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# LONG-RUN EFFECTS OF TRADE WARS

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## ABSTRACT

This short note shows that accounting for capital adjustment is critical when analyzing the long-run effects of trade wars on real wages and consumption. The reason is that trade wars increase the relative price between investment goods and labor by taxing imported investment goods and their inputs. This price shift depresses capital demand, shrinks the long-run capital stock, and pushes down consumption and real wages compared to scenarios when capital is fixed. We illustrate this mechanism by studying recent US tariffs using a dynamic quantitative trade model. When the capital stock is allowed to adjust, long-run consumption and wage responses are both larger and more negative. With capital adjustment, U.S. consumption can fall by 2.6%, compared to 0.6% when capital is held fixed, as in a static model. That is, capital stock adjustment emerges as a dominant driver of long-run outcomes, more important than the standard mechanisms from static trade models — terms-of-trade effects and mis- allocation of production across countries.



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# 1 Introduction and Basic Intuition

How do trade wars affect economic outcomes? Classical trade theory emphasizes two mechanisms: tariffs allow countries to exploit market power, while simultaneously distorting production decisions. The first effect means that a country can benefit from moderate unilateral tariffs at the expense of foreign countries, while the second effect means that such redistribution comes at a cost to global efficiency. This loss of efficiency also means that with retaliation, everyone is typically worse off than with free trade.

In this note, we show that for long-run outcomes, both these mechanisms are dwarfed by a third one: adjustments to the level of capital. Our argument uses a new framework for long-run comparative static analysis developed by Baqaee and Malmberg (2025).

The intuition is the following. Investment goods, used to produce capital goods, are reliant on imports. Therefore, import tariffs typically raise the price of capital goods relative to primary factor endowments like labor and land. This increase in relative prices lowers the demand for capital services relative to other factor inputs as long as firms' demand for capital services is not perfectly inelastic. A reduction in capital demand in turn reduces the long-run capital stock provided that households' savings decisions are not fully inelastic either. Last, a lower capital stock reduces long-run consumption, since economies typically operate below the Golden Rule of savings. A lower capital stock also depresses real wages by reducing the marginal product of labor.

Thus, capital adjustment works against the intuition that long-run effects of negative shocks are milder than short-run effects due to greater adjustment opportunities. The reason is that for capital, adjustment opportunities amplify, rather than dampen, the initial effects.

In the next section, we illustrate d this intuition and quantify the importance of this mechanism using a quantitative trade model.

# 2 Quantitative Illustration

We employ a multi-country, multi-industry dynamic model with overlapping generations, building on Baqaee and Malmberg (2025) and the earlier trade and macro literature (see that paper for a review of the relevant literature).[1] The model features an international production network for consumption goods, capital goods, and intermediate

[1]Some papers that have studied the interaction of capital accumulation and trade costs include Crucini and Kahn (1996), Alvarez (2017), Mutreja et al. (2018), Ravikumar et al. (2019), Ding (2022), Kleinman et al. (2023), Dix-Carneiro et al. (2023), Ravikumar et al. (2024) among others.

inputs.

In each country, there are $N$ industries, and production by each industry $i$ in country $o$ combines labor, $L_{oi}$, capital, $K_{oi}$, and intermediate inputs, $Y_{oi,j}$, using a Cobb-Douglas technology:

$$Y_{oi} = L_{oi}^{\tilde{\Omega}_{oi,L}} K_{oi}^{\tilde{\Omega}_{oi,K}} \prod_{j=1}^{N} Y_{oi,j}^{\tilde{\Omega}_{oi,j}}.$$

Inputs from industry $j$ used by industry $i$ in country $o$ are CES bundles of varieties from different origin countries:

$$Y_{oi,j} = \left( \sum_{o'} \omega_{oi,o'j} \left( \tau_{oi,o'j} Y_{oi,o'j} \right)^{\frac{\theta}{\theta+1}} \right)^{\frac{\theta+1}{\theta}},$$

where $\tau_{oi,o'j}$ captures iceberg trade costs and $\theta$ is the trade elasticity.

Every industry $i$ in country $o$ has its own capital stock that evolves according to

$$\dot{K}_{oi} = X_{oi} - \delta_i K_{oi},$$

where $\delta_i$ is the depreciation rate in industry $i$ and $X_{oi}$ is the investment good. Investment is produced using inputs from different industries combined using a Cobb-Douglas aggregator over CES nests, analogous to the production of other goods.

Returns to capital, net foreign asset positions, and trade deficits are endogenous, and depend on households' savings decisions. The household sector features a perpetual-youth overlapping generation structure as in Blanchard (1985). Financial markets are incomplete: households can invest in an internationally traded riskless bond or in industry-specific local capital, where they face non-diversifiable idiosyncratic investment risk, similar to Angeletos and Panousi (2011).

We follow the same calibration strategy as in Baqaee and Malmberg (2025). We set the trade elasticity, $\theta$, equal to four. Calibration relies on the World Input-Output Database (WIOD, Timmer et al., 2015), the External Wealth of Nations Database (Lane and Milesi-Ferretti, 2018), investment flow tables constructed by Ding (2022), and the integrated industry-level production accounts from the Bureau of Economic Analysis. Our model has 9 regions including the world's largest economies and a composite rest-of-the-world region. Each region has 26 industries covering primary, manufacturing, and service industries. We calibrate the production and investment network to match input-output tables from the latest available releases.[2] In our view, the most important limitation of our

[2]Specifically, the input-output network is calibrated to match the WIOD in 2009, the last year that reports

calibration is that our data is more than a decade old. In particular, our calibration understates the size of the Chinese economy, and will thus understate the effects of a trade war with China taking place today.

**Effect of trade war on consumption and real wages**

We consider a trade war between the United States and the rest of the world. We compare consumption and real wages under a trade war to those under free trade (no tariffs). In the trade war, the United States imposes tariffs on the rest of the world in line with the tariff schedule presented by the Trump administration April 2, 2025. The rest of the world retaliates by imposing symmetric import tariffs on the United States. The list of tariffs in our exercise can be found in the appendix.

| Region | Capital adjusts | Capital fixed | Unilateral | Unilateral - capital fixed |
|---|---|---|---|---|
| United States | -0.026 | -0.006 | 0.000 | 0.005 |
| Canada | -0.015 | -0.004 | -0.019 | -0.007 |
| India | -0.014 | -0.003 | -0.011 | -0.002 |
| China | -0.005 | -0.004 | -0.005 | -0.006 |
| United Kingdom | -0.003 | -0.000 | -0.004 | -0.000 |
| Japan | -0.004 | -0.001 | -0.004 | -0.001 |
| Mexico | -0.036 | -0.002 | -0.041 | -0.005 |
| European Union | -0.002 | -0.001 | -0.004 | -0.002 |
| Rest-of-World | -0.009 | -0.003 | -0.010 | -0.005 |

Table 1: Log change in long-run consumption in response to tariffs

Table 1 presents the results for consumption. In the benchmark calibration, where the capital stock adjusts, consumption in every country declines. The United states is one of the worst, but not the worst, affected with a decline in consumption of 2.6%. Some countries, like Mexico, experience even greater declines since retaliatory tariffs by Mexico have a strong effect on the long-run Mexican capital stock. The second column, which treats investment as a final good and holds the stock of capital constant, can be used to gauge the importance of the mechanism we emphasize. This column predicts much smaller consumption losses. For example, consumption in the United States declines by only 0.6%, that is, almost 5 times less. The third column shows the results of how consumption would respond if the United States could impose unilateral tariffs, without any retaliation. There are no longer any relevant gains from terms-of-trade effects (<0.1%).

investment. The expenditure shares of investment goods are drawn from the 1997 data produced by Ding (2022).

This contrasts to the final column which repeats the unilateral tariff scenario, but holds the capital stock fixed. In this case, consumption in the United States rises 0.5% due to the usual optimal tariff intuition much discussed in classical trade theory.[3]

Table 2 presents the same results for real wages. The change in the real wage is always negative, and the reductions are larger than the ones in consumption, across the board. Real wage declines do not translate one-for-one into declines of consumption since rebated tariff revenue mitigates the effect on household income. Capital adjustment amplifies reductions in real wages since a lower capital stock lowers the marginal product of labor.

| Region | Capital adjusts | Capital fixed | Unilateral | Unilateral - capital fixed |
|---|---|---|---|---|
| United States | -0.037 | -0.018 | -0.016 | -0.010 |
| Canada | -0.027 | -0.014 | -0.018 | -0.007 |
| India | -0.016 | -0.005 | -0.011 | -0.003 |
| China | -0.010 | -0.005 | -0.007 | -0.003 |
| United Kingdom | -0.005 | -0.003 | -0.004 | -0.001 |
| Japan | -0.007 | -0.002 | -0.005 | -0.001 |
| Mexico | -0.044 | -0.011 | -0.038 | -0.005 |
| European Union | -0.005 | -0.002 | -0.004 | -0.002 |
| Rest-of-World | -0.011 | -0.007 | -0.009 | -0.005 |

Table 2: Log change in real wages in response to tariffs

# 3 Summary

This note emphasizes the role of accounting for capital adjustment when considering the long-run effects of a trade war. Since capital investment uses imported inputs, tariffs reduce the capital stock by raising the relative price between capital goods and labor. That is, capital adjustment amplifies rather than dampens the negative effects of tariffs, in contrast to a common narrative that long-run costs of negative shocks are lower due to greater adjustment opportunities.

[3]In addition to the experiments in the table, we also considered an experiment where the trade elasticity varied from $\theta = 2$ to $\theta = 6$. The results of the benchmark mode are insensitive to these changes. The reason is that the primary source of consumption losses in the long-run is substitution between labor and capital, rather than substitution between domestic and foreign varieties.

# A Table of Tariffs

| Country | Tariff Rate |
|---|---|
| Australia | 10% |
| Brazil | 10% |
| Canada | 10% |
| China | 34% |
| United Kingdom | 10% |
| India | 26% |
| Japan | 24% |
| Mexico | 10% |
| European Union | 20% |
| Rest of the World | 25.4% |

Table 3: US tariffs imposed on imports from each region during the trade war

# References


Alvarez, F. (2017). Capital accumulation and international trade. *Journal of Monetary Economics 91*, 1–18.

Angeletos, G.-M. and V. Panousi (2011). Financial integration, entrepreneurial risk and global dynamics. *Journal of Economic Theory 146*(3), 863–896.

Baqaee, D. and H. Malmberg (2025). Long-run comparative statics. Technical report.

Blanchard, O. J. (1985). Debt, deficits, and finite horizons. *Journal of political economy 93*(2), 223–247.

Crucini, M. J. and J. Kahn (1996). Tariffs and aggregate economic activity: Lessons from the great depression. *Journal of Monetary Economics 38*(3), 427–467.

Ding, X. (2022). Capital services in global value chains.

Dix-Carneiro, R., J. P. Pessoa, R. Reyes-Heroles, and S. Traiberman (2023). Globalization, trade imbalances, and labor market adjustment. *The Quarterly Journal of Economics 138*(2), 1109–1171.

Kleinman, B., E. Liu, S. J. Redding, and M. Yogo (2023). Neoclassical growth in an interdependent world. Technical report, National Bureau of Economic Research.

Lane, P. R. and G. M. Milesi-Ferretti (2018). The external wealth of nations revisited: international financial integration in the aftermath of the global financial crisis. *IMF Economic Review 66*, 189–222.

Mutreja, P., B. Ravikumar, and M. Sposi (2018). Capital goods trade, relative prices, and economic development. *Review of Economic Dynamics 27*, 101–122.

Ravikumar, B., A. M. Santacreu, and M. Sposi (2019). Capital accumulation and dynamic gains from trade. *Journal of International Economics 119*, 93–110.

Ravikumar, B., A. M. Santacreu, and M. Sposi (2024). Trade liberalization versus protectionism: Dynamic welfare asymmetries. *European Economic Review 163*, 104692.

Timmer, M. P., E. Dietzenbacher, B. Los, R. Stehrer, and G. J. De Vries (2015). An illustrated user guide to the world input–output database: the case of global automotive production. *Review of International Economics 23*(3), 575–605.