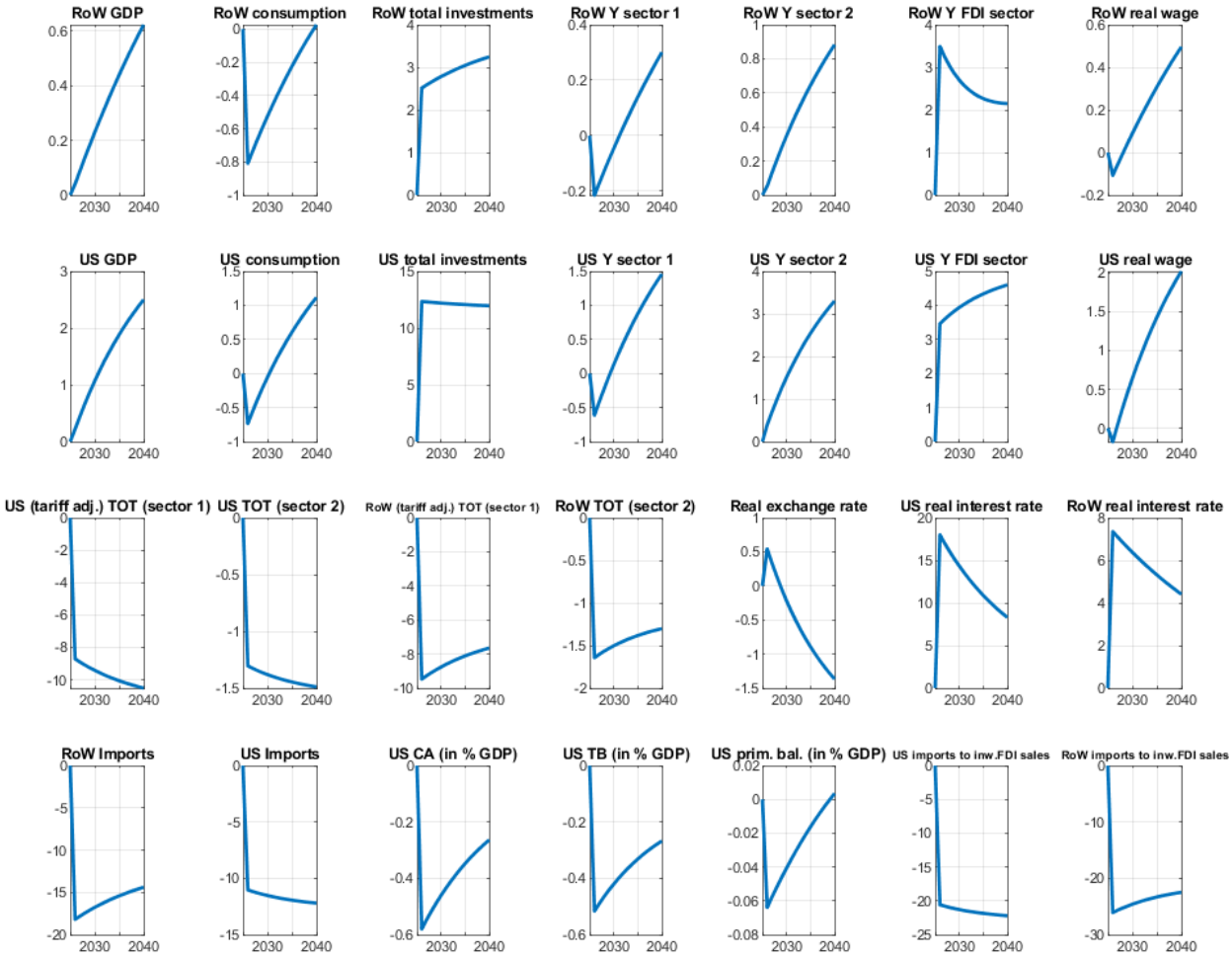


FIGURE 10. TIT FOR TAT TARIFF SHOCK (10%) WITH FULL RETALIATION BY THE ROW AND US AND ROW INVESTMENT SUBSIDIES.

VI. Conclusion

Our findings show that a unilateral US tariff increase, when tariff revenues are transferred to households, leads to higher consumption, an increase in inward FDI, and a reduction in imports. The same pattern applies to exports and outward FDI. However, crowding-out effects on domestic firms' investment result in an overall decline in total investment. If, instead, tariff revenues are used for investment subsidies, total investment turns positive, and the expansionary effects on the US economy are significantly larger. This is because investment subsidies help correct distortions caused by monopoly rents and low savings rates in an overlapping generations (OLG) framework.

The role of retaliation is also crucial. In the case of full retaliation, the US is worse off compared to a coordinated RoW response. The higher openness of the US makes it more vulnerable to increases in the cost of imported intermediate inputs and investment goods. However, this effect is reversed when tariff revenues are used for investment subsidies. In this case, higher US openness generates more tariff revenues relative to GDP, thereby financing additional investment subsidies that reinforce expansionary effects.

Our simulations also highlight the significant spillover effects on the RoW. Redirecting tariff revenues from household transfers to investment subsidies not only strengthens the positive impact on the US economy but also amplifies the negative effects on the RoW. Specifically, welfare losses in the RoW become about seven times larger, investment declines more sharply (from an initial drop of 0.25% to 1.5%), and the long-run GDP contraction increases from 0.075% to 0.24%. This underscores that, from the RoW's perspective, not only the introduction and level of US tariffs matter, but also how tariff revenues are allocated.

In a final scenario, we consider the case in which the RoW fully retaliates with a similar investment subsidy policy. Given that the US is a more open economy in our model, the positive effects on consumption, investment, and GDP turn out to be greater for the US than for the RoW. Although initial FDI production increases by 3.5% in both regions, it rises further in the US in the long run (to about 4.8%) while declining in the RoW.

REFERENCES

Attinasi, Maria Grazia, Lukas Boeckelmann, and Baptiste Meunier. 2023. “The Economic Costs of Supply Chain Decoupling.” ECB Working Paper No. 2023/2839, European Central Bank. http://dx.doi.org/10.2139/ssrn.4532103

Autor, David H., David Dorn, and Gordon H. Hanson. 2024. “Help for the Heartland? The Employment and Electoral Effects of the Trump Tariffs in the United States," NBER Working Papers 32082, National Bureau of Economic Research, Inc. https://doi.org/10.3386/w32082

Barkai, Simcha. 2020. “Declining labor shares and capital shares.” *The Journal of Finance*, 75(5): 2421-2463. https://doi.org/10.1111/jofi.12909

Benigno, Gianluca, and Christian Thoenissen. 2008. “Consumption and real Exchange Rates with incomplete Markets and non-traded Goods.” *Journal of International Money and Finance*, 27(6): 926-948. https://doi.org/10.1016/j.jimonfin.2008.04.008

Blanchard, Olivier J. 1985. “Debt, Deficits, and Finite Horizons.” *Journal of Political Economy*, 93 (2): 223-247. https://www.jstor.org/stable/1832175

Boehm, Christoph E., Andrei A. Levchenko, and Nitya Pandalai-Nayar. 2023. “The Long and Short (Run) of Trade Elasticities.” *American Economic Review*, 113(4): 861-905. https://doi.org/10.1257/aer.20210225

Bouët, Antoine, Leysa Maty, and Yu Zheng. 2024. “Trump 2.0 Tariffs: What Cost for the World Economy?.” *CEPII Policy Brief* No. 49: 1–30. https://www.cepii.fr/PDF_PUB/pb/2024/pb2024-49.pdf

Bown, Chad P., and Eva Y. Zhang. 2019. "Measuring Trump's 2018 Trade Protection: Five Takeaways.” Trade and Investment Policy Watch, Peterson Institute for International Economics (PIIE), February 15. https://www.piie.com/blogs/trade-and-investment-policy-watch/measuring-trumps-2018-trade-protection-five-takeaways

Caballero, Ricardo J., Emmanuel Farhi, and Pierre-Olivier Gourinchas. 2017. “The Safe Assets Shortage Conundrum.” *Journal of Economic Perspectives*, 31(1), 29-46. https://doi.org/10.1257/jep.31.3.29

Celebi, Kaan, Werner Roeger, and Paul J.J. Welfens. 2024. “Persistent US Current Account Deficit: The Role of Foreign Direct Investment.” DIW Berlin Discussion Paper No. 2074. http://dx.doi.org/10.2139/ssrn.4792307

CNBC. 2024. " Trump floats eliminating U.S. income tax and replacing it with tariffs on imports." 13. Juni 2024. https://www.cnbc.com/2024/06/13/trump-all-tariff-policy-to-replace-income-tax.html.

Congressional Research Service. 2020. “Trump Administration Tariff Actions: Frequently Asked Questions.” CRS Report R45529. Washington, DC: Library of Congress. https://sgp.fas.org/crs/row/R45529.pdf

Farhi, Emmanuel, and François Gourio. 2018. “Accounting for Macro-Finance Trends: Market Power, Intangibles, and Risk Premia.” *Brookings Papers on Economic Activity*, The Brookings Institution, 49 (Fall): 147-250. https://www.jstor.org/stable/26743876

Financial Times. 2025. “Donald Trump threatens 25% tariff within days for Mexico and Canada.” January 21, 2025. https://www.ft.com/content/d5141418-6827-4027-92f2-138b43315e31

Fisher, Jonas. 2014. “On the Structural Interpretation of the Smets-Wouters “Risk Premium” Shock.” *Journal of Money, Credit and Banking*, 47(2/3): 511-516. https://doi.org/10.1111/jmcb.12184

Francois, Joseph, and Julia Woerz. 2009. “Non-linear panel estimation of import quotas: The evolution of quota premiums under the ATC.” *Journal of International Economics*, 78(2): 181–191. https://doi.org/10.1016/j.jinteco.2009.01.017

Froot, Kenneth A., and Jeremy C. Stein. 1991. "Exchange Rates and Foreign Direct Investment: An Imperfect Capital Markets Approach." *The Quarterly Journal of Economics*, 106 (4): 1191–1217. http://doi.org/10.2307/2937961

Furceri, Davide, Swarnali A. Hannan, Jonathan D. Ostry, and Andrew K. Rose. 2018. “Macroeconomic Consequences of Tariffs.” *NBER Worling Paper No.* 25402. https://doi.org/10.3386/w25402

Gleckman, Howard. 2024. "A More Aggressive Trump Tariff Would Lower Household Incomes By Nearly $3,000." Tax Policy Center, Urban Institute & Brookings Institute, Oktober 28. https://taxpolicycenter.org/taxvox/more-aggressive-trump-tariff-would-lower-household-incomes-nearly-3000

Helpman, Elhanan, Marc J. Melitz, and Stephen R. Yeaple. 2004. "Export Versus FDI with Heterogeneous Firms." *American Economic Review*, 94 (1): 300–316. http://doi.org/10.1257/000282804322970814

Klein, Mathias, and L. Linnemann. 2021. “Real exchange rate and international spillover effects of US technology shocks.” *Journal of International Economics*, 129: 103414. https://doi.org/10.1016/j.jinteco.2020.103414

Krishnamurthy, Arvind, and Annette Vissing-Jorgensen. 2012. “The Aggregate Demand for Treasury Debt.” *Journal of Political Economy*, 120(2), 233–267. https://doi.org/10.1086/666526

Lincicome, Scott. 2024. "Trade under Trump 2.0 Won’t Be Trump 1.0—Better or Worse?" *Cato Institute Commentary*, November 20. Accessed January 23, 2025. https://www.cato.org/commentary/trade-trump-20-wont-be-trump-10-better-worse

McKibbin, Warwick J., Megan Hogan, and Marcus Noland. 2024. “The international economic implications of a second Trump presidency.” Working Paper Series WP24-20, Peterson Institute for International Economics.

Thimme, Jannis. 2017. “Intertemporal Substitution in Consumption: A Literature Survey.” *Journal of Economic Surveys*, 31(1): 226–257. https://doi.org/10.1111/joes.12142