Online Appendix to "The Demand for Trade Protection over the Business Cycle"

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1 Simulating the effects of a trade war

Over the last few years, some countries around the world among which the U.S. have been raising tariffs substantially. For instance, according to Bown's calculations of the U.S.-China trade war, the average level of U.S. tariffs against China has risen from 3.1% in 2017 to 26.6% at the end of 2019.[1] Symmetrically, China has been raising its average level of tariffs against imports from the U.S. from 8% in January 2018 to 25.9% at the end of 2019. On average, these tariff hikes represent a 370% increase in tariffs. However, given that China represents 13.5% of total U.S. trade in goods and assuming that tariffs with respect to other countries and from other countries remain constant, the above increase in tariffs translates into a 100% increase in the aggregate level of tariffs. Through the lens of our model, for given preferences and technical parameters of the private sector, such a steady rise in sustainable tariffs can only be the product of a change in tariff setters' preferences, which in our case are entirely encapsulated in their discount factor. A rise in tariff setters impatience – a reduction of their discount factor β^g – should raise tariffs because the current utility gains are given a larger weight in their value function in comparison to the future losses induced by the worst Nash equilibrium in case they cheat. Figure 1 reports the effects of a succession over 16 quarters (4 years) of quasi-permanent small, negative (-0.4%) shocks on tariff setters' discount factors. Shocks are unexpected and we consider two alternative cases: (i) asymmetric shocks (affecting the Home tariff setter), or (ii) symmetric shocks (affecting both tariff setters). The value of the shock is adjusted so as to produce an approximate 100% rise in both Home and Foreign tariffs after 16 quarters under the sequence of symmetric shocks, our reference simulation.

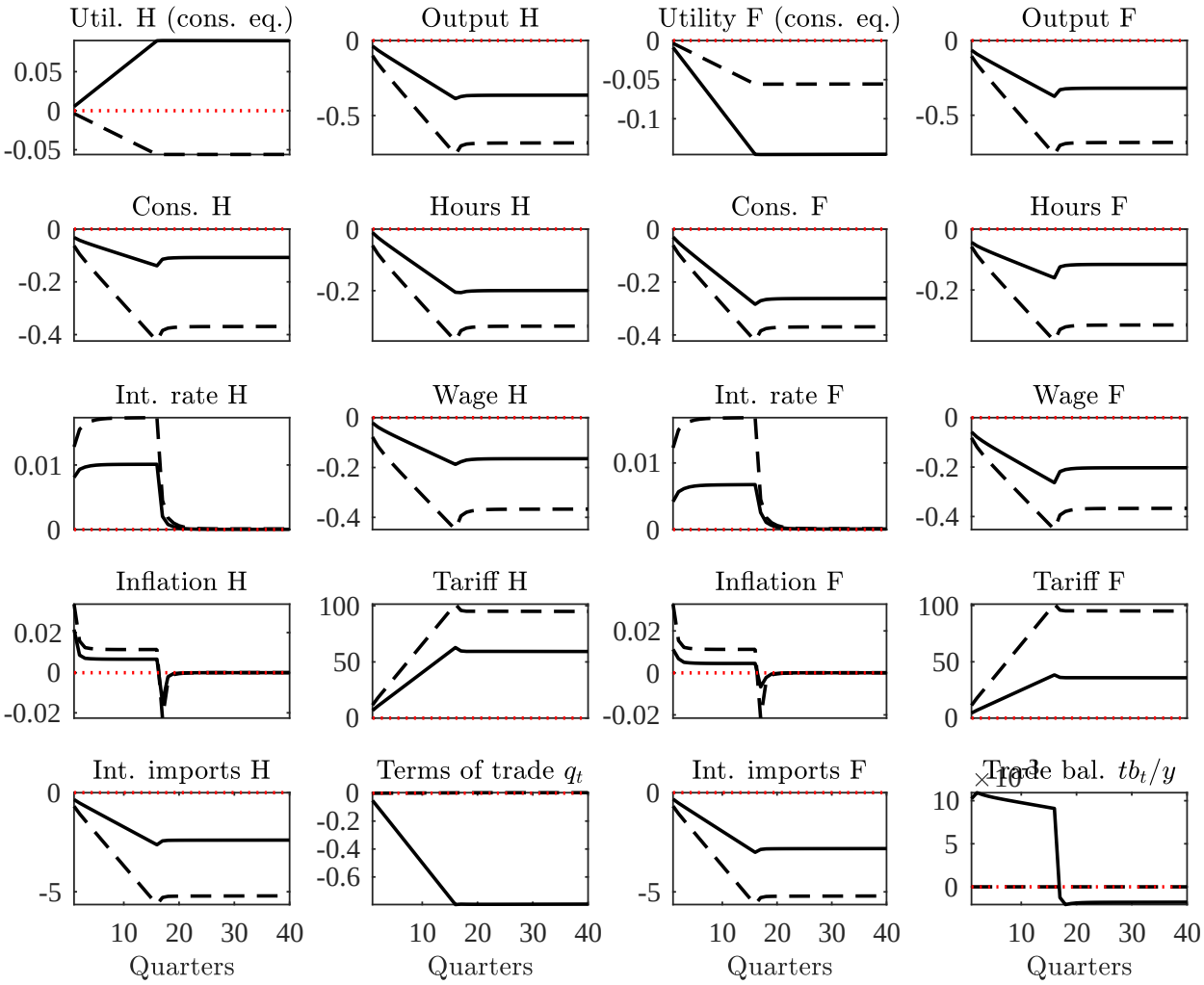
Let us start by looking at the effects of a sequence of asymmetric discount factor shocks. The sequence leads the Home tariff to rise progressively over 16 quarters and settle 59% above its steady-state value, at $\tau = 7.95\%$. The consequences of an asymmetric tariff shock are the same as those depicted in Figure 12 in Appendix C: final and intermediate Home imports fall, leading output, hours worked and real wages to fall. However, contrary to what is reported in Figure 12 of Appendix C, aggregate consumption falls, because the Foreign tariff setter retaliates and raises the Foreign tariff rate by almost 36%, from $\tau^* = 5\%$ to $\tau^* = 6.8\%$. The rise in imported intermediate goods drives CPI inflation up which in turn pushes the Home Central Bank to raise its nominal rate, further fueling the recession by depressing private consumption. As intended, the shock appreciates the real exchange rate which, by the labor supply effects of the terms-of-trade externality, generates welfare gains: hours worked fall more than consumption does. Quantitatively speaking, the sequence of asymmetric shocks lowers output by 0.36%, consumption by 0.11% and hours worked by 0.2%, producing a modest 0.09% welfare gain.[2]

[1] See https://www.piie.com/blogs/trade-and-investment-policy-watch/us-china-trade-war-guns-august.

[2] The Hicksian equivalent consumption gain γ is defined as:

$$\sum_t^{\infty} \beta^{s-t} u\left(c_t, \ell_t\right) = \sum_t^{\infty} \beta^{s-t} u\left(c\left(1+\gamma/100\right), \ell\right)$$

Figure 1: Simulation of a trade war, in percentage deviation.



Solid: Sequence of asymmetric 0.4% shocks on the discount factor of the Home tariff setter (β^g). Dashed: Sequence of symmetric 0.4% shocks on the discount factor of both Home and Foreign tariff setters (β^g and β^{g*}). Utility panels report the Hicksian consumption equivalent, in percents. Positive numbers signal utility gains.

The real exchange rate appreciates marginally, falling by less than 1%. The chief reason is that, on the sustainable path of tariffs, even though the preferences of the Foreign tariff setter remain unchanged, the latter ends up raising its tariffs by 36%, almost as much as in the Home economy. Our model thus predicts that a unilateral change in the preferences of the Home tariff setter can generate an endogenous positive and large response of the tariff set by the Foreign tariff setter, an endogenous trade war. As a matter of fact, the sequence of asymmetric shocks produces very similar dynamics for the Foreign economy, that are marginally compensated by the real exchange rate dynamics. Foreign output falls by 0.32%, consumption by 0.26% and hours worked by 0.12%. Since consumption falls more than in the Home economy and hours worked fall less, the shock produces a 0.145% welfare loss for the Foreign economy. Given that the sequence of shocks produces relatively minor asymmetries among both countries, it should not be surprising that the effects on the Home trade balance are positive but negligible, as it generates a trade surplus of 0.01% of GDP.

In the case of a sequence of symmetric shocks, tariffs rise by 100%, and then fall slightly to settle around 9.7%. The effects of a joint rise in tariffs are perfectly symmetric: output falls by 0.68% in both countries, consumption by 0.37% and hours worked by 0.315%. In addition, intermediate imports jointly drop by 5.2%, inflation jumps more than under the sequence of asymmetric shocks and thus triggers a larger reaction of Central Banks, that further aggravates the recession. Overall, in the scenario of a sequence of symmetric discount factor shocks, both countries experience welfare losses of 0.056%. Notice that consumption falls by 0.37%. Given the level of personal consumption expenditure in the U.S. in 2018, this drop amounts to approximately 49 billion dollars, a number that is remarkably close to that reported by Fajgelbaum, Goldberg, Kennedy, and Khandelwal (2020).

References

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