Trade Fragmentation, Inflationary Pressures and Monetary Policy*

Ludovica Ambrosino[†] Jenny Chan [‡] Silvana Tenreyro [§]

December 29, 2025

Abstract

How does trade fragmentation affect inflationary pressures? What is the response of monetary policy needed to sustain inflation at target? To answer these questions, we develop a two-sector, small open-economy model featuring imperfect international risk-sharing and household heterogeneity that captures both the supply-side and demand-side effects of fragmentation. Fragmentation takes the form of import-price increases or tradable-sector productivity falls. The sign and magnitude of the trade fragmentation's impact on inflationary pressures, and the appropriate policy response, depend not only on the direct supply effect of higher import prices or lower productivity but also, crucially, on how aggregate demand adjusts in response to lower real incomes. In turn, this depends on the pace of fragmentation (whether it is gradual or front-loaded), as well as several other structural factors elucidated by the model analysis. We compare the outcomes resulting from a central bank following Taylor-type monetary policy rules to a constrained-efficient allocation.

Keywords: Monetary policy, trade fragmentation, open economies, inflation, heterogeneity, globalisation
JEL classification: F12, F15, F41, F62

*The views expressed in this paper do not represent those of the Bank of England. We would like to thank the Editor, Vivian Yue, Kristin Forbes, Jordi Gali, and Ricardo Reis and the referees for insightful comments. We are grateful to Kai Arvai, Francesco Caselli, Giancarlo Corsetti, Sebastian Diz, Sebastian Ellingsen, Mishel Ghassibe, Rich Harrison, Matthijs Katz, Paul Konietschke, Simon Lloyd, David Murakami, Erica Perego, Raghu Rajan, Sanjay Singh, Linda Tesar, Enrico Turri, Jan Vlieghe, and Rafael Wouters for constructive discussions, and to participants at the 23rd BIS Annual Conference, Macro Research Network 2024, 25th IWH-CIREQ-GW-BOKERI Macroeconometric Workshop, 3rd XAmsterdam Macroeconomic Workshop, DNB Annual Research Conference, Università Cattolica del Sacro Cuore, 9th Annual AMSE-BdF Workshop, 32nd ES-SIM, Banque de France-TSE, Banca d'Italia Annual Research Conference, SED, 48th NBER-ISOM, CEPR-RISE, CEBRA 2025, 2025 RIDGE, and 2025 EUI-BdF Conference for helpful comments and suggestions. All errors are our own. This work was supported by the Leverhulme Trust ORPG-11206 and Engineering and Physical Sciences Research Council grant number EP/Z533944/1.

[†]London Business School. Contact: lambrosino@london.edu

[‡]Bank of England. Contact: jenny.chan@bankofengland.co.uk

[§]London School of Economics, UK; CFM, CEPR. Contact: Tenreyro: Department of Economics and Centre for Macroeconomics, London School of Economics, Houghton Street, London, WC2A 2AE, United Kingdom; s.tenreyro@lse.ac.uk

1 Introduction

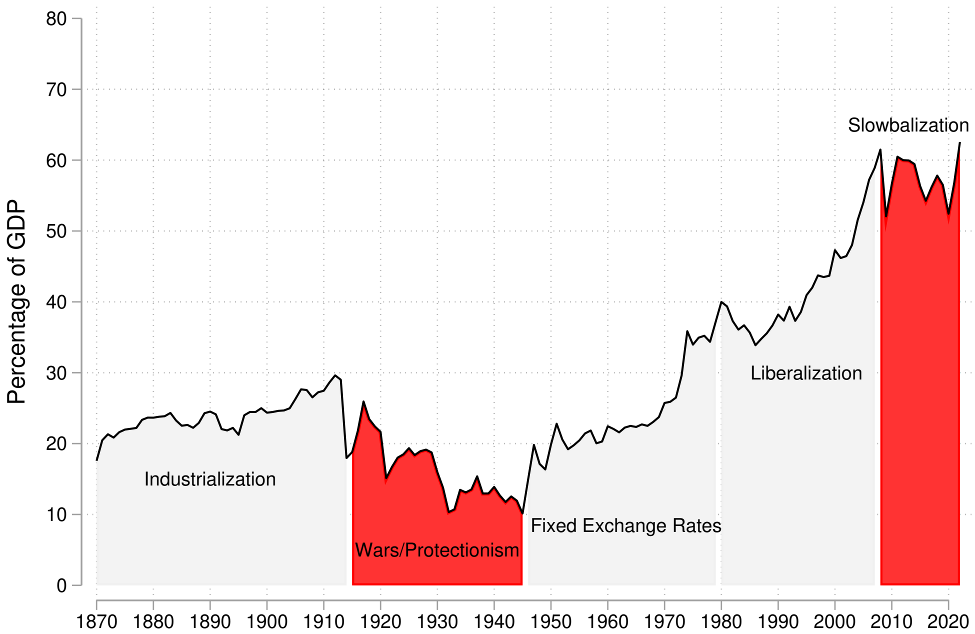
Global trends have shifted noticeably in recent decades. The protracted postwar increase in trade openness has stalled, amidst a resurgence in trade wars and protectionism. This shift is visible in Figure 1, which plots the long-term trajectory of global trade flows (imports plus exports) relative to world GDP, as well as in Figure 2, which tracks a broad index of economic fragmentation since the 1970s (Fernández-Villaverde, Mineyama, and Song (2024)). Both figures show a turning point around the global financial crisis, with trade openness plateauing and fragmentation steadily increasing, before rising sharply during the pandemic and Russia's invasion of Ukraine. The geopolitical factors driving these changes are likely to persist. New trade paradigms, such as friendshoring or fragmentation into trading blocs of geopolitically aligned countries are becoming normalised (Yellen (2022)). This reconfiguration of trade patterns raises concerns about potential losses in efficiency and aggregate output (Javorcik, Kitzmüller, Schweiger, and Yıldırım (2024); Georgieva (2023)).

A key question for policy makers is how trade fragmentation will affect inflationary pressures, and, in turn, what should be the monetary policy response. The conventional view suggests that as nations retreat from global integration and supply chains duplicate, production costs will rise, exerting upward pressure on inflation (e.g., Lagarde (2023), Goodhart and Pradhan (2020)). Indeed, disinflationary trends of the 1990s and 2000s have often been linked to the rapid increase in trade integration during that period, leading to expectations that its reversal will be inflationary. However, this relationship remains contentious. Other forces besides globalisation may have contributed to the era of disinflation, including the shift to inflation-targeting regimes (Roberts (2006)) and the lower bound constraint on interest rates in many countries (Attinasi and Balatti (2021)). Taking the United States as an example, estimates of the disinflationary effects of increased trade integration appear modest at best (Yellen (2006)).[1]

The conventional view is built around the direct or partial-equilibrium impact of trade integration on supply, abstracting from its indirect impact on aggregate demand. This paper addresses this gap by studying the broader, general equilibrium effects of trade fragmentation in a setting in which aggregate demand is also affected through changes in real incomes. We model fragmentation in two ways: the first consists of an increase in the price of imported goods (which could result, for example, when firms switch from the cheapest or more efficient suppliers to geopolitically-aligned, but more expensive suppliers; or when tariffs or non-tariff barriers are imposed). The second form of fragmentation entails a fall in tradable sector productivity in the domestic economy (relative to its original trend). Through these alternative forms of fragmentation, we illustrate how the inflationary impact

[1] Kamin, Marazzi, and Schindler (2004), for example, show that the impact of Chinese exports on global prices has been fairly modest. Moreover, these studies do not explicitly take into account real exchange-rate adjustments. As Kohn (2005) argues, during the second half of the 1990s, the dollar experienced a substantial appreciation, driven by increased investment flows drawn to the prospect of higher productivity growth. This may have amplified the downward trend in dollar prices of U.S. imports.

Figure 1: Sum of exports and imports,% of GDP



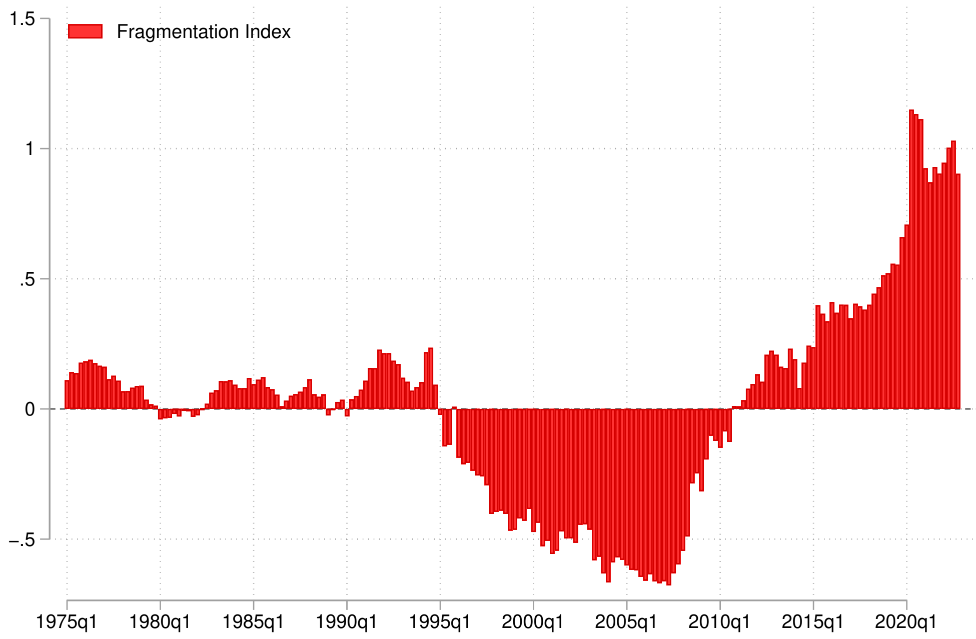
Source: Peterson Institute for International Economics; Jordà-Schularick-Taylor Macrohistory Database; Penn World Table (10.0); World Bank; OWID.

depends crucially on the adjustment of aggregate demand. Higher import prices or lower tradable sector productivity not only constrain supply through higher marginal costs, but also demand through lower real incomes and consumption, reflecting general equilibrium effects. Consequently, the net impact on inflationary pressures is a priori ambiguous.

We capture these competing channels in a two-sector (tradable and non-tradable), small open economy New Keynesian model featuring household heterogeneity and home bias in consumption. Specifically, following Debortoli and Galí (2017), the economy features two types of consumers. The first type consists of *unconstrained* agents, with access to international and domestic financial markets. To account for frictions in international financial markets, we introduce imperfect international risk sharing: unconstrained agents trade risk-free foreign bonds, with a convex cost of holding assets in quantities that deviate from some long-run level (Schmitt-Grohé and Uribe (2003)). The second type consists of *constrained* hand-to-mouth households, who consume only out of their labour income and have no access to financial markets. The domestic economy trades with the rest of the world, importing goods for direct consumption, for use as intermediate inputs, or both.

We consider three scenarios to show how different forms of fragmentation can have distinct macroeconomic implications. First, we consider a *gradual* (and permanent) increase in the price of imported goods. This yields a persistent increase in imported inflation, which lasts until the import price stabilises at a higher level in the medium-to-longer term. Aggregate consumption falls in response to fragmentation, as both financially constrained and un-

Figure 2: Fragmentation has increased since 2008.



Source: Fernández-Villaverde, Mineyama, and Song (2024)

constrained households suffer losses in real income: the real disposable income of hand-to-mouth consumers falls as a direct consequence of higher prices, restricting their spending; in turn, financially unconstrained households, who take into account their permanent-income losses, also reduce their consumption in anticipation of lower future incomes. This further accentuates the fall in aggregate demand, spilling over to hand-to-mouth consumers. Real wages fall both because of the negative terms-of-trade effect and because of the fall in domestic demand. Financially constrained households make up for some of the fall in income by increasing their labour supply. The fall in aggregate demand pushes down on domestic inflation. Aggregate CPI (consumer price index) inflation, a composite of domestic and imported goods inflation, falls, given the larger weight of domestic components on the basket. The reduction in demand is reflected in the real natural rate of interest, which decreases with the fragmentation shock. This suggests that when demand adjusts, the overall effect is not inflationary. This scenario leads to a long period of stagnation, with weak demand and subdued inflation. In this setting, monetary policy needs to loosen in order to bring inflation back to target.

Next, we consider a fully *front-loaded*, permanent increase in the price of imported goods.[2] The shock creates a sharp temporary trade-off, with inflation increasing and aggregate demand falling on impact. Both financially unconstrained and constrained households lower their consumption. The fall in real wages (relative to the price of imported inputs) triggers

[2]This is akin to the recent U.S. and E.U. tariffs on Chinese electric vehicles, reaching up to 100 percent and 38 percent, respectively, as well as the increase in energy prices after Russia's invasion of Ukraine.

an increase in labour supply from both types of consumers. On impact, the short-term real interest rate increases, as a tightening in monetary policy is required to bring inflation back to target. The result is a temporary overshoot in inflation, with longer-term losses in income and consumption.

Finally, we study a *gradual and permanent* fall in the total factor productivity (TFP) of tradable goods as a potential consequence of increased fragmentation. As in the standard New Keynesian model, this shock results in two changes in the domestic tradable sector: more employment per unit of output and an increase in inflation as marginal costs rise. Compared to the gradual import price shock, a gradual deterioration in TFP redistributes resources differently. Real wages do not fall by as much, which mitigates the fall in consumption. Aggregate employment also increases by less. In this scenario, the fall in non-tradable inflation is not enough to outweigh the increase in home tradable inflation, and aggregate CPI inflation increases moderately. In principle, the impact of this shock on the natural real rate is ambiguous. In our calibration, there is a small decrease in the natural rate, a fall in non-tradable components of inflation and a moderate, temporary increase on CPI inflation.

In summary, all three fragmentation scenarios lead to a contraction in aggregate supply, but their effects on demand differ. Conventional assessments of the impact of fragmentation on inflation often abstract from the demand-side or general-equilibrium impact that fragmentation can have through lower real incomes, focusing primarily on its adverse supply-side effects. While the direct (or partial equilibrium) effect of fragmentation might be inflationary, the general equilibrium effect could dampen inflation, as lower real incomes weigh on aggregate demand. The effects of fragmentation on inflation dynamics and the direction of monetary policy cannot be decoupled from its impact on the natural real interest rate (r^*). As trade fragmentation affects the desired levels of savings and spending, the balance between these supply and demand forces ultimately determines the sign and magnitude of changes in the natural rate of interest.

To build intuition, we start the analysis with a representative-agent New Keynesian (RANK) version of our model as a special case of our TANK baseline model, where there are no constrained households. Next, we compare the RANK model to our TANK baseline: the presence of hand-to-mouth households leads to a larger fall in consumption and a smaller fall in output. Regarding consumption, while in principle the presence of constrained households reduces the anticipation effect from lower future incomes, the demand spillovers are stronger, leading to a larger fall in consumption. By contrast, output declines less because constrained households increase their labour supply more than unconstrained households in response to the import price shocks. Our conclusions across the three scenarios remain the same and in particular, the demand adjustment in the gradual scenario is still sufficient to lower domestic inflationary pressures and offset the increase in imported goods inflation.

Following Drechsel, McLeay, Tenreyro, and Turri (2025), we benchmark the small open economy's response to various fragmentation shocks against a constrained-efficient allocation to isolate the sources of inefficiencies in the decentralised equilibrium. Nominal frictions that delay the adjustment of non-tradables prices to shocks and frictions in the adjustment of foreign bond holdings limit the efficient reallocation of resources within and across sectors, as well as intertemporally and externally in response to shocks. As a result, there is too much reallocation towards home tradables following the import price shocks and too little towards non-tradables after an adverse productivity shock in the home tradable sector.

To sharpen our understanding of the underlying mechanisms, we vary two key parameters in our simulations: the degree of home bias in consumption and the Cobb-Douglas weight of foreign inputs in domestic production. The extent of home bias in consumption plays an important role. More open economies are more exposed to shocks in foreign prices, which is reflected in the responses of consumption and production. In the scenarios with a persistent increase in foreign prices, we see a deeper fall in the natural real rate in the more open economy. However, in the case of a negative and permanent TFP shock, openness mitigates supply pressures by allowing for diversification away from home tradables and facilitating reallocation between the two sectors domestically. The permanent nature of the shock also affects the consumption of forward-looking households, which weighs on demand.

We show that our main results are robust to extensions that incorporate additional domestic supply-side constraints, such as a higher share of imported inputs in domestic production and wage rigidities. Increased reliance on imported inputs leads to higher employment responses in our various scenarios, driven by factor substitution as import prices increase or as productivity deteriorates.

An extension of the RANK model with nominal wage rigidities moderates the degree of disinflationary pressures in the gradual fragmentation scenario and worsens the policy trade-off in the front-loaded scenario. However, the demand-side impacts are maintained, as a more modest decline in real wages is offset by a sharper fall in output and employment.

Related Literature We build on a rich literature studying monetary policy in small open economies (SOEs), including the seminal work of Benigno and Benigno (2003), Gali and Monacelli (2005), and Corsetti, Dedola, and Leduc (2010). Other important contributions to this line of research include but are not limited to, Santacreu (2005) and De Paoli (2009), who study tradable and non-tradable sectors in SOEs, and Schmitt-Grohé and Uribe (2003), who introduce imperfect international risk sharing.

We also draw on an extensive literature that studies the impact of external shocks on macroeconomic outcomes using structural models, such as Romero (2008), Catao (2013), Hevia and Nicolini (2013), Wills (2014), Bergholt (2014), Ferrero and Seneca (2019), Drechsel, McLeay, and Tenreyro (2019), Siena (2021), Comin, Johnson, and Jones (2023), Broadbent, Di Pace, Drechsel, Harrison, and Tenreyro (2023), Guerrieri, Marcussen, Reichlin, and Tenreyro (2023) and Nispi Landi and Moro (2024).[3] Recent contributions to this literature

[3]The balance between global demand and supply pressures shapes aggregate outcomes and inflationary

have explored the transmission of external shocks in models with household heterogeneity (Ferra, Mitman, and Romei (2020), Auclert, Rognlie, Souchier, and Straub (2021), Auclert, Monnery, Rognlie, and Straub (2023), and Chan, Diz, and Kanngiesser (2024)). As in Comin and Johnson (2020), we highlight general-equilibrium effects. Our focus is on fragmentation rather than offshoring, and our scenarios capture a broader range of possibilities: instead of modelling a transition to a steady state with a different degrees of openness, we consider fragmentation shocks that differ in the speed of adjustment, their origin (domestic versus foreign), and the variable directly affected (foreign input prices versus productivity).

Finally, we build on the vast literature that has examined the macroeconomic effects of globalisation. While increased competition in import prices has placed downward pressure on prices of manufactured goods, studies have shown that globalisation has had a negative, but economically small (if not negligible) effect on core inflation (Carluccio, Gautier, and Guilloux-Nefussi (2023)). Moreover, there is evidence that global disinflationary forces, such as the shift to inflation targeting regimes (Roberts (2006), ECB (2021), Ascari and Fosso (2024)) or the lower bound constraint on interest rates (Attinasi and Balatti (2021)) may offer a better explanation for the observed disinflationary trends. Theoretical results provide support for these findings. Sbordone (2008) shows that in a model in which firms' desired markup is a function of its relative market share, an increase in the number of traded goods can generate real rigidities that affect the slope of the Phillips curve. As the economy reaches a steady state with higher trade, the elasticity of demand that firms face increases, but the elasticity of the desired markup declines. These opposing forces determine how the inflation-marginal cost component of the Phillips curve slope varies. Estimates on trade data from 1960 to 2006 suggest that it remains uncertain whether trade growth observed during the globalisation era is sufficient to have driven a decline in this component of the slope. On the empirical front, Chen, Imbs, and Scott (2009) provide evidence of short-run pro-competitive effects from increased openness. They also show that trade liberalisation can have ambiguous effects in the long run, as firms can respond to increased competition by locating to protected markets.[4]

Our paper also relates to the strand of literature pioneered by Rogoff (2003) and Rogoff (2007), which looks at how economic integration affects global inflationary trends. We ab-

dynamics. Guerrieri, Lorenzoni, and Werning (2025) show that while individual central banks typically take global supply conditions as given, their collective actions influence global demand and the transmission of supply shocks to global inflation.

[4]Recent developments in global trade policy have motivated a growing body of research on the macroeconomic effects of tariffs (Bergin and Corsetti (2023), Bianchi and Coulibaly (2025), Meng, Russ, and Singh (2023), Campos, Estefania-Flores, Furceri, and Timini (2023), Auclert, Rognlie, and Straub (2025), Kalemli-Özcan, Soylu, and Yildirim (2025), Werning, Lorenzoni, and Guerrieri (2025), Cuba-Borda, Queralto, Reyes-Heroles, and Scaramucci (2025), Mehrotra and Waugh (2025), Mix and Hoang (2025), and Gnocato, Montes-Galdón, and Stamato (2025)). This paper studies the macroeconomic consequences of a realignment in global trading patterns that may be less efficient overall. While tariffs can contribute to this inefficiency, realignment may also reflect a reorientation toward less efficient suppliers, making our framework applicable to a range of factors that may increase import costs.

stract, however, from the political economy factors studied by Afrouzi, Halac, Rogoff, and Yared (2024), who suggest that globalisation would worsen the trade-offs faced by central banks, leading them to succumb to political pressures and deviate from or abandon their inflation targets. The question we ask in this paper is a different one: what would it take for central banks to bring inflation back to target under different fragmentation scenarios? As we show, in some scenarios, activity and inflation both fall, leading to stagnation (that is, without a trade-off); in others, activity and inflation move in opposite directions, creating short-term trade-offs or temporary stagflation. What is required of monetary policy to return inflation to target depends on how aggregate demand responds to lower incomes in general equilibrium. This is contingent on a number of structural parameters that we consider, as well as on the trajectory of fragmentation, particularly on the extent to which the impact on import prices is gradual or front-loaded.

Outline Section 2 sets out the theoretical framework. Section 3 describes the model calibration and analyses shocks that are linked to trade fragmentation in a RANK and TANK framework. Section 4 studies the efficient allocation of a benevolent social planner. Finally, Section 5 presents concluding remarks and potential directions for future research. We consider various extensions in the Appendix, varying the degree of home bias, the dependence of imported inputs in domestic production, nominal wage rigidity, price flexibility, and alternative elasticities of substitution.

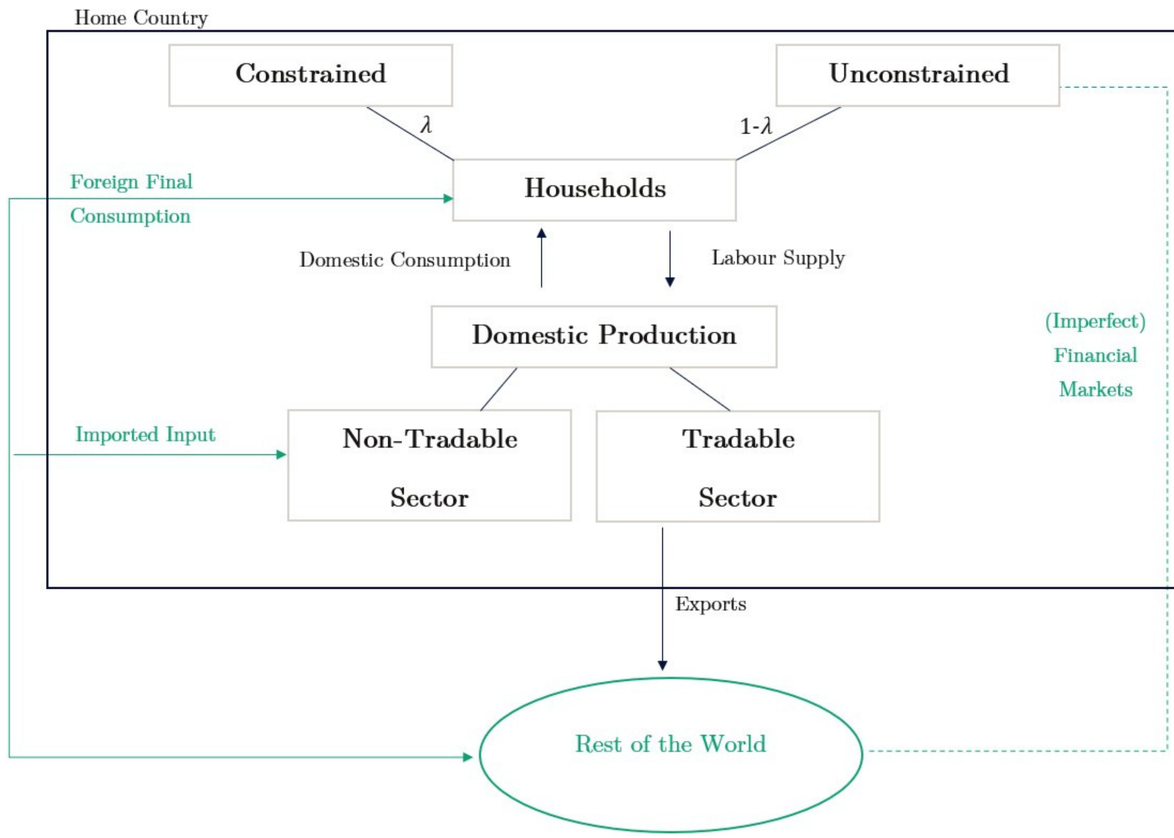
2 Baseline Model

The goal of this section is to deliver qualitative insights into shocks associated with trade fragmentation. We present a small open economy model that builds on Drechsel, McLeay, and Tenreyro (2019) and Ferrero and Seneca (2019). To capture a more realistic response of aggregate demand to international shocks, we introduce constrained and unconstrained households as in Debortoli and Galí (2017). To study the impact of fragmentation, we introduce an imported input used in the production of domestic goods and study the impact of shocks to imported prices. We also consider the impact of changes in productivity in the tradable sector of the model economy. Figure 3 presents an illustration of the model described in this section.

2.1 Households

There is a continuum of households with identical preferences at any given point in time t. A constant measure (1-λ) of households are *unconstrained* (U): they are able to smooth consumption through their access to international and domestic financial markets. The remaining fraction (λ) of households are fully *constrained* (C), meaning that they have no access to financial markets.

Figure 3: Model Structure from Home Country Perspective.



Each type of household $j \in \{U, C\}$ consumes C_t^j and supplies labour N_t^j, at wage W_t, leading to expected lifetime utility given by

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left\{ \frac{(C_t^j)^{1-\sigma}}{1-\sigma} - \kappa_\ell \frac{(N_t^j)^{1+\phi}}{1+\phi} \right\}$$

The parameters β, σ, and ϕ capture the discount factor, the inverse intertemporal elasticity of substitution and the inverse Frisch elasticity, respectively, while κ_ℓ is the disutility weight placed on labour.

Unconstrained households: The period budget constraint of these households is given by:

$$P_t C_t^U + B_t + \mathcal{E}_t B_t^* = B_{t-1}(1+i_{t-1}) + \mathcal{E}_t B_{t-1}^*(1+i_{t-1}^*) + W_t N_t^U + P_t \Psi_t - \frac{\chi}{2} \mathcal{E}_t P_t^* \left(\frac{B_t^*}{P_t^*} - b^* \right)^2 \tag{1}$$

where P_t is the aggregate price level and B_t denotes the holdings of a risk-free one-period nominal bond in domestic currency, which pays the nominal interest rate i_t. The risk-free one-period nominal bond in foreign currency is denoted by B_t^*. The foreign interest rate is denoted by i_t^* and the nominal exchange rate (expressed in terms of domestic currency relative to foreign currency) is denoted by $\mathcal{E}_t$. The real profits from firms in both tradable and non-tradable sectors (Ψ_t) are rebated to the unconstrained agents. Following Schmitt-Grohé and Uribe (2003), we assume that there is a quadratic cost of changing the real bond position relative to a real steady-state value (b^*) when trading in the foreign bond market. This cost is a common feature of small open economy models and ensures that the economy returns to a unique steady-state net foreign asset position following a transitory shock. The cost (in units of the consumption index) is denoted by a non-negative parameter, χ, while P_t^* is the aggregate price level in the foreign country. Unconstrained households maximise their expected lifetime utility by choosing a sequence $\{C_t^U, N_t^U, b_t, b_t^*\}_{t=0}^{\infty}$ subject to the series of budget constraints (1), where $b_t = \frac{B_t}{P_t}, b_t^* = \frac{B_t^*}{P_t^*}$. Consequently, the optimality conditions are as follows,

$$\kappa_\ell (N_t^U)^\phi = (C_t^U)^{-\sigma} \frac{W_t}{P_t} \tag{2}$$

$$\frac{1}{(1+i_t)} = \beta \mathbb{E}_t \left[\left(\frac{C_{t+1}^U}{C_t^U} \right)^{-\sigma} \frac{1}{1+\pi_{t+1}} \right] \tag{3}$$

$$[1 + \chi(b_t^* - b^*)] = \beta \mathbb{E}_t \left[\left(\frac{C_{t+1}^U}{C_t^U} \right)^{-\sigma} \frac{1+i_t^*}{1+\pi_{t+1}^*} \frac{\mathcal{S}_{t+1}}{\mathcal{S}_t} \right] \tag{4}$$

where $\Pi_{t+1} = (1+\pi_{t+1}) = \frac{P_{t+1}}{P_t}$ is the gross inflation rate, $\Pi_{t+1}^* = (1+\pi_{t+1}^*) = \frac{P_{t+1}^*}{P_t^*}$ is the foreign gross inflation rate, and $\mathcal{S}_t = \frac{\mathcal{E}_t P_t^*}{P_t}$ is the real exchange rate. We define $\Lambda_{t,t+1}^U = \beta \left(\frac{C_{t+1}^U}{C_t^U} \right)^{-\sigma}$ as the relevant stochastic discount factor, since only the unconstrained households have access to financial markets. The household's optimality condition for labour yields the labour supply relation (2). The Euler equation (3) follows from the first order condition for b_t. Finally, households' choices of foreign and domestic bonds give rise to an uncovered interest rate parity condition, which links the expected change in the exchange rate to the differential between the domestic and foreign interest rates. The conditions on b_t and b_t^* imply equation (4), the deviation from the uncovered interest-rate parity (UIP). According to this equation, international risk sharing will generally be imperfect, and aggregate demand across countries will fluctuate inefficiently,

$$\chi(b_t^* - b^*) = \mathbb{E}_t \left[\Lambda_{t,t+1}^U \left(\frac{(1+i_t^*)}{(1+\pi_{t+1}^*)} \frac{\mathcal{S}_{t+1}}{\mathcal{S}_t} - \frac{1+i_t}{1+\pi_{t+1}} \right) \right].$$

Constrained households: These households do not have access to financial markets and therefore they cannot smooth their consumption over time without adjusting their leisure. Instead, they only consume their labour income in each period,

$$P_t C_t^C = W_t N_t^C,$$

which implies

$$C_t^C = \frac{W_t}{P_t} N_t^C. \tag{5}$$

Their optimal labour supply condition is given by

$$\kappa_\ell (N_t^C)^\phi = (C_t^C)^{-\sigma} \frac{W_t}{P_t}. \tag{6}$$

Aggregate consumption is a weighted average of the consumption of the two types of households, $C_t = (1-\lambda)C_t^U + \lambda C_t^C$. Similarly, aggregate labour is given by $N_t = (1-\lambda)N_t^U + \lambda N_t^C$.

As in Santacreu (2005), aggregate consumption is a CES aggregate of both *tradable* (T) and *non-tradable* (N) goods,

$$C_t \equiv \left[(1-\varsigma)^{\frac{1}{\iota}} C_{T,t}^{\frac{\iota-1}{\iota}} + \varsigma^{\frac{1}{\iota}} C_{N,t}^{\frac{\iota-1}{\iota}} \right]^{\frac{\iota}{\iota-1}}$$

where ς is the share of non-tradable goods in domestic consumption and ι is the elasticity of substitution between tradable and non-tradable goods. $C_{T,t}$ is a CES aggregate of tradable goods produced in the domestic and foreign economy,

$$C_{T,t} = \left[(1-\theta)^{\frac{1}{\mu}} C_{H,t}^{\frac{\mu-1}{\mu}} + \theta^{\frac{1}{\mu}} C_{F,t}^{\frac{\mu-1}{\mu}} \right]^{\frac{\mu}{\mu-1}} \tag{7}$$

where $1-\theta$ captures the home bias: smaller values of θ imply that the economy consumes less foreign goods. The elasticity of substitution between home-produced tradable and foreign tradable goods is given by μ.

The aggregate CPI price index (P_t) and the tradable good price index ($P_{T,t}$) are respectively given by

$$P_t \equiv \left[(1-\varsigma) P_{T,t}^{1-\iota} + \varsigma P_{N,t}^{1-\iota} \right]^{\frac{1}{1-\iota}}$$

$$P_{T,t} \equiv \left[(1-\theta) P_{H,t}^{1-\mu} + \theta P_{F,t}^{1-\mu} \right]^{\frac{1}{1-\mu}}$$

where $P_{F,t} = \mathcal{E}_t P_{F,t}^*$ and $P_{F,t}^*$ follows an AR(1) process.[5] In our simulations, we will study different processes for this variable to capture the increase in fragmentation. It is important to stress that the simulations vary the foreign-currency price of imported goods, $P_{F,t}^*$, which will leads to changes in the terms of trade, defined as the relative price of imported to domestically produced tradable goods ($P_{F,t}/P_{H,t}$). This amounts to a terms-of-trade shock, distinct from a general change in the foreign country's price level, and affects the composition and level of the tradable price index $P_{T,t}$.

Aggregate prices are a function of the prices for both tradable and non-tradable goods. In turn, tradable prices are a composite of prices for domestically-produced tradable goods

[5] See Appendix A for the specifications of all exogenous variables.

and foreign-produced tradable goods, with weights reflecting the degree of home bias. The non-tradable goods and price index are given, respectively, by

$$C_{N,t} \equiv \left(\int_0^1 C_{N,t}(i)^{\frac{\epsilon-1}{\epsilon}} di \right)^{\frac{\epsilon}{\epsilon-1}}, \quad P_{N,t} \equiv \left(\int_0^1 P_{N,t}(i)^{1-\epsilon} di \right)^{\frac{1}{1-\epsilon}},$$

where ϵ captures the substitutability across different non-tradable consumption varieties i.

2.2 Firms

Households supply labour to both the tradable and non-tradable sectors, such that

$$N_t = N_{H,t} + N_{N,t} = \lambda N_t^C + (1-\lambda) N_t^U. \tag{8}$$

Labour is completely mobile across sectors, therefore there is only one wage rate in equilibrium.

2.2.1 Non-tradable goods sector

Final Goods Producers Competitive final goods producers assemble intermediate goods. We denote by $Y_{N,t}(i)$ the quantity demanded of each variety i, and by $P_{N,t}(i)$ the price charged by the individual firm producing variety i. The final good producer's optimisation problem is to choose $\{Y_{N,t}(i)\}, i \in [0,1]$ to maximise profits

$$\max_{Y_{N,t}(i)} \left\{ P_{N,t} Y_{N,t} - \int_0^1 P_{N,t}(i) Y_{N,t}(i) di \right\}$$

subject to an aggregation technology with constant elasticity of substitution,

$$Y_{N,t} = \left(\int_0^1 Y_{N,t}(i)^{\frac{\epsilon-1}{\epsilon}} di \right)^{\frac{\epsilon}{\epsilon-1}}.$$

Profit maximization, taking as given the final goods price $P_{N,t}$ and the prices for the intermediate goods $P_{N,t}(i)$, yields the set of demand schedules

$$Y_{N,t}(i) = \left[\frac{P_{N,t}(i)}{P_{N,t}} \right]^{-\epsilon} Y_{N,t}. \tag{9}$$

Intermediate Goods Producers Intermediate goods firms use labour and an *intermediate imported input* $M_{F,t}$ in production,

$$Y_{N,t}(i) = A_{N,t} M_{F,t}^{\kappa}(i) N_{N,t}^{1-\kappa}(i) \tag{10}$$

where $A_{N,t}$ is the exogenous sector-specific productivity.

Firms are monopolistically competitive and adjust prices according to Rotemberg (1982), incurring an adjustment cost each time,

$$AC_t(i) = \frac{\xi}{2}\left(\frac{P_{N,t}(i)}{P_{N,t-1}(i)} - \Pi_N\right)^2 Y_{N,t}P_{N,t}$$

where ξ summarises the degree of nominal rigidity in the economy and Π_N denote steady state non-tradable gross inflation. Finally, we obtain the Phillips Curve for non-tradable goods,

$$\Pi_{N,t}\left(\Pi_{N,t} - \Pi_N\right) = \mathbb{E}_t\left[\Lambda^U_{t,t+1}\Pi_{N,t+1}\left(\Pi_{N,t+1} - \Pi_N\right)\frac{Y_{N,t+1}P_{N,t+1}}{Y_{N,t}P_{N,t}}\right] + \frac{\epsilon}{\xi}\left(\frac{MC_t}{P_{N,t}} - \frac{\epsilon - 1}{\epsilon}\right) \tag{11}$$

where MC_t is the marginal cost obtained from differentiating the total cost function.[6] Using the demand relation and the labour market clearing condition $N_{N,t} = \int_0^1 N_{N,t}(i)di$, we can write the aggregate production function as

$$Y_{N,t}\Delta_t = A_{N,t}M^{\kappa}_{F,t}N^{1-\kappa}_{N,t}$$

where $\Delta_t = \left(1 - \frac{\xi}{2}(\Pi_{N,t} - \Pi_N)^2\right)$ captures the output loss caused by the costly adjustment of prices.

2.2.2 Tradable goods sector

The tradable sector is internationally competitive. Domestic firms in this sector take prices as given at $P_{H,t} = \mathcal{E}_t P^*_{H,t}$. We assume that the foreign price dynamics ($P^*_{H,t}$) is driven by developments in world markets and therefore exogenous from the perspective of our small open economy. Tradable sector production is given by

$$Y_{H,t} = A_{H,t}N^{1-\zeta}_{H,t} \tag{12}$$

where $A_{H,t}$ is the exogenous sector-specific productivity. The problem of a firm in the tradable sector is to maximise profits

$$\max_{N_{H,t}} P_{H,t}Y_{H,t} - W_t N_{H,t}$$

subject to the production technology (12). This yields

$$\frac{W_t}{P_{H,t}} = (1-\zeta)A_{H,t}N^{-\zeta}_{H,t}. \tag{13}$$

[6] See Appendix A for derivations.

2.3 Monetary Policy

The monetary policy authority sets the interest rate according to the following Taylor rule,

$$\frac{I_t}{I} = \left(\frac{\Pi_t}{\Pi}\right)^{\phi_\pi} \left(\frac{Y_t}{Y}\right)^{\phi_y} \tag{14}$$

where $I_t = (1 + i_t)$ is the gross nominal interest rate and I, Π, Y are the steady state level of nominal interest rate, inflation and output, respectively.[7]

2.4 Equilibrium

Given the tradable and foreign import prices $P^*_{T,t}, P^*_{F,t}$, the monetary policy rule determining i_t, foreign output Y^*_t, inflation Π^*_t and and interest rates i^*_t, and an initial condition on price dispersion, the equilibrium is given by a sequence of quantities $\{C_{H,t}, C_{T,t}, C_{N,t}, C_{F,t}, C_t, C^U_t, C^C_t, N^U_t, N^C_t, N_{H,t}, N_{N,t}, B^H_{t+1}, B^*_{t+1}, Y_{N,t}, Y_{H,t}, M_{F,t}, \Psi_t\}^\infty_{t=0}$ and prices $\{\Lambda^U_{t,t+1}, \Pi_{H,t}, \Pi_{N,t}, \Pi_{T,t}, \Pi_{F,t}, \Pi_t, W_t, \mathcal{T}_t, \mathcal{S}_t, \mathcal{E}_t, \Delta_t\}^\infty_{t=0}$ such that firms and households maximise their objectives, and the goods, labour and financial markets clear,

$$\begin{aligned}
Y_t &= C_{H,t} + C^*_{H,t} + C_{N,t} \\
Y_{H,t} &= C_{H,t} + C^*_{H,t} \\
Y_{N,t} &= C_{N,t} \\
B_t &= 0 \\
B^*_t &= B^* \\
N_t &= N_{H,t} + N_{N,t} = \lambda N^C_t + (1-\lambda) N^U_t \\
Y^*_t &= C^*_t.
\end{aligned}$$

2.5 Natural Real Interest Rate and Natural Level of Output

To understand the impact of our shocks and to determine the appropriate real policy interest rate, we calculate the natural level of output (Y^n_t) and the natural real interest rate (r^n_t).

Y^n_t is the level of output that would arise under flexible prices. To derive it, we need to determine the profit-maximizing flexible price for the domestic non-tradable good firms, which is the only sector facing nominal rigidities. Profit-maximising firms set the flexible optimal price in order to equalise marginal cost and marginal revenue. This is equivalent to setting the real marginal cost to the inverse of the desired markup,

$$MC_{N,t} = \frac{\epsilon - 1}{\epsilon}.$$

[7] We chose a Taylor rule that targets the inflation rate, rather than unobservable variables such as the natural rate or the output gap. This type of rule approximates the remit of most central banks that follow a price stability mandate, and is in line with the literature (Galí (2015)).

This yields

$$\frac{\epsilon - 1}{\epsilon} = \frac{(1-\tau)}{A_{N,t}} \left((C_t^n)^{\sigma}(N_t^n)^{\phi}\right)^{1-\kappa} \left(\frac{P_{F,t}}{P_t}\right)^{\kappa} \left[\left(\frac{\kappa}{(1-\kappa)}\right)^{1-\kappa} + \left(\frac{(1-\kappa)}{\kappa}\right)^{\kappa}\right]. \tag{15}$$

Using the UIP condition as well as the equilibrium condition for output, we can express the natural real interest rate as the risk-free real interest rate consistent with the Euler equation when output is at its natural level at all times,

$$(C_{t+1}^n)^{\sigma} = \beta(1 + r_t^n)(C_t^n)^{\sigma}$$
$$(1 + r_t^n) = \frac{1}{\beta}\left[\left(\frac{Y_{t+1}^n}{Y_t^n}\right)\frac{\Sigma_{\varsigma\theta,t}}{\Sigma_{\varsigma\theta,t+1}}\right]^{\sigma}$$

where $C_t = \frac{1}{\Sigma_{\varsigma\theta,t}} Y_t$ and $\Sigma_{\varsigma\theta,t} \equiv \left[\varsigma\left(\frac{P_t}{P_{N,t}}\right)^{\iota} + (1-\theta)(1-\varsigma)\left(\frac{P_{T,t}}{P_{H,t}}\right)^{\mu}\left(\frac{P_t}{P_{T,t}}\right)^{\iota} + \theta\left(\frac{P_t}{P_{H,t}}\right)^{\mu}\frac{\mathcal{S}_t^{\mu-1}}{\mathcal{D}_t^{\frac{1}{\sigma}}}\right]$.[8]

3 Calibration

We calibrate the model at a quarterly frequency. Our aggregate baseline calibration is standard, as several preference and technology parameters are shared with the standard New Keynesian literature. We assume a discount factor $\beta = 0.9877$ which implies an annual nominal rate of 5% in steady state. In our baseline scenario, we set the share of hand-to-mouth consumers in the population equal to 30%, following Kaplan, Violante, and Weidner (2014), Kaplan, Moll, and Violante (2018), Kaplan and Violante (2022). We set the elasticity of intertemporal substitution $\sigma = 2$. This aligns with the recent literature (Jones (2023), Kimball, Reck, Zhang, Ohtake, and Tsutsui (2024), etc.) that discusses the limitations of log-utility assumptions in economics models. For simplicity, we consider unitary elasticities of substitution between foreign and domestic tradable goods (μ), and between tradable and non-tradable goods (ι), and the Frisch elasticity.[9] In the baseline model, θ equals 0.6, which implies a weight on foreign goods in the economy of approximately 25 percent, following Harrison and Oomen (2010). We set κ, the income share of foreign primitive input in the production of non-tradable goods, close to 0 in the baseline. A positive κ (around 0.3 to match the non-labour share of income) amplifies the quantitative impact of the fragmentation scenarios we study, while leaving the qualitative interpretation unchanged.[10] Finally, we calibrate ς, the share of non-tradable goods in the consumption basket to be 0.6.

[8]See Appendix A for a full derivation.

[9]This is consistent with the view that elasticities of substitution are high in the medium- to long-run, if fragmentation is a permanent, phased-in process. However, results are robust to usual variation in these parameters (Corsetti, Dedola, and Leduc (2009)). See Appendix C.4.

[10]See Section C.2.

Parameter	Definition	Value	Source / Target
β	Household discount factor	0.9877	Annual net nominal rate $r_{ss} \approx 5\%$
σ	Household risk aversion	2	Corsetti, Dedola, and Leduc (2009)
κ_ℓ	Labour disutility	≈ 5	Literature
ϕ	Inverse Frisch elasticity	1	Gali and Monacelli (2005)
λ	Share of constrained households	0.3	Kaplan, Moll, and Violante (2018)
θ	Share of foreign tradables	0.6	Harrison and Oomen (2010)
ς	Share of non-tradables	0.6	Literature
μ	Elasticity of substitution between home and foreign goods	1	Literature
ι	Elasticity of substitution between tradables and non-tradables	1	Literature
ϵ	Elasticity of substitution between non-tradable varieties	11	10% gross final markup
ϕ_π	Interest sensitivity to inflation	1.5	Literature
ϕ_y	Interest sensitivity to output	0	Literature
ξ	Rotemberg adjustment cost	57	Avg lifetime of prices 3Q
ζ	Labour share in tradables	0.8	Literature
κ	Foreign input share in non-tradables	$\approx 0; 0.3$	Literature
ρ_s	Persistence coefficient	0.9	$s \in \{N, H^*, C^*, r^*\}$
ρ_H	Tradable TFP persistence coefficient	0.85	
ρ_F	Persistence coefficient of foreign price	0.75; 1	
χ	Portfolio adjustment cost	0.001	Literature

Table 1: This table presents the baseline quarterly calibration.

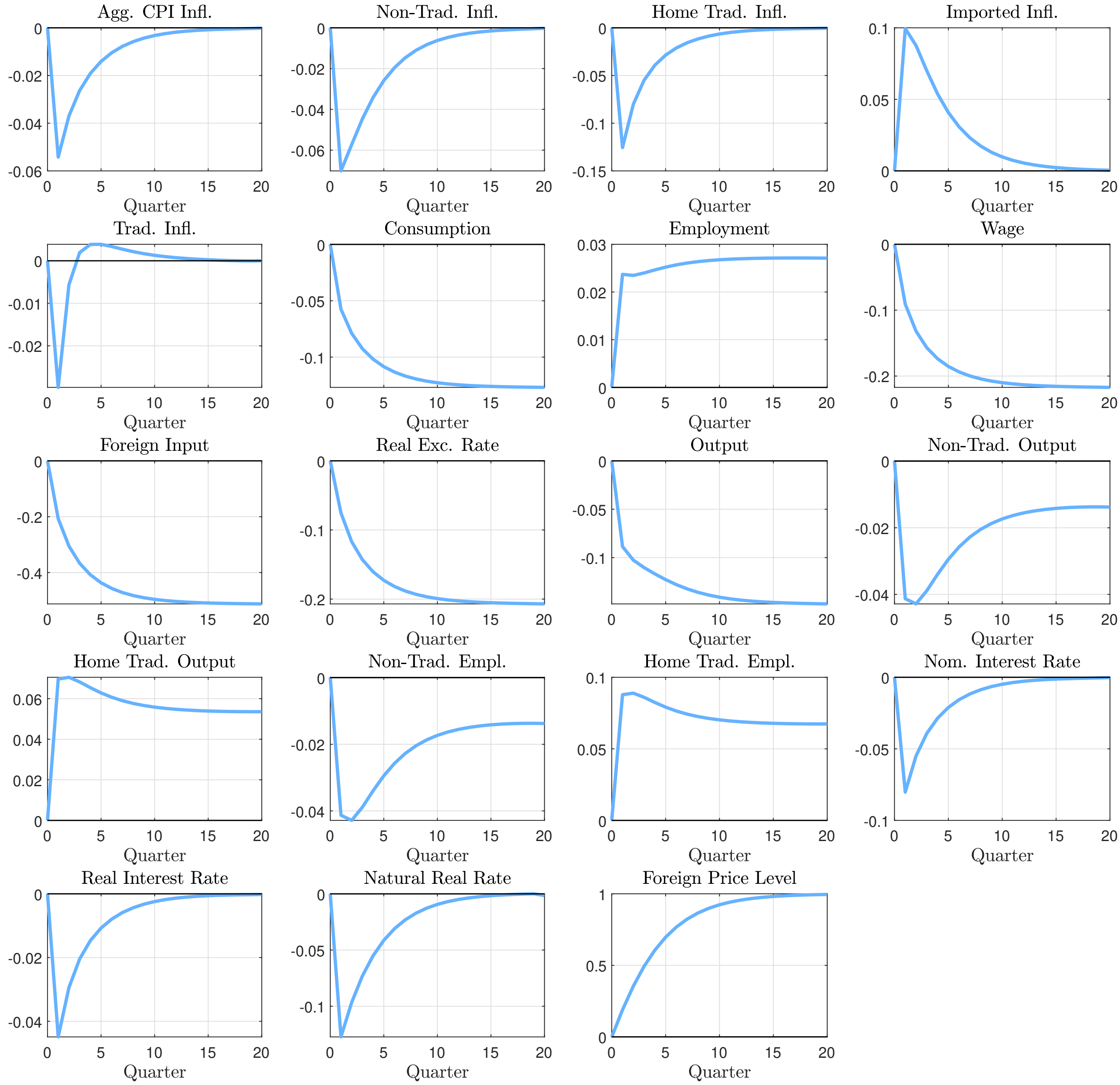
3.1 Special Case: RANK

To establish some basic intuition for our results, we study our three fragmentation scenarios in a representative agent model. This corresponds to a special case of our baseline model, where the share of constrained households is $\lambda = 0$.

Gradual Fragmentation To simulate a gradual shift towards a more restrictive trade environment, Figure 4 plots the impulse response functions (IRFs) of various macroeconomic aggregates to a gradual increase in import prices ($P^*_{F,t}$). In this scenario, import prices stabilise in the medium term, with a cumulative increase of 100 percent. The price of imported goods, $P^*_{F,t}$, will affect demand directly, both through the consumption basket $C_{F,t}$ and through imported inputs ($M_{F,t}$) in non-tradable goods production. Additionally, it indirectly affects demand through real wages.

An increase in imported inflation follows from the gradual increase in the price of foreign goods. This places upward pressure on CPI inflation, but is more than offset by the fall in domestic inflation, which declines due to the falls in both non-tradable and tradable inflation. This fall in domestic inflation is driven by the fall in consumption, which responds to the drop in households' permanent real income. Households partly compensate for the fall in real wages by increasing labour supply, which mitigates the impact of higher import prices on aggregate supply. Overall, the anticipation effect of lower real incomes leads to demand falling by more than supply, and consequently, to a fall in domestic inflation. Aggregate CPI inflation, which is a composite of domestic and imported goods inflation, falls on balance. This is reflected in a decrease in the natural real rate of interest, indicating that when demand materially adjusts in anticipation, the effect can be disinflationary. This prompts the central bank to ease policy, by lowering the nominal interest rate, in line with the Taylor-type rule characterising its reaction function.

Figure 4: IRFs to a 100% Gradual Increase in Foreign Price Level.



Notes: The results are generated under a RANK calibration ($\lambda = 0$). All the other parameters are calibrated according to Table 1.

Front-loaded Fragmentation Figure 5 shows the effect of a permanent and immediate increase in foreign prices $P^*_{F,t}$. This type of shock is intended to capture rapid 'fragmentation events', such as export controls on imported goods, supply chain disruptions, or tariffs hikes that are immediately and fully implemented, without any anticipation.[11]

The increase in the price of foreign goods leads to a sharp increase in imported inflation, which quickly reverts to its steady-state level. Aggregate consumption falls on impact and stabilises at a lower steady state. Non-tradable inflation falls, following the fall in consumption demand. Domestic tradable inflation also decreases initially, following the fall in consumption. Tradable inflation rises sharply, reflecting the surge in imported-goods inflation. Altogether, this leads to a significant spike in aggregate CPI inflation. Non-tradable output falls temporarily as the higher price of the foreign input restricts supply, but then partially recovers as households increase labour supply to compensate for losses in real income. The economy enters a temporary period of stagflation, with prices increasing and aggregate demand decreasing. Unlike the gradual scenario, there is no change in the natural real rate. The Taylor rule followed by the central bank leads to an increase in the nominal rate in order to return inflation to target.

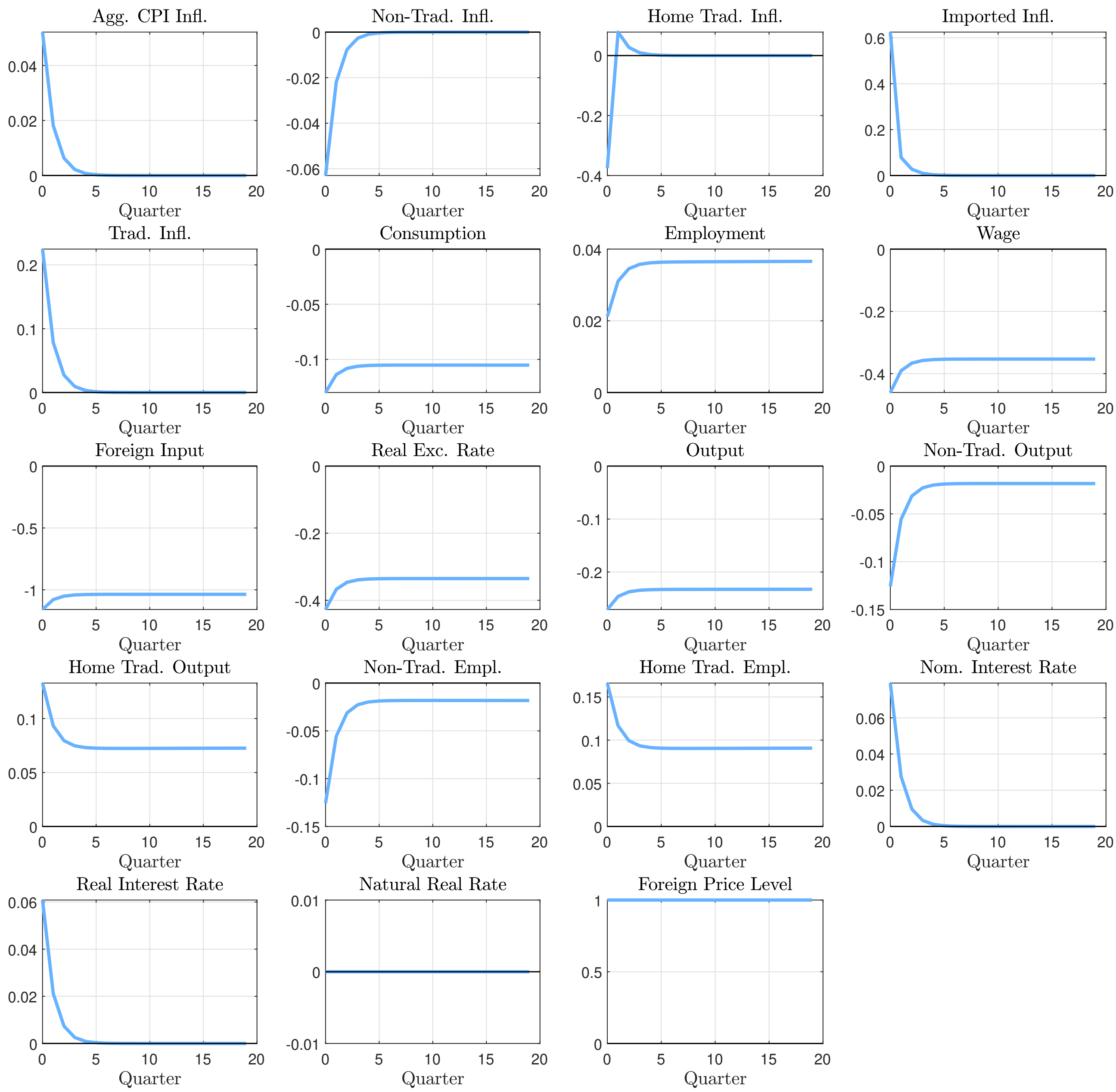
Fall in Tradables Productivity $A_{T,t}$ We consider an additional shock that can result from 'trade fragmentation': a persistent and permanent decrease in the productivity of the tradable goods sector, which makes domestic production of tradable goods less competitive in the global market. In Figure 6, we show the response to a negative one standard deviation shock to total factor productivity in the tradable sector, $A_{T,t}$.

As in the standard New Keynesian model, this constraint on home tradable supply results in more employment per unit of output and an increase in inflation as marginal costs rise. With the gradual deterioration in TFP, real wages and consumption fall, reflecting the negative wealth effect.

Inflation in the non-tradable sector is negligible as both demand and marginal costs decrease in line with the decline in real wages. As a result, the fall in non-tradable inflation is not enough to outweigh the increase in home tradable inflation, leading to a moderate increase in aggregate CPI inflation in this scenario. Monetary policy, which tracks CPI inflation, is initially contractionary, as this is needed to bring CPI inflation back to target, while the natural rate falls (reflecting lower domestic inflationary pressures), and gradually returns to steady state as the economy recovers.

[11] A caveat is in order: our analysis does not account for the use of fiscal proceeds from tariffs. One way to justify this would be to assume that proceeds from tariffs are used to stimulate supply and demand in equal amounts, without affecting the output gap or inflation. Alternatively, we can assume that import restrictions take the form of non-tariff barriers (which comprise the majority of trade restrictions), in which case there is no tax revenue to be rebated. More broadly, this exercise is intended to capture the realignment of trade, whereby geopolitics forces domestic firms to switch from low-cost to geopolitically friendly suppliers, leading to efficiency losses.

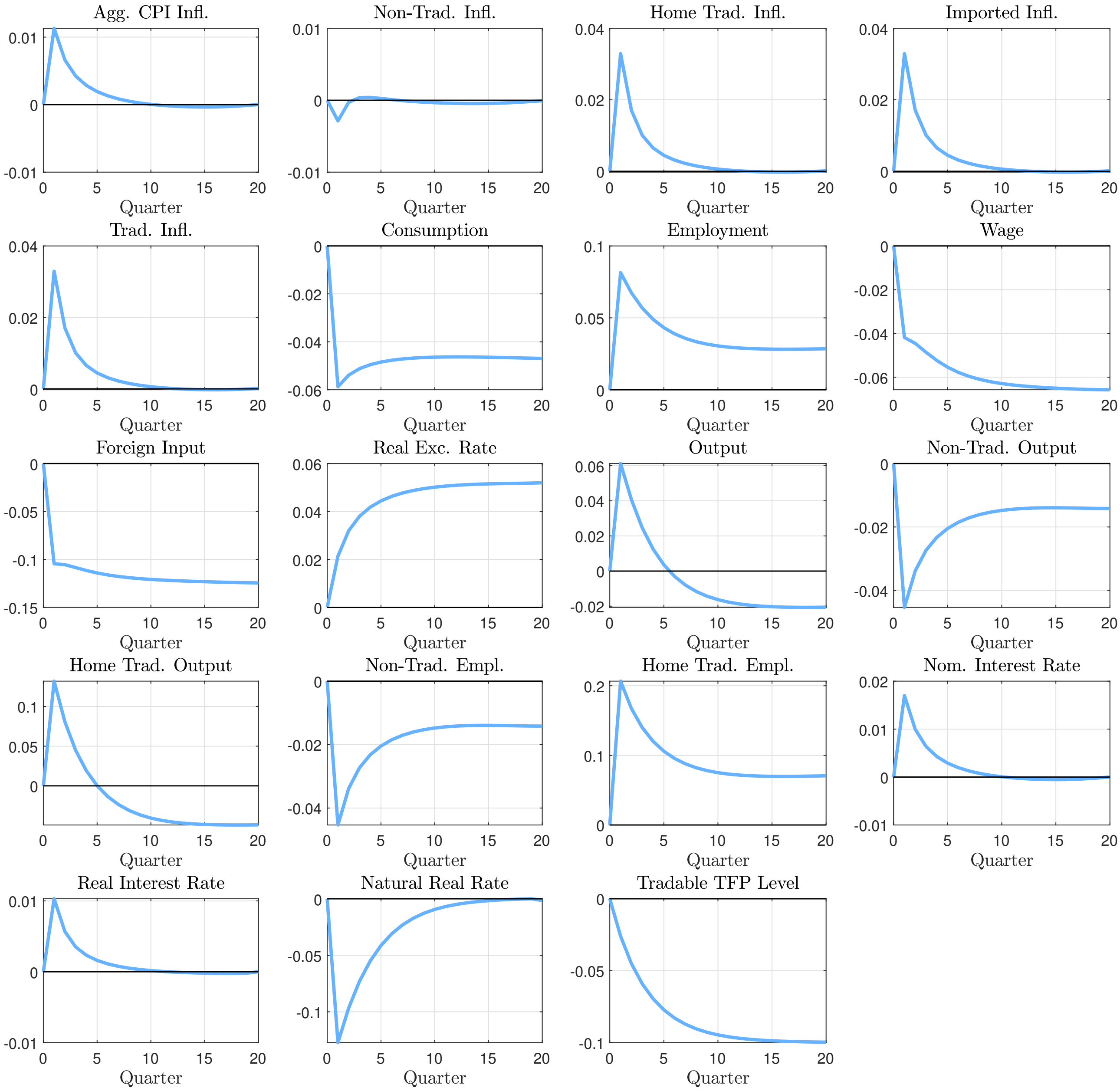
Figure 5: IRFs to a 100% Front-loaded Increase in Foreign Price Level.



Notes: The results are generated under a RANK calibration ($\lambda = 0$). All the other parameters are calibrated according to Table 1.

In summary, as all three scenarios consider shocks that constrain supply capacity, the supply-side effects are unambiguous. To capture general equilibrium effects, this section uses a simple framework to demonstrate how aggregate demand adjusts differently in various scenarios that model aspects of trade fragmentation. In the gradual fragmentation scenario, a steady increase in import prices reduces the purchasing power of labour income, through an increase in the price of imported consumption goods as well as through a fall in nominal wages. If this change is expected to be permanent, then households also expect a

Figure 6: IRFs to a 10% Gradual and Permanent Decrease in Tradable TFP.



Notes: IRFs to a negative TFP shock in the tradable sector. The results are generated under a RANK calibration ($\lambda = 0$). All the other parameters are calibrated according to Table 1.

permanent fall in purchasing power, leading to a fall in consumption spending. Therefore, a fall in permanent labour income leads to a fall in demand, which affects the price-level response to the initial increase in import prices. This scenario leads to stagnation, with lower real incomes and disinflationary pressures. In contrast, a front-loaded fragmentation scenario, which takes the form of a sharp permanent increase in import prices, may create a short-term tradeoff for policymakers, with weaker activity and higher CPI inflation. Finally, a fall in tradable sector productivity has, in principle, an ambiguous impact on CPI inflation, but it is moderately inflationary in our calibration.

These results suggest that the form in which fragmentation materialises, the extent to which it is anticipated by households, and households' ability to smooth consumption over time, all matter. The next section will consider the case where a proportion of households are unable to smooth consumption in response to changes in their permanent income.

3.2 Baseline Model: TANK

Two important factors in gauging how inflation will respond to these trade-related shocks are the degree of forward-looking behaviour in demand and the extent to which households can effectively smooth consumption in the presence of a shock. This section considers a more general framework that allows for household heterogeneity on this front.

Relative to the previous section, the presence of constrained households introduces agents who cannot smooth consumption in response to the shock, although they can adjust their labour supply. The fall in real incomes affects these households directly, while the fall in labour demand and aggregate demand by unconstrained households affects them indirectly. As in the previous section, we consider three scenarios to show how the form of fragmentation will affect the demand-side adjustment.

The fall in permanent income highlighted in the previous section will be mitigated by the proportion of constrained households. While all households consume out of permanent income in a RANK model, only a proportion λ of households do so in a TANK model. The presence of constrained households lessens the adverse demand-side effect since they cannot cut consumption in anticipation of the shock. However, the fall in consumption from unconstrained households also affects constrained households, who consume out of labour income only and cannot smooth consumption over time.

Gradual Fragmentation To simulate a gradual shift towards a more restricted trade environment, Figure 7 plots the impulse response functions to an increase in the price of imported goods, which stabilises at a 100 percent higher level in the medium term. As in the RANK case, the price of imported goods, $P^*_{F,t}$, affects demand directly, both through the consumption basket (through $C_{F,t}$) and through imported inputs in production ($M_{F,t}$). Additionally, it indirectly affects demand through real wages.

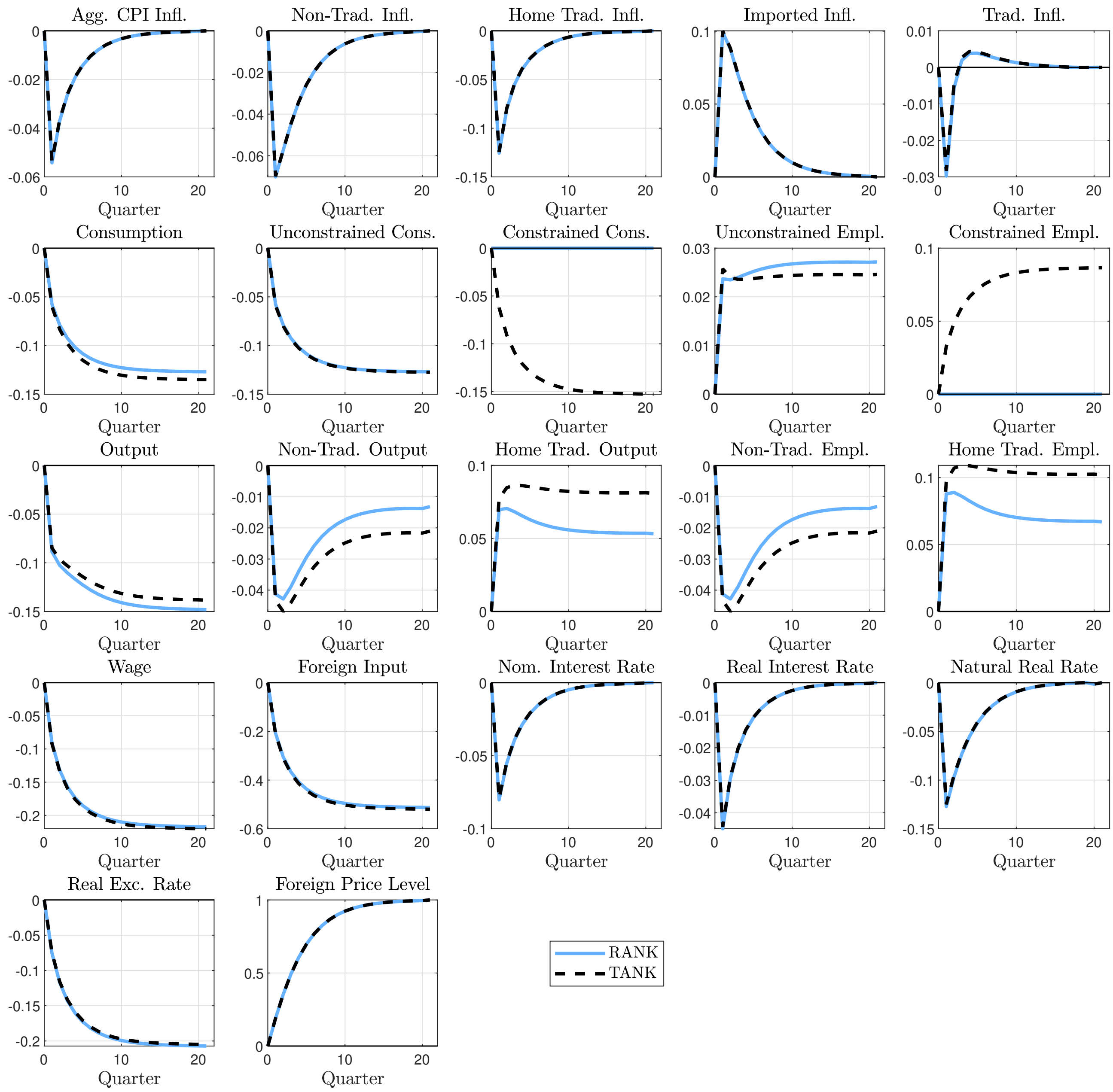
The response of real and nominal variables in a TANK model is largely similar to the RANK setting (Figure 4). Unconstrained households, who can borrow to smooth consumption, cut consumption by less than constrained households. Comparing the two cases, the presence of constrained households mitigates the adverse effect of the shock on supply, as constrained households partly compensate for the loss in real wages by increasing labour supply. Hours worked and output fall by more in the non-tradable sector, reallocating to the tradable sector, where output and hours worked increases. Overall, output falls by less in the TANK case, as the presence of constrained households mitigates the impact of higher import prices on aggregate supply. While unconstrained households lower spending in response to lower permanent incomes, constrained households also cut consumption, given higher prices and the aggregate fall in domestic demand. Overall, the anticipation effect of lower real incomes on demand by unconstrained households and the effect of lower current income on demand by constrained households lead to demand falling more than supply, and consequently, to a fall in domestic inflation. As in the RANK model, the fall in domestic inflation more than offsets the persistent increase in imported inflation, leading to a fall in aggregate CPI inflation. The natural real rate of interest falls, suggesting that when demand adjusts, the effect can be disinflationary. The central bank's nominal interest rate falls in response, in line with the rule characterising the policy maker's reaction function.

Front-loaded Fragmentation Figure 8 shows the effect of a permanent and immediate increase in foreign prices $P^*_{F,t}$. This scenario leads to a sharp increase in imported inflation, which quickly reverts back to the steady-state level. The responses of nominal variables in a TANK model are similar to the RANK case. In the TANK model, aggregate consumption falls by more due to the larger response of the hand-to-mouth consumers. Consumption falls significantly on impact, before settling at a lower steady state level for both constrained and unconstrained consumers, and in the aggregate. Non-tradable output and employment fall temporarily as the higher price of the foreign input restricts supply, but both recover as households increase their labour supply to compensate for income losses. Relative to the RANK case, the TANK setting features a larger fall in non-tradable output and employment, which is reallocated to the tradable sector, where output and employment increase by more. As in the RANK case, aggregate inflation increases in this scenario, driven by largely by the surge in imported inflation, and the economy enters a temporary period of stagflation. The policy rule followed by the central bank leads to an increase in the policy rate. Unlike the gradual fragmentation scenario, the natural real rate remains unchanged.

Fall in Tradables Productivity Finally, we consider a permanent and gradual decrease in the productivity of the tradable goods sector, which makes domestic production less competitive relative to foreign production. Figure 9 plots the responses of all variables to a one standard deviation negative shock to total factor productivity in the tradable sector, $A_{T,t}$.

Home tradable employment increases relative to home tradable output. Inflation in this sector also increases, due to the rise in the marginal cost of production. Comparing the RANK and TANK models highlights how the tradable TFP shock affects labour income and firm profits differently from an import price shock. Constrained households, who only consume out of labour income, experience a much smaller drop in consumption than unconstrained households, whose consumption also depends on firm profits. While constrained employment increases only moderately, unconstrained employment rises to a much greater extent. Overall, there is a smaller fall in consumption in the TANK model, as labour in-

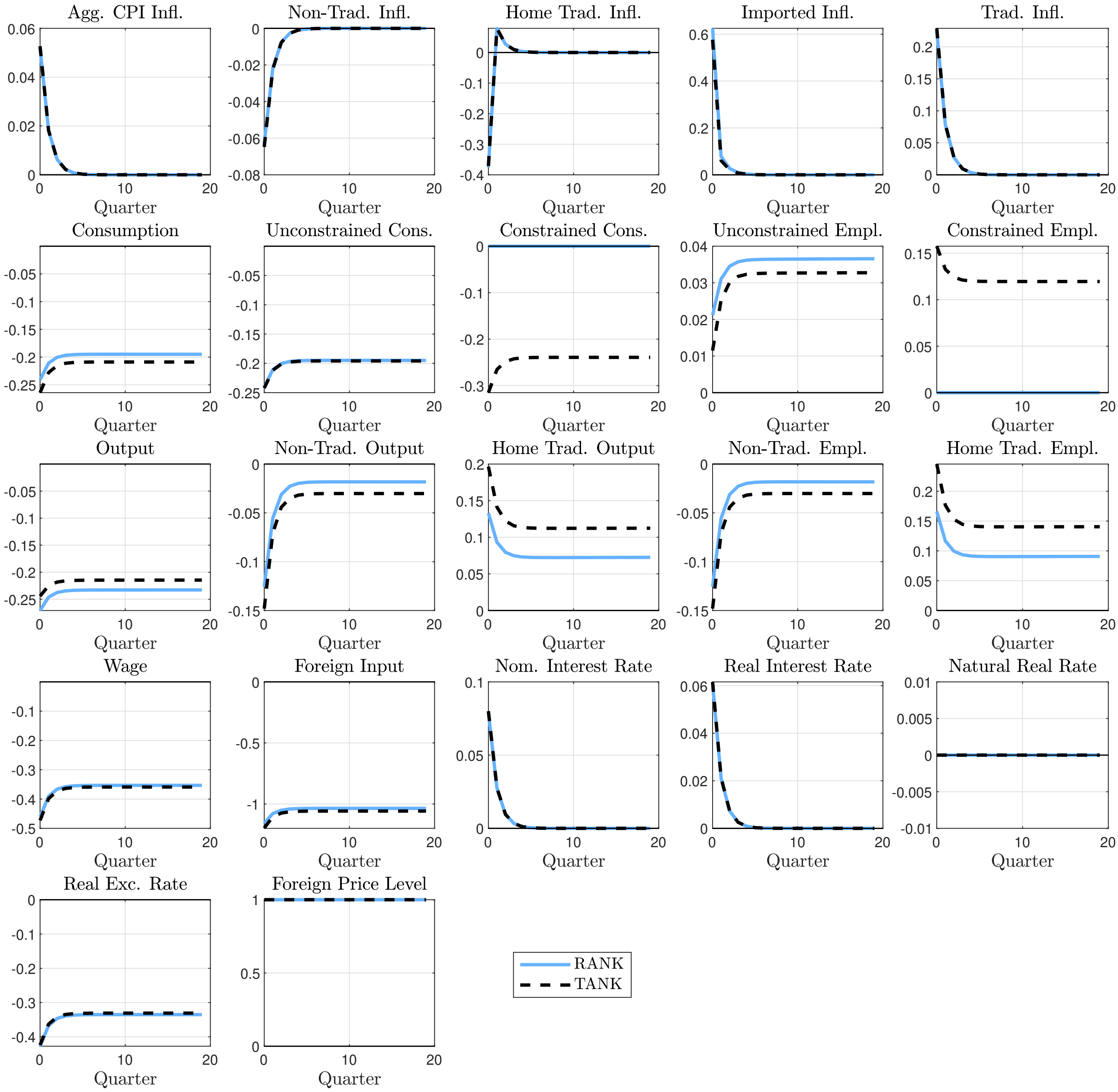
Figure 7: IRFs to a 100% Gradual Increase in Foreign Price Level.



Notes: The RANK case ($\lambda = 0$) is shown in the solid blue lines, while the TANK case ($\lambda = 0.3$) is shown in the black dashed lines. All other parameters are calibrated according to Table 1.

comes are supported by higher hours of work. Non-tradable output and employment fall by a smaller extent, relative to the RANK model. As a result, aggregate output falls by less overall. Nevertheless, this scenario is still moderately inflationary, as non-tradable inflation falls by a small amount, failing to outweigh the spike in tradables inflation.

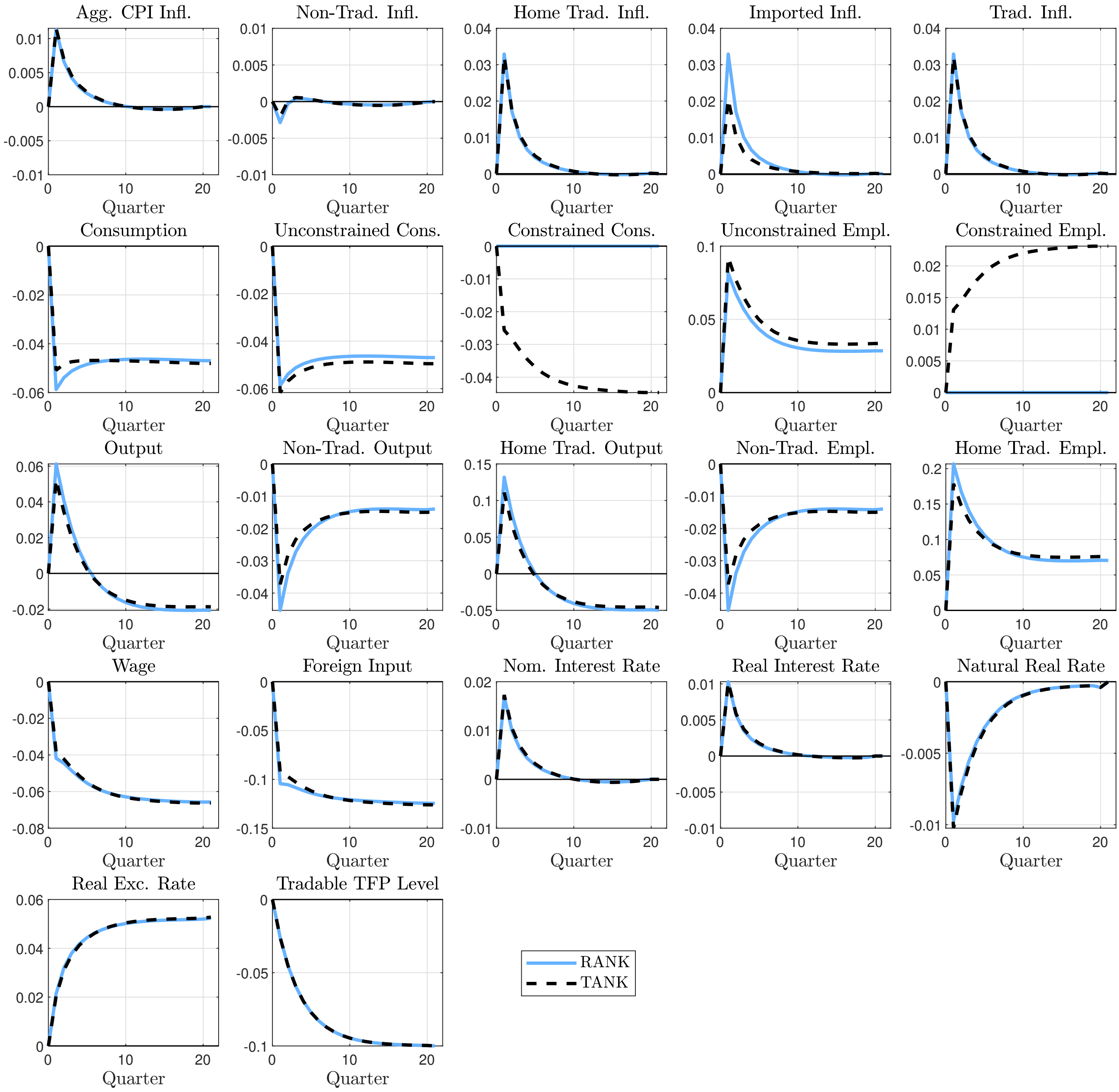
Figure 8: IRFs to a 100% Front-loaded Increase in Foreign Price Level.



Notes: The RANK case ($\lambda = 0$) is shown in the solid blue lines, while the TANK case ($\lambda = 0.3$) is shown in the black dashed lines. All other parameters are calibrated according to Table 1.

In summary, the form in which fragmentation takes place will matter for the balance of supply and demand. The sudden implementation of tariffs will have different effects compared to a gradual implementation or an adverse shock to tradables productivity. The presence of hand-to-mouth households mitigates the adverse impact of the fragmentation scenarios on aggregate supply. In the TANK model, the demand-side impact features competing effects: while fewer forward-looking agents reduce their consumption in anticipation of lower future incomes, this still affects the demand of hand-to-mouth households, who

Figure 9: IRFs to a 10% Gradual and Permanent Decrease in Tradable TFP.



Notes: The RANK case ($\lambda = 0$) is shown in the solid blue lines, while the TANK case ($\lambda = 0.3$) is shown in the black dashed lines. All other parameters are calibrated according to Table 1.

have a higher marginal propensity to consume out of labour income.[12] Finally, the TANK model highlights how aggregate demand can depend on the distributional effects of the var-

[12]Including investment would increase the importance of forward-looking behaviour for our results. As firms are more forward-looking than households, a gradual increase in import prices or a deterioration in productivity would lead to a fall in investment, deepening the contraction in demand and intensifying disinflationary pressures. Similarly, including uncertainty around the price path will tend to reinforce the anticipation effect, depressing demand more in response to the gradual shocks to import prices or productivity.

ious shocks. This is most salient with the adverse TFP shock, which has a less negative effect on labour income relative to an import price shock. Nevertheless, the net inflationary impact and the appropriate monetary policy response in each of the fragmentation scenarios remain the same across the RANK and TANK models.

Robustness and extensions We assess the robustness of our results and clarify the underlying mechanisms in Appendix C, by varying several key parameters of the model, including the degree of home bias in consumption and the share of imported inputs in domestic production. Greater openness increases the economy's exposure to foreign shocks. In the scenarios where import prices increase, more open economies experience a greater fall in demand. This is reflected in a more pronounced decline in the natural real rate of interest in the gradual case. In the contrast, in response to a negative TFP shock to the domestic tradables sector, openness allows for diversification away from home tradables.

We also extend the analysis to incorporate additional domestic supply-side constraints, including greater reliance on imported inputs in production and nominal wage rigidities. A higher share of imported inputs in production raises employment across the scenarios, as labour demand increases when import prices rise or productivity falls. Introducing wage stickiness leads to a less disinflationary outcome in the gradual fragmentation scenario and more persistent inflation in the front-loaded case. The demand-side effect of our various shocks are preserved: while wage stickiness moderates the fall in real wages, output and employment decline more sharply relative to the baseline.

Finally, our results across the three scenarios remain robust to additional sensitivity checks, such as allowing for greater price flexibility or alternative substitution elasticities. Allowing prices to adjust more frequently increases disinflationary pressure in the gradual scenario, while reducing the trade-off between higher inflation and lower activity in the front-loaded case. Increased substitutability between home and foreign tradables, and lower substitutability between tradables and non-tradables attenuates the impact of the terms-of-trade shock. This scenario matters most for the gradual scenario, where it leads to a less stagnation relative to the baseline calibration.

4 Welfare

In this section, we study the welfare optimal response to the range of fragmentation scenarios in our model, following Drechsel, McLeay, Tenreyro, and Turri (2025).

4.1 Social Planner's Solution

We characterise the social planner's solution in a small open economy. To maximise household utility, the social planner chooses the composition of consumption ($C_{H,t}, C_{F,t}, C_{N,t}$), input intensity in non-tradable production ($M_{F,t}$), resource allocation across sectors ($N_{N,t}$, $N_{H,t}$), and the external asset position (B_t^*), taking preferences, production, resource constraints, and international prices as given

$$\max_{\substack{\{C_{H,t},C_{F,t},C_{N,t},\\ N_{N,t},N_{H,t},M_{F,t},B_t^*\}_{t=0}^{\infty}}} \sum_{t=0}^{\infty} \beta^t \left[(1-\varsigma)(\theta \log C_{F,t} + (1-\theta)\log C_{H,t}) + \varsigma \log C_{N,t} - \frac{(N_{H,t}+N_{N,t})^{1+\phi}}{1+\phi} \right]$$

subject to

$$A_{N,t} M_{F,t}^{\kappa} N_{N,t}^{1-\kappa} + A_{H,t} N_{H,t}^{1-\zeta} = C_{H,t} + C_{N,t} + C_{H,t}^* \tag{16}$$

$$P_{F,t}^* C_{F,t} - P_{H,t}^* C_{H,t}^* + P_{F,t}^* M_{F,t} = (1+i_{t-1}^*) B_{t-1}^* - \frac{\chi}{2}(B_t^* - \bar{B}^*)^2 - B_t^* \tag{17}$$

$$C_{H,t}^* = \frac{C_{H,t}}{C_{F,t}} \frac{\theta}{(1-\theta)} \theta^* C_t^*. \tag{18}$$

The first constraint is a resource constraint, the second captures the trade balance, while the third describes foreign demand for home-produced goods. The solution to the planner's problem is sketched in Appendix B.

Comparing efficient and decentralised outcomes highlights the distortionary effects of price rigidity in the non-tradable sector, an inefficient use of foreign bonds to smooth shocks due to the cost of changing bond positions, and a suboptimal policy response to the shocks. Abstracting from frictions in the decentralised economy, the social planner is able to find a more optimal allocation of inputs within and across sectors and a more optimal choice of household consumption and employment. In this analysis, we focus focus on a RANK model under Cole-Obstfeld preferences ($\sigma = \mu = \iota = 1$).

Gradual Fragmentation Figure 10 shows the response of the social planner to a gradual increase in import prices. The import price shock affects the optimal intensity of imported inputs in the non-tradable sector, which becomes more labour-intensive instead. As the marginal product of labour falls in this sector, labour reallocates towards the home tradable sector. This shock is effectively an adverse terms-of-trade shock, increasing the relative price of foreign tradables to home tradables. As a result, there is also a change in the composition of domestic consumption, which switches from foreign tradables to home tradables.

The most notable difference with respect to the decentralised equilibrium is a small expansion, not a sharp contraction in the non-tradable sector, and a much smaller expansion in the home-tradable sector. This comparison suggests that although some reallocation between sectors is efficient, nominal rigidities in the non-tradable sector result in too much reallocation: in the decentralised equilibrium, there is a sharp fall in quantities (output and employment) in the non-tradable sector, and an increase in labour in the home tradable sector. In addition, the labour intensity in the home-tradable sector resulting from the shock is higher in the decentralised equilibrium. In the decentralised equilibrium, this excess contraction in output and employment in the non-tradable sector may also be attributable to a policy rule targeting aggregate CPI inflation.

The outcomes in the efficient allocation suggest that the social planner relies less on a large reallocation of resources from non-tradables to tradables and more on accumulating foreign bonds to smooth the shock intertemporally in response to import prices that increase gradually and permanently. The social planner is able to achieve a better trade-off between consumption and employment, by tolerating a slightly larger fall in consumption over time in exchange for a much smaller increase in employment.

Front-loaded Fragmentation In Figure 11, we show the response of the social planner to a front-loaded increase in import prices. Qualitatively, we see some of the same patterns from the gradual case: there is a fall in imported consumption goods and imported inputs for non-tradable production and an increase in consumption of home tradables relative to foreign tradables. Unlike the gradual scenario, these adjustments take place immediately and there is a mild contraction in the non-tradable sector.

As in the decentralised equilibrium (Figure 5), the domestic adjustment in response to this shock involves a reallocation of resources towards the home tradable sector. However, this reallocation occurs to a much smaller extent than in the decentralised case, as the social planner does not face nominal rigidities in the non-tradable sector. Consequently, the decline in output and employment in the non-tradable sector is much more moderate relative to the decentralised equilibrium.

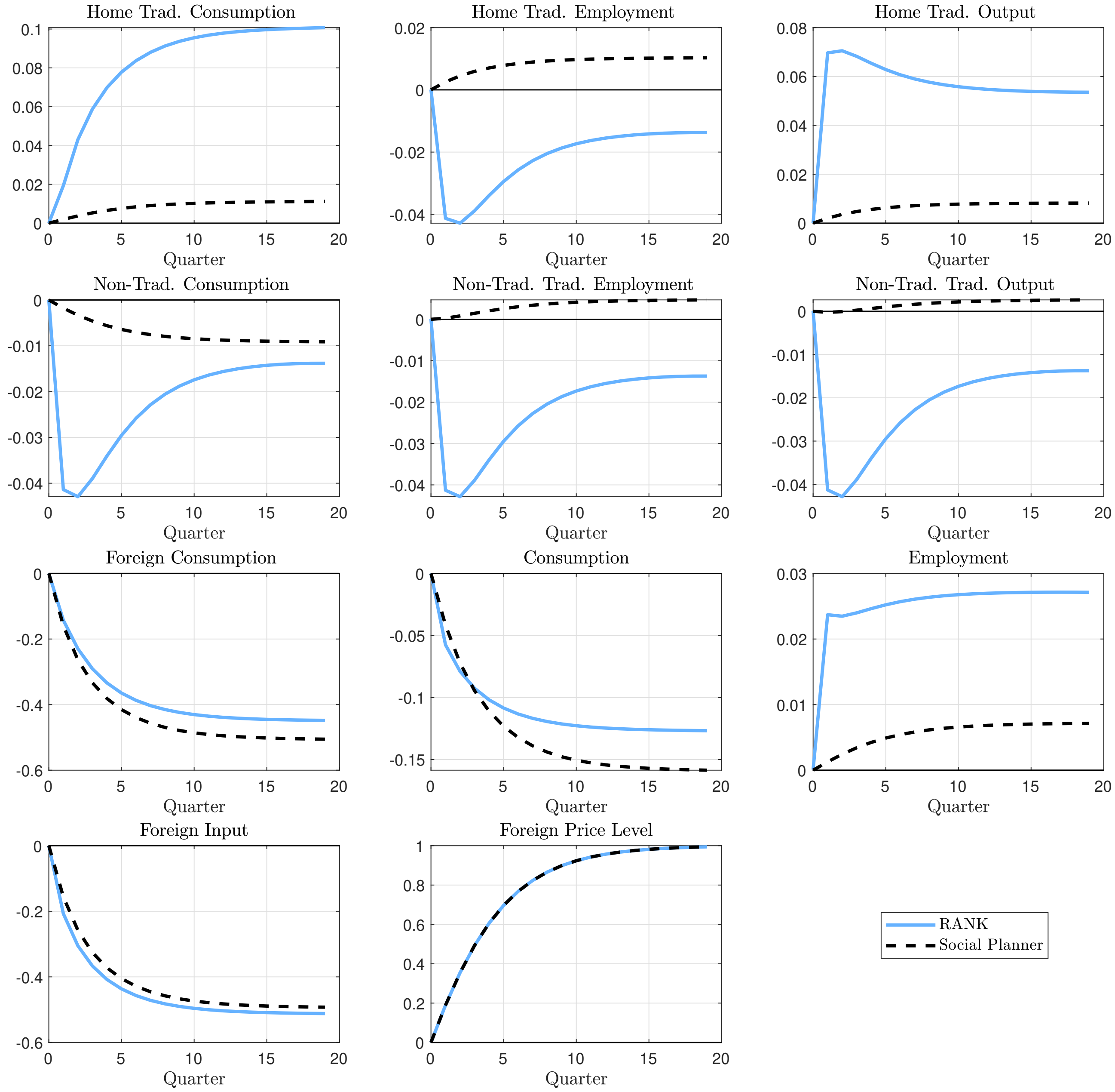
Finally, as in the gradual case, the social planner is able to trade off a slightly larger fall in consumption (driven by a large fall in consumption of foreign tradables) for a small increase in aggregate employment.

Tradables Productivity Finally, we consider the response of the social planner to a gradual and permanent deterioration in home tradables productivity in Figure 12. As expected, the home tradable sector contracts as consumption switches from home tradables to foreign tradables.

In the decentralised equilibrium, the non-tradable sector contracted, while labour intensity in the home tradable sector increased. In the efficient allocation, there is an expansion in non-tradables production and a contraction in home tradables production with no increase in labour intensity. This suggests the reallocation from home tradables to non-tradables is inefficiently low in the decentralised equilibrium due to nominal rigidities in the non-tradable sector.

Finally, most notably, consumption increases in the efficient allocation, while it decreases in the decentralised equilibrium. The increase in consumption is driven by an increase in the

Figure 10: IRFs to a 100% Gradual Increase in Foreign Price Level.

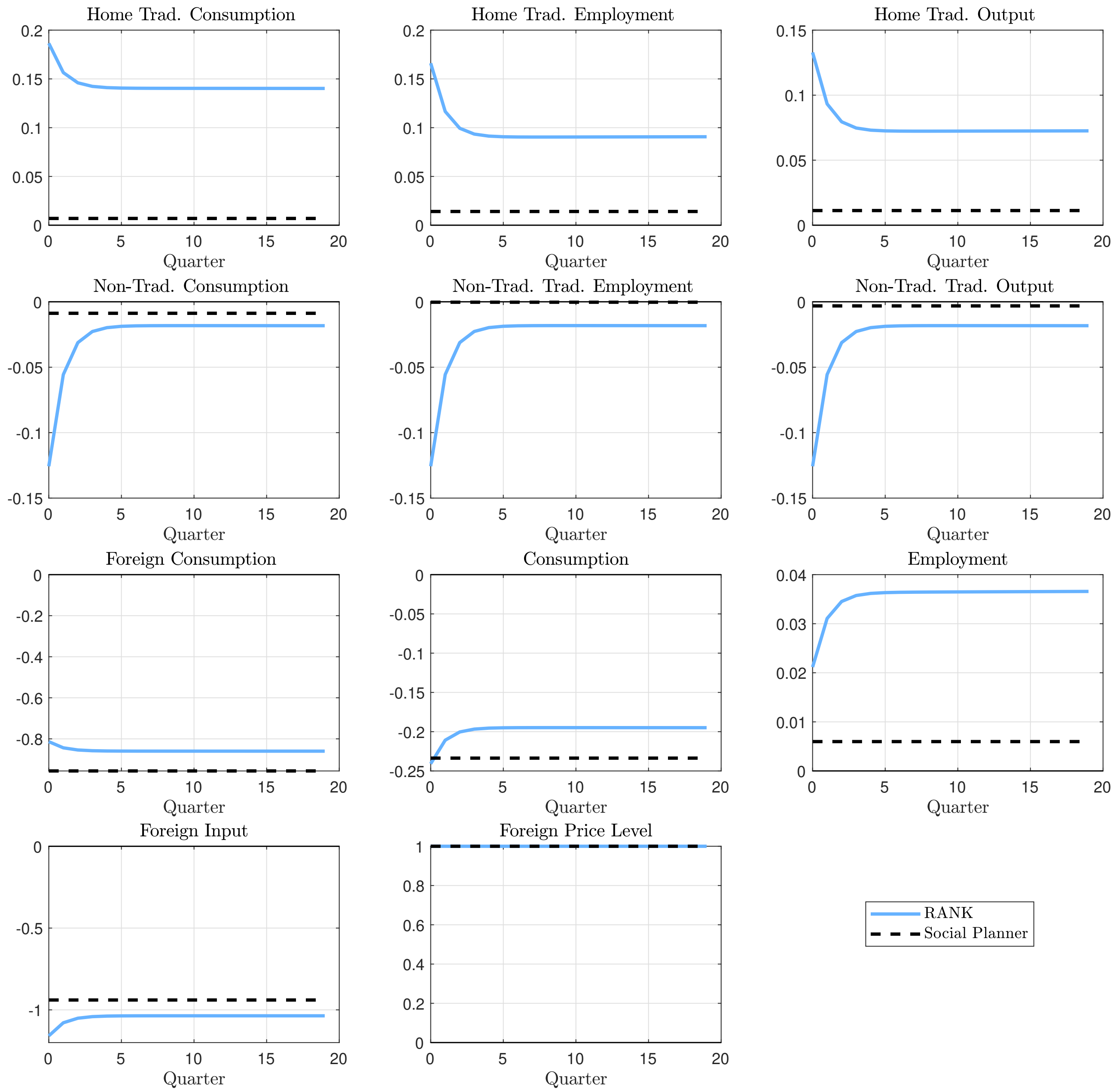


Notes: The RANK case ($\lambda = 0$) is shown in the solid blue lines, while the Social Planner case is shown in the black dashed lines. The results for the Social Planner case are generated under $\sigma = \mu = \iota = 1$, $\lambda = 0$ and $\theta^* = 0.01$. All the other parameters are calibrated according to Table 1.

consumption of foreign tradables. In the efficient allocation, employment increases gradually to a higher steady-state level.

To summarise, this section considered the efficient allocation across the three fragmentation scenarios. This exercise highlights the following inefficiencies in the decentralised equilibrium. First, sticky non-tradables prices prevent optimal domestic reallocation between sectors. Second, the cost of adjusting bond positions results in a suboptimal intertemporal response to shocks. A social planner chooses different allocations for the composition of

Figure 11: IRFs to a 100% Front-loaded Increase in Foreign Price Level.

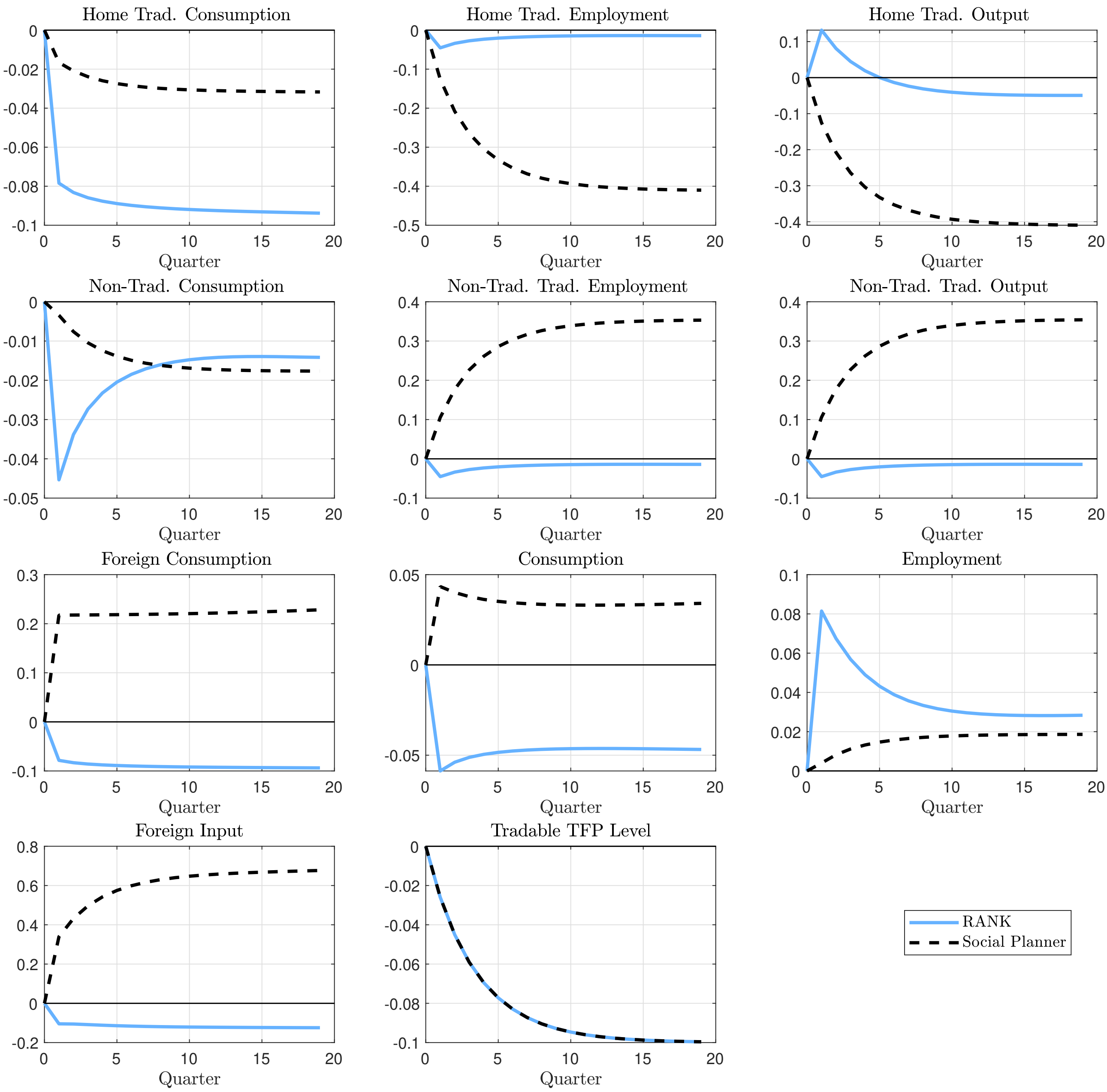


Notes: The RANK case ($\lambda = 0$) is shown in the solid blue lines, while the Social Planner case is shown in the black dashed lines. The results for the Social Planner case are generated under $\sigma = \mu = \iota = 1$, $\lambda = 0$ and $\theta^* = 0.01$. All the other parameters are calibrated according to Table 1.

consumption, the intensity of imported production inputs, the allocation of labour across sectors, and external assets to attain better outcomes for aggregate consumption and employment. The efficient allocation suggests that in the decentralised equilibrium, there is generally too much reallocation to the home-tradable sector in the scenarios with import price shocks, and too little reallocation to the non-tradable sector in the case of an adverse shock to TFP in the home tradable sector.[13]

[13] A social planner in a TANK framework would internalise the distribution of consumption and income risk

Figure 12: IRFs to a 10% Gradual and Permanent Decrease in Tradable TFP.



Notes: The RANK case ($\lambda = 0$) is shown in the solid blue lines, while the Social Planner case is shown in the black dashed lines. The results for the Social Planner case are generated under $\sigma = \mu = \iota = 1$, $\lambda = 0$ and $\theta^* = 0.01$. All the other parameters are calibrated according to Table 1.

among households. Even with utilitarian weights, the TANK planner would reallocate resources differently than in RANK because constrained households have higher marginal utility, they cannot smooth consumption intertemporally, and they consume entirely out of labour income. In both the gradual and front-loaded import price shocks, the TANK planner would mitigate the sharp fall in real incomes that would otherwise affect constrained households most in the decentralized equilibrium. In the case of the import price shocks, the TANK planner would therefore choose less reallocation from non-tradables to home tradables and a smoother path for non-tradables prices and employment relative to the RANK model. In the front-loaded case, where the impact on real incomes occurs immediately, the planner would use foreign bonds more intensively to

5 Conclusion

There is a broad consensus that a realignment of trading patterns is taking place. While fragmentation, understood as a shift from efficient suppliers toward geopolitically aligned suppliers, is likely to result in higher imported goods prices and lower real incomes, we show that the inflationary impact and the appropriate monetary policy response depend crucially on how demand adjusts to lower incomes, which in turn, depends on the form that fragmentation takes.

We study the macroeconomic effects of fragmentation using a two-sector, open economy New Keynesian model featuring imperfect risk sharing and heterogeneous households. We consider different fragmentation scenarios by varying the speed at which foreign prices adjust to a permanently higher level, as well as a negative shock to tradable sector productivity. The scenarios we consider capture the standard supply-side channels through which higher input prices affect inflation, while emphasising that the overall inflationary effect depends on how demand adjusts to lower real incomes. The balance between supply and demand differs across scenarios, with implications for inflation and consequently, monetary policy.

Our results suggest that trade fragmentation is not necessarily inflationary. In our first scenario, while the gradual and permanent increase in foreign prices yields a persistent increase in imported good price inflation, the impact on aggregate inflation is counteracted by a fall in domestic inflation. The key mechanism for this result is that forward-looking households reduce their spending in anticipation of more restrictive future supply, as they respond to lower permanent income by smoothing consumption. The natural rate of interest decreases, suggesting that, when we allow for demand to adjust, the overall effect is not inflationary. The economy enters a period of stagnation, with lower real incomes, lower demand and lower inflationary pressures. Adding investment and uncertainty to the model should exacerbate the negative impact on demand and its disinflationary effects. In our second scenario, a front-loaded and persistent increase in the price of imported goods leads to a temporary period of stagflation, with lower consumption and higher short-term inflationary pressures. Finally, a fall in the productivity of domestic tradable goods production is moderately inflationary. This scenario leads to higher marginal costs in the domestic tradable sector. However, the demand-side effects are different from the import price shocks, as labour income is less adversely affected.

To understand the various channels shaping the response of demand and supply under fragmentation, we compare our baseline results to a RANK model: the degree of forward-looking behaviour, the extent of demand spillovers between domestic agents, and the differential impact of the shock on labour and profit income are all important determinants of

prevent a sudden fall in constrained households' consumption. In the scenario where domestic tradables productivity falls, the TANK planner would opt for greater reallocation toward non-tradables to preserve labour income. Expenditure switching toward foreign tradables would also help to maintain constrained households' consumption following a decline in domestic tradables TFP.

the aggregate demand response.

We also study the social planner's response to the shocks in our different fragmentation scenarios. Comparing the efficient allocation to the decentralised equilibrium helps to isolate the sources of inefficiencies in the economy's adjustment to the various fragmentation shocks. Sticky prices in the non-tradable sector create a wedge between prices and marginal cost, while the cost of adjusting bond positions results in a suboptimal intertemporal response to shocks. In the case of import price shocks, there is an overallocation of resources to the home tradable sector while in the case of an adverse shock to home tradable productivity, there is an underallocation of resources to the non-tradable sector. In the case of a gradual increase in import prices, foreign assets are underused to smooth through shocks. The extent of domestic reallocation and external adjustment in the response to shocks is generally inefficient in the decentralised equilibrium, resulting in excess of hours worked. In all cases, by choosing a different composition for consumption, production input intensity, and labour allocation, the social planner is able to trade off a slightly larger fall in aggregate consumption for a much smaller increase in employment.

We also consider extensions with varying degrees of home bias, greater dependence on imported inputs in production, wage rigidities, price flexibility, and non-unitary elasticities of substitution. We find that macroeconomic outcomes in response to an increase in imported good prices are more adverse in open economies, as they are more exposed to foreign shocks. However, in the case of purely domestic shocks to tradables TFP, openness mitigates the supply-side impact by allowing for diversification away from home tradables.

We show that our results are robust to a higher share of imported inputs in domestic production and greater wage rigidities, which both capture additional domestic supply-side constraints. In the case of greater reliance on imported inputs in production, our various fragmentation shocks lead to a rise in employment, either through factor substitution (toward the cheaper input) or adverse TFP. However, this only stimulates the demand-side moderately through labour income.

Our extension with wage rigidities lead to more moderate disinflation in the gradual fragmentation case and more persistent inflation in the front-loaded case. While wage stickiness moderates the fall in real wages, it also leads to a fall in labour demand. The demand-side effect of our various shocks are therefore preserved, as real wages fall more moderately but employment falls more steeply. Allowing prices to adjust more frequently increases disinflationary pressures in the gradual scenario, while reducing the trade-off for policymakers in the front-loaded case.

Finally, increased substitutability between home and foreign tradables, and lower substitutability between tradables and non-tradables leads to a less adverse terms-of-trade shock for the domestic economy. This specification seems to matter most for the gradual scenario, where it leads to less stagnation relative to the baseline calibration. Overall, these extensions highlight the robustness of our main conclusions across the different fragmentation scenarios as well as the underlying mechanisms. They also underscore the need to carefully tailor the calibration to specific economies and contexts, when trying to derive policy implications.

References

Afrouzi, Hassan, Marina Halac, Kenneth S Rogoff, and Pierre Yared (Apr. 2024). *Changing Central Bank Pressures and Inflation*. Working Paper 32308. National Bureau of Economic Research.

Ascari, Guido and Luca Fosso (None 2024). “The international dimension of trend inflation”. Journal of International Economics 148.C, None.

Attinasi, Maria Grazia and Mirco Balatti (2021). “Globalisation And Its Implications For Inflation In Advanced Economies”. Economic Bulletin Articles 4.

Auclert, Adrien, Hugo Monnery, Matthew Rognlie, and Ludwig Straub (Aug. 2023). *Managing an Energy Shock: Fiscal and Monetary Policy*. Working Paper 31543. National Bureau of Economic Research.

Auclert, Adrien, Matthew Rognlie, Martin Souchier, and Ludwig Straub (May 2021). *Exchange Rates and Monetary Policy with Heterogeneous Agents: Sizing up the Real Income Channel*. Working Paper 28872. Revised August 2024. National Bureau of Economic Research.

Auclert, Adrien, Matthew Rognlie, and Ludwig Straub (Apr. 2025). *The Macroeconomics of Tariff Shocks*. Working Paper 33726. National Bureau of Economic Research.

Benigno, Gianluca and Pierpaolo Benigno (2003). “Price Stability In Open Economies”. The Review of Economic Studies 70.4, pp. 743–764.

Bergholt, Drago (2014). *Monetary Policy in Oil Exporting Economies*. Tech. rep. 5/2014. Accessed: 2025-05-25. Oslo: Centre for Applied Macro- and Petroleum Economics (CAMP), BI Norwegian Business School.

Bergin, Paul R. and Giancarlo Corsetti (2023). “The Macroeconomic Stabilization of Tariff Shocks: What Is the Optimal Monetary Response?” Journal of International Economics 143, p. 103758.

Bianchi, Javier and Louphou Coulibaly (Mar. 2025). *The Optimal Monetary Policy Response to Tariffs*. Working Paper 33560. National Bureau of Economic Research.

Broadbent, Ben, Federico Di Pace, Thomas Drechsel, Richard Harrison, and Silvana Tenreyro (Sept. 2023). “The Brexit Vote, Productivity Growth, and Macroeconomic Adjustments in the U.K.” The Review of Economic Studies 91.4, pp. 2104–2134.

Campos, Rodolfo G, Julia Estefania-Flores, Davide Furceri, and Jacopo Timini (2023). “Geopolitical Fragmentation and Trade”. Journal of Comparative Economics 51.4, pp. 1289–1315.

Carluccio, Juan, Erwan Gautier, and Sophie Guilloux-Nefussi (2023). “Dissecting the Impact of Imports From Low-Wage Countries on Inflation”. European Economic Review 160, p. 104613.

Caselli, Francesco, Miklós Koren, Milan Lisicky, and Silvana Tenreyro (2020). “Diversification Through Trade”. The Quarterly Journal of Economics 135.1, pp. 449–502.

Catao, Luis A. V. (2013). “Monetary Rules For Commodity Traders”. IMF Economic Review 61.1, pp. 52–91.

Cavallo, Alberto, Francesco Lippi, and Ken Miyahara (2024). “Large shocks travel fast”. American Economic Review: Insights 6.4, pp. 558–574.

Chan, Jenny, Sebastian Diz, and Derrick Kanngiesser (2024). “Energy Prices And Household Heterogeneity: Monetary Policy in a Gas-TANK”. Journal of Monetary Economics, p. 103620.

Chen, Natalie, Jean Imbs, and Andrew Scott (2009). “The Dynamics of Trade and Competition”. Journal of International Economics 77.1, pp. 50–62.

Comin, Diego A and Robert C Johnson (Oct. 2020). *Offshoring and Inflation*. Working Paper 27957. National Bureau of Economic Research.

Comin, Diego A, Robert C Johnson, and Callum J Jones (Apr. 2023). *Supply Chain Constraints and Inflation*. Working Paper 31179. National Bureau of Economic Research.

Corsetti, Giancarlo, Luca Dedola, and Sylvain Leduc (2009). “Optimal Monetary Policy and the Sources of Local-Currency Price Stability”. *International Dimensions of Monetary Policy*. Ed. by Jordi Galí and Mark J. Gertler. University of Chicago Press, pp. 255–296.

— (2010). “Optimal Monetary Policy in Open Economies”. *Handbook of Monetary Economics*. Ed. by Benjamin M. Friedman and Michael Woodford. Vol. 3. Amsterdam: Elsevier, pp. 861–933.

Cuba-Borda, Pablo, Albert Queralto, Ricardo Reyes-Heroles, and Mikaël Scaramucci (2025). “Trade Costs and Inflation Dynamics”.

De Paoli, Bianca (2009). “Monetary Policy and Welfare in a Small Open Economy”. Journal of international Economics 77.1, pp. 11–22.

Debortoli, Davide and Jordi Galí (Sept. 2017). *Monetary policy with heterogeneous agents: Insights from TANK models*. Economics Working Papers 1686. Department of Economics and Business, Universitat Pompeu Fabra.

Drechsel, Thomas, Michael McLeay, and Silvana Tenreyro (2019). “Monetary Policy For Commodity Booms And Busts”.

Drechsel, Thomas, Michael McLeay, Silvana Tenreyro, and Enrico Turri (Aug. 2025). *Optimal Monetary Policy and Exchange Rate Regimes in Commodity-Exposed Economies*. SSRN Working Paper.

ECB, European Central Bank (2021). *The Implications of Globalisation for the ECB Monetary Policy Strategy*. report 263. European Central Bank.

Fernández-Villaverde, Jesús, Tomohide Mineyama, and Dongho Song (July 2024). *Are We Fragmented Yet? Measuring Geopolitical Fragmentation and Its Causal Effect*. Working Paper 32638. National Bureau of Economic Research.

Ferra, Sergio De, Kurt Mitman, and Federica Romei (2020). "Household Heterogeneity And The Transmission Of Foreign Shocks". Journal of International Economics 124. NBER International Seminar on Macroeconomics 2019, p. 103303.

Ferrero, Andrea and Martin Seneca (2019). "Notes on The Underground: Monetary Policy in Resource-rich Economies". Journal of Money, Credit and Banking 51.4, pp. 953–976.

Gali, Jordi and Tommaso Monacelli (2005). "Monetary Policy and Exchange Rate Volatility in a Small Open Economy". The Review of Economic Studies 72.3, pp. 707–734.

Galí, Jordi (2015). *Monetary policy, inflation, and the business cycle: an introduction to the new Keynesian framework and its applications*. Princeton University Press.

Galí, Jordi, J David López-Salido, and Javier Vallés (2007). "Understanding the Effects of Government Spending on Consumption". Journal of the European Economic Association 5.1, pp. 227–270.

Georgieva, Kristalina (2023). *Confronting Fragmentation Where It Matters Most: Trade, Debt, And Climate Action*. Tech. rep.

Gnocato, Nicolò (2025). "Energy price shocks, unemployment, and monetary policy". Journal of Monetary Economics 151, p. 103734.

Gnocato, Nicolò, Carlos Montes-Galdón, and Giovanni Stamato (July 2025). *Tariffs Across the Supply Chain*. ECB Working Paper TBD. Forthcoming. European Central Bank.

Goodhart, Charles Albert Eric and Manoj Pradhan (2020). *The Great Demographic Reversal: Ageing Societies, Waning Inequality, And An Inflation Revival*. Vol. 10. Springer.

Guerrieri, Veronica, Guido Lorenzoni, Ludwig Straub, and Iván Werning (2021). *Monetary Policy in Times of Structural Reallocation*. Working Paper. Prepared for the Jackson Hole Economic Policy Symposium.

Guerrieri, Veronica, Guido Lorenzoni, and Ivan Werning (2025). *Global Price Shocks And International Monetary Coordination*. Working Paper.

Guerrieri, Veronica, Morten Marcussen, Lucrezia Reichlin, and Silvana Tenreyro (2023). *The Art and Science of Patience: Relative Prices and Inflation*. Tech. rep. Paris & London.

Harrison, Richard and Ozlem Oomen (2010). *Evaluating And Estimating A DSGE Model for the United Kingdom*. Tech. rep.

Hevia, Constantino and Juan Pablo Nicolini (2013). "Optimal Devaluations". IMF Economic Review 61.1, pp. 22–51.

Javorcik, Beata S., Lucas Kitzmüller, Helena Schweiger, and Muhammed A. Yıldırım (2024). “Economic Costs of Friend-Shoring”. The World Economy 47.7, pp. 2871–2908.

Jones, Charles I. (Nov. 2023). *The A.I. Dilemma: Growth Versus Existential Risk*. Working Paper 31837. National Bureau of Economic Research.

Kalemli-Özcan, Sebnem, Can Soylu, and Muhammed A Yildirim (Apr. 2025). *Global Networks, Monetary Policy and Trade*. Working Paper 33686. National Bureau of Economic Research.

Kamin, Steven, Mario Marazzi, and John Schindler (Jan. 2004). *Is China Exporting Deflation?* International Finance Discussion Paper 2004-791. Federal Reserve Board of Governors.

Kaplan, Greg, Benjamin Moll, and Giovanni L Violante (2018). “Monetary Policy According To HANK”. American Economic Review 108.3, pp. 697–743.

Kaplan, Greg and Giovanni L Violante (2022). “The Marginal Propensity To Consume In Heterogeneous Agent Models”. Annual Review of Economics 14, pp. 747–775.

Kaplan, Greg, Giovanni L. Violante, and Justin Weidner (Apr. 2014). *The Wealthy Hand-to-Mouth*. Working Paper 20073. National Bureau of Economic Research.

Kimball, Miles S., Daniel Reck, Fudong Zhang, Fumio Ohtake, and Yoshiro Tsutsui (Jan. 2024). *Diminishing Marginal Utility Revisited*. Working Paper 32077. National Bureau of Economic Research.

Kohn, Donald (2005). “Globalization, Inflation, And Monetary Policy”. Remarks during the James R. Wilson Lecture Series at the College of Wooster. Wooster, Ohio 11.

Lagarde, Christine (2023). “Breaking the Persistence of Inflation”. Speech by President of the ECB, at the ECB Forum on Central Banking 2023 on “Macroeconomic Stabilisation in a Volatile Inflation Environment” in Sintra, Portugal June.

Mehrotra, Neil R. and Michael E. Waugh (Aug. 2025). *Tariffs, Trade Wars, and the Natural Rate of Interest*. Tech. rep. Michael E. Waugh is also affiliated with the NBER. Federal Reserve Bank of Minneapolis.

Meng, Xiangtao, Katheryn N. Russ, and Sanjay R. Singh (2023). “Tariffs And The Macroeconomy”. Oxford Research Encyclopedia of Economics and Finance.

Mix, Carter and Trang T. Hoang (2025). *Trade Wars and Rumors of Trade Wars: The Dynamic Effects of the U.S.–China Tariff Hikes*. SSRN working paper No. 5101245. (Visited on 08/16/2025).

Montag, Hugh and Daniel Villar Vallenas (2025). “Post-pandemic price flexibility in the US: evidence and implications for price setting models”.

Morales-Jiménez, Camilo and Luminita Stevens (2024). “Price rigidities in US business cycles”. Manuscript, University of Maryland.

Nispi Landi, Valerio and Alessandro Moro (2024). “FraNK: Fragmentation in the NK Model”. Available at SSRN 4966420.

Roberts, John M. (Sept. 2006). “Monetary Policy And Inflation Dynamics”. International Journal of Central Banking 2.3.

Rogoff, Kenneth (2007). “Impact of Globalization on Monetary Policy”. *The New Economic Geography: Effects and Policy Implications*. Revised version of paper presented at the Jackson Hole conference, August 24–26, 2006. Federal Reserve Bank of Kansas City, pp. 265–305.

Rogoff, Kenneth S. (2003). “Globalization and Global Disinflation”. *Monetary Policy and Uncertainty: Adapting to a Changing Economy*. Federal Reserve Bank of Kansas City, pp. 77–112.

Romero, Roman E. (2008). *Monetary Policy in Oil-Producing Economies*. Tech. rep. 169. Princeton, NJ: Princeton University, Department of Economics, Center for Economic Policy Studies.

Rotemberg, Julio J (1982). “Sticky Prices in the United States”. Journal of Political Economy 90.6, pp. 1187–1211.

Santacreu, Ana Maria (June 2005). *Reaction Functions in a Small Open Economy: What Role for Non-traded Inflation?* Working Papers 2014-44. Federal Reserve Bank of St. Louis.

Sbordone, Argia M. (Apr. 2008). *Globalization And Inflation Dynamics: The Impact Of Increased Competition*. Staff Report 324. Federal Reserve Bank of New York.

Schmitt-Grohé, Stephanie and Martín Uribe (2003). “Closing small open economy models”. Journal of International Economics 61.1, pp. 163–185.

— (Dec. 2006). *Comparing Two Variants of Calvo-Type Wage Stickiness*. Working Paper 12770. National Bureau of Economic Research.

Siena, Daniele (2021). “The Euro Area Periphery and Imbalances: Is It an Anticipation Story?” Review of Economic Dynamics 40, pp. 278–308.

Werning, Ivan, Guido Lorenzoni, and Veronica Guerrieri (May 2025). *Tariffs as Cost-Push Shocks: Implications for Optimal Monetary Policy*. Working Paper 33772. National Bureau of Economic Research.

Wills, Samuel (2014). *Optimal Monetary Responses to Oil Discoveries*. Tech. rep. CFM-DP2014-8. London, UK: Centre for Macroeconomics.

Yellen, Janet L (2022). “Way Forward For The Global Economy”. Remarks By Secretary of the Treasury Janet L. Yellen 13.

— (June 2006). “Monetary Policy in a Global Environment”. FRBSF Economic Letter.

A Model

A.1 Demand Side

Unconstrained households maximise their expected lifetime utility by choosing a sequence $\{C_t^U, N_t^U, b_t, b_t^*\}_{t=0}^{\infty}$ subject to the series of budget constraints (1). For simplicity, we can rewrite the budget constraint in real terms as

$$C_t^U + b_t + \mathcal{S}_t b_t^* = b_{t-1}\frac{(1+i_{t-1})}{(1+\pi_t)} + \mathcal{S}_t b_{t-1}^* \frac{(1+i_{t-1}^*)}{(1+\pi_t^*)} + w_t N_t^U + \Psi_t - \frac{\chi}{2}\mathcal{S}_t\left(b_t^* - b^*\right)^2 \quad \text{(A.1)}$$

where $b_t = \frac{B_t}{P_t}, b_t^* = \frac{B_t^*}{P_t^*}, w_t = \frac{W_t}{P_t}, \mathcal{S}_t = \frac{\mathcal{E}_t P_t^*}{P_t}$ is the real exchange rate, and $\pi_t = \frac{P_t}{P_{t-1}} - 1$ is the net inflation rate.

For unconstrained households, the first-order conditions with respect to C_t^U, N_t^U, b_t, b_t^* are respectively given by:

$$\begin{aligned}
(C_t^U)^{-\sigma} &= \delta_t \\
\kappa_\ell (N_t^U)^{\phi} &= \delta_t \frac{W_t}{P_t} \\
\delta_t &= \beta \mathbb{E}_t\left[\frac{(1+i_t)}{(1+\pi_{t+1})}\delta_{t+1}\right] \\
\delta_t[\mathcal{S}_t + \mathcal{S}_t\chi(b_t^* - b^*)] &= \beta \mathbb{E}_t\left[\frac{(1+i_t^*)}{(1+\pi_{t+1}^*)}\mathcal{S}_{t+1}\delta_{t+1}\right]
\end{aligned}$$

where δ_t is the Lagrange multiplier on the budget constraint. Total consumption expenditure by households is given by the sum of expenditures on domestic and foreign goods,

$$P_t C_t = P_{T,t}C_{T,t} + P_{N,t}C_{N,t} = P_{H,t}C_{H,t} + P_{F,t}C_{F,t} + P_{N,t}C_{N,t}$$

The system of demand functions is given by

$$\begin{aligned}
C_{H,t} &= (1-\theta)\left(\frac{P_{H,t}}{P_{T,t}}\right)^{-\mu} C_{T,t} \\
C_{F,t} &= \theta\left(\frac{P_{F,t}}{P_{T,t}}\right)^{-\mu} C_{T,t} \\
C_{N,t} &= \varsigma\left(\frac{P_{N,t}}{P_t}\right)^{-\iota} C_t \\
C_{T,t} &= (1-\varsigma)\left(\frac{P_{T,t}}{P_t}\right)^{-\iota} C_t \\
C_{N,t}(i) &= \left(\frac{P_{N,t}(i)}{P_{N,t}}\right)^{-\epsilon} C_{N,t}
\end{aligned}$$

The terms of trade are defined as the price of imports in terms of the price of domestic goods,

$$\mathcal{T}_t \equiv \frac{P_{F,t}}{P_{H,t}} \quad \text{(A.2)}$$

A.2 Non-Tradable Firms

Firm i in the non-tradable sector maximises profits

$$\max_{M_{F,t}(i),N_{N,t}(i),P_{N,t}(i)} P_{N,t}(i)Y_{N,t}(i) - (1-\tau)\left(P_{F,t}M_{F,t}(i) - W_t N_{N,t}(i)\right) - AC_t(i)$$

subject to its production technology (10) and the demand function for its product (9). This problem yields the following first-order conditions

$$(1-\tau)W_t = MC_t(i)(1-\kappa)\frac{Y_{N,t}(i)P_{N,t}(i)}{N_{N,t}(i)} \tag{A.3}$$

$$(1-\tau)P_{F,t} = MC_t(i)\kappa\frac{Y_{N,t}(i)P_{N,t}(i)}{M_{F,t}(i)} \tag{A.4}$$

where $MC_t(i)$ is the Lagrange multiplier on the technology constraint. We can interpret this multiplier as the shadow cost of producing an additional unit of good $Y_{N,t}(i)$, that is, the marginal cost.

Substituting equations (A.3) and (A.4) into the production function we obtain demand functions for the two production inputs,

$$N_{N,t}(i) = \frac{Y_{N,t}(i)}{A_{N,t}}\left[\frac{1-\kappa}{\kappa}\frac{P_{F,t}}{W_t}\right]^{\kappa}, \quad M_{F,t}(i) = \frac{Y_{N,t}(i)}{A_{N,t}}\left[\frac{\kappa}{1-\kappa}\frac{W_t}{P_{F,t}}\right]^{1-\kappa}$$

The total factor cost function is equal to

$$\begin{aligned} TC_t(i)\left(W_t, Y_{N,t}(i), P_{F,t}, A_{N,t}\right) &= (1-\tau)\left(W_t N_{N,t} + P_{F,t}M_{F,t}\right) \\ &= (1-\tau)\left(\frac{Y_{N,t}(i)}{A_t}W_t^{1-\kappa}P_{F,t}^{\kappa}\left[\left(\frac{\kappa}{(1-\kappa)}\right)^{1-\kappa} + \left(\frac{(1-\kappa)}{\kappa}\right)^{\kappa}\right]\right) \end{aligned} \tag{A.5}$$

where $\tau = \frac{1}{\epsilon}$ is a subsidy to correct for inefficiencies introduced by the presence of monopolistic competition. Differentiation of the total cost function yields marginal cost,

$$MC_{N,t}(i) = (1-\tau)\frac{W_t^{1-\kappa}P_{F,t}^{\kappa}}{A_t}\left[\left(\frac{\kappa}{(1-\kappa)}\right)^{1-\kappa} + \left(\frac{(1-\kappa)}{\kappa}\right)^{\kappa}\right] \tag{A.6}$$

Since equation (A.6) is solely a function of factor prices and productivity, $MC_{N,t}(i) = MC_{N,t}\ \forall i$. We can rewrite nominal marginal cost in real terms as follows,

$$MC^r_{N,t}(i) = \frac{MC_{N,t}}{P_t} = \frac{(1-\tau)}{A_t}\left(\frac{W_t}{P_t}\right)^{1-\kappa}\left(\frac{P_{F,t}}{P_t}\right)^{\kappa}\left[\left(\frac{\kappa}{(1-\kappa)}\right)^{1-\kappa} + \left(\frac{(1-\kappa)}{\kappa}\right)^{\kappa}\right] \tag{A.7}$$

A.3 Tradable Firms

Tradable sector production is given by

$$Y_{H,t} = A_{H,t}N_{H,t}^{1-\zeta} \tag{A.8}$$

where $A_{H,t} = (A^{ss}_{H,t})^{1-\rho_h} A^{\rho_h}_{H,t-1}\epsilon_{H,t}$, and $\rho_h \in (0,1]$. Therefore, the problem of the tradable firm is to maximise profits

$$\max_{N_{H,t}} P_{H,t}Y_{H,t} - W_t N_{H,t}$$

subject to its production technology (12). This yields

$$\frac{W_t}{P_{H,t}} = (1-\zeta)A_{H,t}N_{H,t}^{-\zeta} \implies W_t N_{H,t} = (1-\zeta)Y_{H,t}P_{H,t} \tag{A.9}$$

which gives us profits $\Psi_{H,t} = (\zeta)P_{H,t}Y_{H,t}$.

A.4 Exogenous Processes

$$P^*_{F,t} = \left(P^{*ss}_{F,t}\right)^{1-\rho_F}\left(P^*_{F,t-1}\right)^{\rho_F}\exp(\nu_{F,t}) \quad \rho_F \in [0,1] \tag{A.10}$$
$$A_{N,t} = (A^{ss}_N)^{1-\rho_N}A^{\rho_N}_{N,t-1}\exp(\nu_{N,t}), \quad \rho_N \in (0,1] \tag{A.11}$$
$$A_{H,t} = (A^{ss}_{H,t})^{1-\rho_H}A^{\rho_H}_{H,t-1}\exp(\nu_{H,t}), \quad \rho_H \in (0,1] \tag{A.12}$$
$$P^*_{H,t} = \left(P^{*ss}_{H,t}\right)^{1-\rho_{H^*}}\left(P^*_{H,t-1}\right)^{\rho_{H^*}}\exp(\nu_{H^*,t}) \quad \rho_{H^*} \in (0,1] \tag{A.13}$$
$$C^*_t = (C^{*ss}_t)^{1-\rho_{C^*}}\left(C^*_{t-1}\right)^{\rho_{C^*}}\exp(\nu_{C^*,t}) \quad \rho_{C^*} \in (0,1] \tag{A.14}$$
$$r^*_t = (r^{*ss}_t)^{1-\rho_{r^*}}\left(r^*_{t-1}\right)^{\rho_{r^*}}\exp(\nu_{r^*,t}) \quad \rho_{r^*} \in (0,1] \tag{A.15}$$

A.5 Equilibrium Conditions

We can derive demand functions for $Y_{H,t}$ and $Y_{N,t}$ in order to obtain the market clearing conditions. Tradables are by definition consumed both domestically and in the rest of the world,

$$C_{H,t} = (1-\theta)\left(\frac{P_{T,t}}{P_{H,t}}\right)^{\mu}C_{T,t} = (1-\theta)(1-\varsigma)\left(\frac{P_{T,t}}{P_{H,t}}\right)^{\mu}\left(\frac{P_t}{P_{T,t}}\right)^{\iota}C_t$$
$$C^*_{H,t} = \theta^*\left(\frac{P_t}{P_{H,t}}\right)^{\mu}\mathcal{S}^{\mu}_t C^*_t$$
$$Y_{H,t} = (1-\theta)(1-\varsigma)\left(\frac{P_{T,t}}{P_{H,t}}\right)^{\mu}\left(\frac{P_t}{P_{T,t}}\right)^{\iota}C_t + \theta^*\left(\frac{P_t}{P_{H,t}}\right)^{\mu}\mathcal{S}^{\mu}_t C^*_t$$

where $C^*_{H,t}$, the foreign tradable demand, is derived by assuming symmetric preferences in the rest of the world. For non-tradables, instead, we calculate domestic demand as follows,

$$C_{N,t} = \varsigma\left(\frac{P_t}{P_{N,t}}\right)^{\iota}C_t \tag{A.16}$$

Therefore, we can express domestic aggregate output as follows,

$$Y_t = \varsigma\left(\frac{P_t}{P_{N,t}}\right)^{\iota}C_t + (1-\theta)(1-\varsigma)\left(\frac{P_{T,t}}{P_{H,t}}\right)^{\mu}\left(\frac{P_t}{P_{T,t}}\right)^{\iota}C_t + \theta^*\left(\frac{P_t}{P_{H,t}}\right)^{\mu}\mathcal{S}^{\mu}_t C^*_t. \tag{A.17}$$

A.6 Natural Level of Output

To derive Y_t^n, we set the real marginal cost to the inverse of the desired markup,

$$MC_{N,t} = \frac{\epsilon - 1}{\epsilon}.$$

Using the real marginal cost in equation (A.7), we obtain

$$\frac{\epsilon - 1}{\epsilon} = \frac{(1-\tau)}{A_{N,t}} \left(\frac{W_t}{P_t}\right)^{1-\kappa} \left(\frac{P_{F,t}}{P_t}\right)^{\kappa} \left[\left(\frac{\kappa}{1-\kappa}\right)^{1-\kappa} + \left(\frac{1-\kappa}{\kappa}\right)^{\kappa}\right]. \tag{A.18}$$

Under perfectly competitive labour markets, we can write the labour supply condition as follows[14]

$$\frac{W_t}{P_t} = C_t^{\sigma} N_t^{\phi}.$$

Therefore,

$$\frac{\epsilon - 1}{\epsilon} = \frac{(1-\tau)}{A_{N,t}} \left((C_t^n)^{\sigma} (N_t^n)^{\phi}\right)^{1-\kappa} \left(\frac{P_{F,t}}{P_t}\right)^{\kappa} \left[\left(\frac{\kappa}{(1-\kappa)}\right)^{1-\kappa} + \left(\frac{(1-\kappa)}{\kappa}\right)^{\kappa}\right] \tag{A.19}$$

Next, we express C_t in terms of C_t^*. Using the household's first-order condition on foreign bond holdings, and assuming that the same conditions hold in the foreign economy,

$$\frac{1}{(1+i_t^*)} = \beta \mathbb{E}_t \left[\left(\frac{C_{t+1}^*}{C_t^*}\right)^{-\sigma} \frac{1}{(1+\pi_{t+1}^*)}\right]. \tag{A.20}$$

If $\Pi = \Pi^* = 1$ in steady state, then $r = r^* = \frac{1}{\beta}$. We can therefore write the international risk-sharing condition as follows

$$\mathbb{E}_t \left[\left(\frac{C_t}{C_{t+1}}\right)^{\sigma}\right] = \mathbb{E}_t \left[\left(\frac{C_t^*}{C_{t+1}^*}\right)^{\sigma} \frac{\mathcal{S}_t}{\mathcal{S}_{t+1}}\right] \left[1 + \chi(b_t^* - b^*)\right]. \tag{A.21}$$

We can rewrite this as

$$\mathcal{D}_t^{\frac{1}{\sigma}} = \frac{C_t}{C_t^* \mathcal{S}_t} \qquad \mathcal{D}_t^{\frac{1}{\sigma}} = (1 + \chi(b_t^* - b^*)).$$

Using the goods market clearing equation and the assumption that international markets are incomplete, we can write

$$Y_t = \varsigma \left(\frac{P_t}{P_{N,t}}\right)^{\iota} C_t + (1-\theta)(1-\varsigma) \left(\frac{P_{T,t}}{P_{H,t}}\right)^{\mu} \left(\frac{P_t}{P_{T,t}}\right)^{\iota} C_t + \theta^* \left(\frac{P_t}{P_{H,t}}\right)^{\mu} \mathcal{S}_t^{\mu} C_t^*$$

$$Y_t = \left[\varsigma \left(\frac{P_t}{P_{N,t}}\right)^{\iota} + (1-\theta)(1-\varsigma) \left(\frac{P_{T,t}}{P_{H,t}}\right)^{\mu} \left(\frac{P_t}{P_{T,t}}\right)^{\iota} + \theta^* \left(\frac{P_t}{P_{H,t}}\right)^{\mu} \frac{\mathcal{S}_t^{\mu-1}}{\mathcal{D}_t^{\frac{1}{\sigma}}}\right] C_t$$

$$C_t = \frac{1}{\Sigma_{\varsigma\theta,t}} Y_t.$$

[14] Galí, López-Salido, and Vallés (2007).

where $\Sigma_{\varsigma\theta,t} = \left[\varsigma\left(\frac{P_t}{P_{N,t}}\right)^{\iota} + (1-\theta)(1-\varsigma)\left(\frac{P_{T,t}}{P_{H,t}}\right)^{\mu}\left(\frac{P_t}{P_{T,t}}\right)^{\iota} + \theta^*\left(\frac{P_t}{P_{H,t}}\right)^{\mu}\frac{\mathcal{S}_t^{\mu-1}}{\mathcal{D}_t^{\frac{1}{\sigma}}}\right]$. The relationship between domestic consumption and aggregate domestic production is described by $\Sigma_{\varsigma\theta,t}$. In an open economy, these two variables do not move in lockstep; instead, their dynamics are influenced by the degree of openness to trade. Higher θ therefore widens the wedge between consumption and production, attributable to the increased share of tradable goods destined for export.

Since $N_t^n = N_{N,t}^n + N_{H,t}^n$, we can write

$$N_t^n = \left(\frac{Y_{H,t}^n}{A_{H,t}}\right)^{\frac{1}{1-\zeta}} + Y_{N,t}^n\left(\frac{P_{F,t}}{P_{N,t}}\right)^{\frac{1-\kappa}{\kappa}}\kappa^{-\frac{\kappa}{1-\kappa}}A_{N,t}^{-\frac{1}{1-\kappa}}.$$

Substituting back in equation (A.19), we obtain

$$Y_t^n = \Sigma_{\varsigma\theta,t}\left\{\left(A_{N,t}^{\frac{1}{1-\kappa}}\Gamma^{-\frac{1}{1-\kappa}}p_{F,t}^{-\frac{\kappa}{1-\kappa}}\right)\left[N_{H,t}^n + N_{NT,t}^n\right]^{-\phi}\right\}^{\frac{1}{\sigma}}. \tag{A.22}$$

Equation (A.22) describes the natural level of output, which can vary with technology in both sectors, relative prices of input and foreign demand. Finally, the natural real interest rate is the risk-free real interest rate consistent with the Euler equation when output is at its natural level at all times,

$$(C_{t+1}^n)^{\sigma} = \beta(1+r_t^n)(C_t^n)^{\sigma}$$
$$(1+r_t^n) = \frac{1}{\beta}\left(\left(\frac{Y_{t+1}^n}{Y_t^n}\right)\frac{\Sigma_{\varsigma\theta,t}}{\Sigma_{\varsigma\theta,t+1}}\right)^{\sigma}$$

where we have used $C_t = \frac{1}{\Sigma_{\varsigma\theta,t}}[Y_t]$.

B Social Planner's Problem

Assuming Cole-Obstfeld conditions, we can simplify the following expressions

$$P_t = P_{T,t}^{1-\varsigma}P_{N,t}^{\varsigma}$$
$$P_{T,t} = P_{H,t}^{1-\theta}P_{F,t}^{\theta}$$
$$C_{T,t} = \frac{C_{H,t}^{1-\theta}C_{F,t}^{\theta}}{\theta^{\theta}(1-\theta)^{(1-\theta)}}$$
$$C_t = \frac{C_{N,t}^{\varsigma}C_{T,t}^{1-\varsigma}}{\varsigma^{\varsigma}(1-\varsigma)^{1-\varsigma}} = \frac{C_{N,t}^{\varsigma}}{\varsigma^{\varsigma}(1-\varsigma)^{1-\varsigma}}\left(\frac{C_{H,t}^{1-\theta}C_{F,t}^{\theta}}{\theta^{\theta}(1-\theta)^{(1-\theta)}}\right)^{1-\varsigma}$$

where $P_{F,t} = \mathcal{E}_t P_{F,t}^*$. The social planner solves the following optimisation problem,

$$\max_{\substack{\{C_{H,t},C_{F,t},C_{N,t},\\ N_{N,t},N_{H,t},M_{F,t},B_t^*\}_{t=0}^{\infty}}}\sum_{t=0}^{\infty}\beta^t\left[(1-\varsigma)(\theta\log C_{F,t}+(1-\theta)\log C_{H,t})+\varsigma\log C_{N,t}-\frac{(N_{H,t}+N_{N,t})^{1+\phi}}{1+\phi}\right]$$

subject to

$$A_{N,t}M_{F,t}^{\kappa}N_{N,t}^{1-\kappa}+A_{H,t}N_{H,t}^{1-\zeta}=C_{H,t}+C_{N,t}+C_{H,t}^{*} \tag{B.1}$$

$$P_{F,t}^{*}C_{F,t}=P_{H,t}^{*}C_{H,t}^{*}-P_{F,t}^{*}M_{F,t}+(1+i_{t-1}^{*})B_{t-1}^{*}-\frac{\chi}{2}(B_t^{*}-\bar{B}^{*})^2-B_t^{*} \tag{B.2}$$

$$C_{H,t}^{*}=\frac{C_{H,t}}{C_{F,t}}\frac{\theta(1-\varsigma)}{(1-\theta)(1-\varsigma)}\theta^{*}C_t^{*}. \tag{B.3}$$

The first constraint captures a resource constraint: output from the two sectors in the domestic economy is either consumed domestically or exported (as foreign consumption of domestic tradables). The second constraint describes the trade balance: the value of domestic consumption of foreign goods is equal to the net foreign asset position plus the revenue from exporting tradables for foreign consumption, minus the cost of imported intermediate inputs. Finally, the third constraint captures foreign demand for home produced goods.

The system of demand functions is given by

$$\begin{aligned}
C_{H,t}&=(1-\theta)\left(\frac{P_{H,t}}{P_{T,t}}\right)^{-1}C_{T,t}\\
C_{F,t}&=\theta\left(\frac{P_{F,t}}{P_{T,t}}\right)^{-1}C_{T,t}\\
C_{N,t}&=\varsigma\left(\frac{P_{N,t}}{P_t}\right)^{-1}C_t\\
C_{T,t}&=(1-\varsigma)\left(\frac{P_{T,t}}{P_t}\right)^{-1}C_t\\
C_{N,t}(i)&=\left(\frac{P_{N,t}(i)}{P_{N,t}}\right)^{-\epsilon}C_{N,t}.
\end{aligned}$$

The terms of trade are defined as the price of imports in terms of the price of domestic goods.

$$\mathcal{T}_t\equiv\frac{P_{F,t}}{P_{H,t}}.$$

The relevant price index for $P_{F,t}, P_{H,t}$ in our case is $P_t=P_{N,t}^{\varsigma}P_{H,t}^{(1-\varsigma)(1-\theta)}P_{F,t}^{(1-\varsigma)\theta}$. So we can write:

$$\begin{aligned}
\frac{P_{H,t}}{P_t}&=\frac{P_{H,t}}{P_{N,t}^{\varsigma}P_{H,t}^{(1-\varsigma)(1-\theta)}P_{F,t}^{(1-\varsigma)\theta}}=\mathcal{T}_t^{-\theta(1-\varsigma)}\left(\frac{P_{H,t}}{P_{N,t}}\right)^{\varsigma}\\
\frac{P_{F,t}}{P_t}&=\frac{P_{F,t}}{P_{N,t}^{\varsigma}P_{H,t}^{(1-\varsigma)(1-\theta)}P_{F,t}^{(1-\varsigma)\theta}}=\mathcal{T}_t^{1-\theta(1-\varsigma)}\left(\frac{P_{H,t}}{P_{N,t}}\right)^{\varsigma}.
\end{aligned}$$

This allows us to rewrite the demand system in terms of aggregate consumption and relative prices. Using the definitions of the tradable price index and the terms of trade, we obtain

$$
\begin{aligned}
C_{H,t} &= (1-\theta)\left(\frac{P_{H,t}}{P_{T,t}}\right)^{-1}(1-\varsigma)\left(\frac{P_{T,t}}{P_t}\right)^{-1}C_t \\
&= (1-\theta)(1-\varsigma)\left(\frac{P_t}{P_{H,t}}\right)C_t \\
&= (1-\theta)(1-\varsigma)C_t\mathcal{T}t^{\theta(1-\varsigma)}\left(\frac{P_{N,t}}{P_{H,t}}\right)^{\varsigma}
\end{aligned}
$$

and analogously,

$$
\begin{aligned}
C_{F,t} &= \theta\left(\frac{P_{F,t}}{P_{T,t}}\right)^{-1}(1-\varsigma)\left(\frac{P_{T,t}}{P_t}\right)^{-1}C_t \\
&= \theta(1-\varsigma)\left(\frac{P_t}{P_{F,t}}\right)C_t \\
&= \theta(1-\varsigma)C_t\mathcal{T}t^{\theta(1-\varsigma)-1}\left(\frac{P_{N,t}}{P_{H,t}}\right)^{\varsigma}.
\end{aligned}
$$

The law of one price requires $P_{F,t} = \mathcal{E}_t P^*_{F,t},\ P_{H,t} = \mathcal{E}_t P^*_{H,t}$. For the rest of the world, we assume that $\alpha^* \to 0,\ \alpha^* C^*_t > 0$. We also assume that the rest of the world does not have any non-traded goods in its consumption basket, $\varsigma^* \to 0$. Therefore, we can write

$$
\mathcal{S}_t = \frac{\mathcal{E}_t P^*_t}{P_t} = \frac{\mathcal{E}_t(P^*_{F,t})}{P_t} = \frac{P_{F,t}}{P_t} = \mathcal{T}_t^{1-\theta(1-\varsigma)}\left(\frac{P_{H,t}}{P_{N,t}}\right)^{\varsigma}.
$$

As the foreign demand for the home-produced good is

$$
C^*_{H,t} = \mathcal{T}_t\theta^* C^*_t,
$$

We can use the system of demand to rewrite $\mathcal{T}_t$ by taking the ratio of $C_{H,t},\ C_{F,t}$

$$
\begin{aligned}
\frac{C_{H,t}}{C_{F,t}} &= \frac{(1-\theta)(1-\varsigma)}{\theta(1-\varsigma)C_t}C_t\mathcal{T}_t^{\theta(1-\varsigma)}\left(\frac{P_{N,t}}{P_{H,t}}\right)^{\varsigma}\mathcal{T}_t^{1-\theta(1-\varsigma)}\left(\frac{P_{H,t}}{P_{N,t}}\right)^{\varsigma} \\
\frac{C_{H,t}}{C_{F,t}} &= \frac{(1-\theta)(1-\varsigma)}{\theta(1-\varsigma)}\mathcal{T}_t \\
\mathcal{T}_t &= \frac{C_{H,t}}{C_{F,t}}\frac{\theta(1-\varsigma)}{(1-\theta)(1-\varsigma)}.
\end{aligned}
$$

Finally, we obtain

$$
C^*_{H,t} = \frac{C_{H,t}}{C_{F,t}}\frac{\theta(1-\varsigma)}{(1-\theta)(1-\varsigma)}\theta^* C^*_t. \tag{B.4}
$$

B.1 Lagrangian

$$
\begin{aligned}
\mathcal{L} = \sum_{t=0}^{\infty}\beta^t \Big\{ & (1-\varsigma)(\theta \log C_{F,t} + (1-\theta)\log C_{H,t}) + \varsigma \log C_{N,t} - \frac{(N_{H,t}+N_{N,t})^{1+\phi}}{1+\phi} \\
& + \vartheta_t \Big[A_{N,t} M_{F,t}^{\kappa} N_{N,t}^{1-\kappa} + A_{H,t} N_{H,t}^{1-\zeta} - C_{H,t} - C_{N,t} - \frac{C_{H,t}}{C_{F,t}} \frac{\theta(1-\varsigma)}{(1-\theta)(1-\varsigma)} \theta^* C_t^* \Big] \\
& + \omega_t \Big[P_{H,t}^* \frac{C_{H,t}}{C_{F,t}} \frac{\theta(1-\varsigma)}{(1-\theta)(1-\varsigma)} \theta^* C_t^* - P_{F,t}^* M_{F,t} - P_{F,t}^* C_{F,t} \\
& + (1+i_{t-1}^*) B_{t-1}^* - \frac{\chi}{2}(B_t^* - \bar{B}^*)^2 - B_t^* \Big] \Big\}
\end{aligned}
$$

Taking first order conditions,

$$
\begin{aligned}
& \text{wrt to } C_{H,t}: \frac{(1-\theta)(1-\varsigma)}{C_{H,t}} + \vartheta_t \left[-1 - \frac{\theta}{(1-\theta)} \frac{\theta^* C_t^*}{C_{F,t}} \right] + \omega_t \left[\frac{\theta}{(1-\theta)} \frac{\theta^* C_t^*}{C_{F,t}} P_{H,t}^* \right] = 0 \\
& \text{wrt to } C_{F,t}: \frac{\theta(1-\varsigma)}{C_{F,t}} + \vartheta_t \left[\frac{\theta}{(1-\theta)} \frac{\theta^* C_t^* C_{H,t}}{C_{F,t}^2} \right] + \omega_t \left[- \frac{\theta}{(1-\theta)} \frac{\theta^* C_t^* C_{H,t}}{C_{F,t}^2} P_{H,t}^* - P_{F,t}^* \right] = 0 \\
& \text{wrt to } C_{N,t}: \frac{\varsigma}{C_{N,t}} + \vartheta_t[-1] = 0 \\
& \text{wrt to } N_{N,t}: -(N_{H,t}+N_{N,t})^{\phi} + \vartheta_t [A_{N,t} M_{F,t}^{\kappa} N_{N,t}^{-\kappa}(1-\kappa)] = 0 \\
& \text{wrt to } N_{H,t}: -(N_{H,t}+N_{N,t})^{\phi} + \vartheta_t [A_{H,t} N_{H,t}^{-\zeta}(1-\zeta)] = 0 \\
& \text{wrt to } M_{F,t}: \vartheta_t \left[A_{N,t} M_{F,t}^{\kappa-1} N_{N,t}^{1-\kappa} \kappa \right] + \omega_t [-P_{F,t}^*] = 0 \\
& \text{wrt to } B_t^*: \omega_t[-\chi(B_t^* - \bar{B}^*) - 1] + \beta \omega_{t+1}[(1+i_t^*)] = 0.
\end{aligned}
$$

These can be rewritten as follows,

$$
\begin{aligned}
\frac{(1-\theta)(1-\varsigma)}{C_{H,t}} &= \vartheta_t \left[1 + \frac{\theta}{(1-\theta)} \frac{\theta^* C_t^*}{C_{F,t}} \right] - \omega_t \left[\frac{\theta}{(1-\theta)} \frac{\theta^* C_t^*}{C_{F,t}} P_{H,t}^* \right] \\
\frac{\theta(1-\varsigma)}{C_{F,t}} &= \omega_t \left[\frac{\theta}{(1-\theta)} \frac{\theta^* C_t^* C_{H,t}}{C_{F,t}^2} P_{H,t}^* + P_{F,t}^* \right] - \vartheta_t \left[\frac{\theta}{(1-\theta)} \frac{\theta^* C_t^* C_{H,t}}{C_{F,t}^2} \right] \\
\frac{\varsigma}{C_{N,t}} &= \vartheta_t \\
(N_{H,t}+N_{N,t})^{\phi} &= \vartheta_t [A_{N,t} M_{F,t}^{\kappa} N_{N,t}^{-\kappa}(1-\kappa)] \\
(N_{H,t}+N_{N,t})^{\phi} &= \vartheta_t [A_{H,t} N_{H,t}^{-\zeta}(1-\zeta)] \\
\vartheta_t \left[A_{N,t} M_{F,t}^{\kappa-1} N_{N,t}^{1-\kappa} \kappa \right] &= \omega_t P_{F,t}^* \\
\beta \omega_{t+1}[(1+i_t^*)] &= \omega_t [\chi(B_t^* - \bar{B}^*) + 1] \\
A_{N,t} M_{F,t}^{\kappa} N_{N,t}^{1-\kappa} + A_{H,t} N_{H,t}^{1-\zeta} &= C_{H,t} + C_{N,t} + \frac{C_{H,t}}{C_{F,t}} \frac{\theta(1-\varsigma)}{(1-\theta)(1-\varsigma)} \theta^* C_t^* \\
P_{F,t}^* C_{F,t} &= P_{H,t}^* \frac{C_{H,t}}{C_{F,t}} \frac{\theta(1-\varsigma)}{(1-\theta)(1-\varsigma)} \theta^* C_t^* - P_{F,t}^* M_{F,t} + (1+i_{t-1}^*) B_{t-1}^* - \frac{\chi}{2}(B_t^* - \bar{B}^*)^2
\end{aligned}
$$

From here we can solve for the steady state through these equations,

$$N_{N,t} = \left(\frac{A_{N,t}M^{\kappa}_{F,t}}{A_{H,t}} \frac{(1-\kappa)}{(1-\zeta)} N^{\zeta}_{H,t} \right)^{\frac{1}{\kappa}}$$

$$C_{N,t} = \frac{\varsigma}{(N_{H,t}+N_{N,t})^{\phi}}[A_{H,t}N^{-\zeta}_{H,t}(1-\zeta)]$$

$$\frac{\varsigma}{C_{N,t}} = \vartheta_t$$

$$\frac{\vartheta_t}{P^*_{F,t}}\left[A_{N,t}M^{\kappa-1}_{F,t}N^{1-\kappa}_{N,t}\kappa\right] = \omega_t$$

$$\frac{(1-\theta)(1-\varsigma)}{\vartheta_t\left[1+\frac{\theta}{(1-\theta)}\frac{\theta^*C^*_t}{C_{F,t}}\right]-\omega_t\left[\frac{\theta}{(1-\theta)}\frac{\theta^*C^*_t}{C_{F,t}}P^*_{H,t}\right]} = C_{H,t}$$

$$C_{F,t} = \frac{C_{H,t}}{A_{N,t}M^{\kappa}_{F,t}N^{1-\kappa}_{N,t}+A_{H,t}N^{1-\zeta}_{H,t}-C_{H,t}-C_{N,t}}\frac{\theta}{(1-\theta)}\theta^*C^*_t$$

$$N_{H,t} = \vartheta_t[A_{N,t}M^{\kappa}_{F,t}N^{-\kappa}_{N,t}(1-\kappa)] - N_{N,t} \quad \phi = 1$$

$$P^*_{F,t}M_{F,t} = P^*_{H,t}\frac{C_{H,t}}{C_{F,t}}\frac{\theta(1-\varsigma)}{(1-\theta)(1-\varsigma)}\theta^*C^*_t - P^*_{F,t}C_{F,t} + (1+i^*_{t-1})B^*_{t-1} - \frac{\chi}{2}(B^*_{ty}-\bar{B}^*)^2 - B^*_t.$$

C Robustness Exercises

This section examines several important dimensions of the model: the degree of trade openness and the share of imported inputs in production.

C.1 Different Degrees of Openness

This section explores the impact of the initial level of trade openness on the macroeconomic response to fragmentation. We therefore consider the same set of fragmentation scenarios while varying the degree of home bias, denoted by $1-\theta$. A lower value of θ indicates a less open economy: the consumption basket and price index are less affected by foreign prices and consumption relies more on domestic production. This adjustment allows us to capture variation in the degree of exposure to trade shocks and how the policy response may vary with the level of openness.

More open economies are more directly exposed to fluctuations in foreign prices; absent diversification strategies, this would directly affect their consumption and production responses.[15] In the scenarios involving permanent increases in foreign prices, whether gradual or front-loaded, the more open economy experiences a more pronounced decline in the natural rate of interest. All the results we discussed in the previous sections are exacerbated in more open economies. However, in the case of a negative TFP shock, output falls more

[15] Caselli, Koren, Lisicky, and Tenreyro (2020) discuss conditions under which diversification of international buyers and suppliers can reduce volatility in more open economies.

in a closed economy, as more open economies can mitigate the impact by diversifying away from domestic shocks through trade with foreign suppliers (and buyers).

Gradual Fragmentation Figure 13 shows that the open economies ($\theta = 0.6$ and $\theta = 0.8$) respond differently from the relatively closed economy ($\theta = 0.1$) in a gradual fragmentation scenario. Aggregate inflation has the same behaviour in all three cases; however, the underlying mechanisms differ quantitatively.

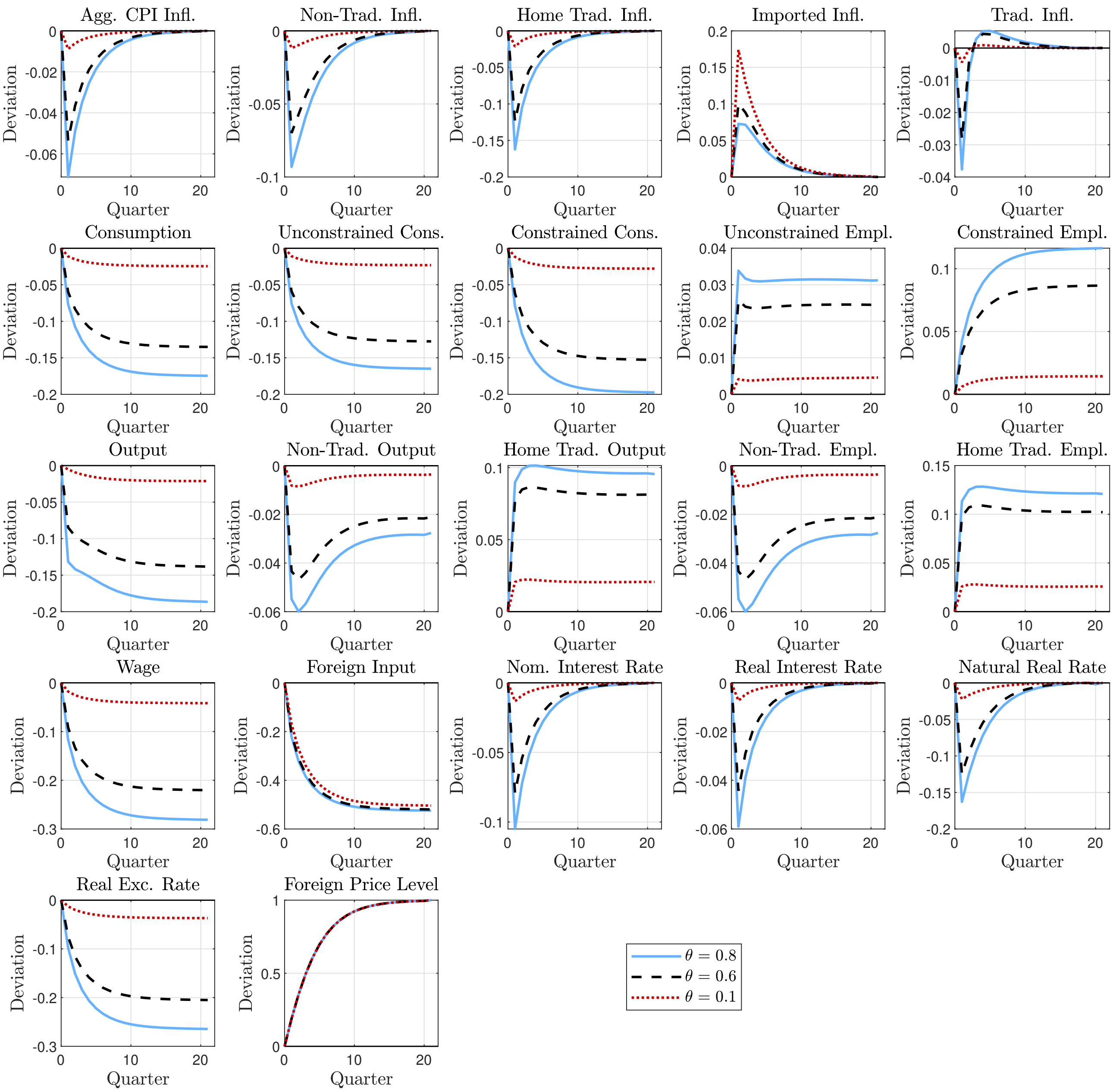
A useful benchmark to start with is the relatively closed economy case ($\theta = 0.1$, red dotted lines). Here, imported inputs are used mainly as an intermediate input for the production of non-tradable goods and the consumption basket of domestic households consists mainly of domestically produced tradable and non-tradable goods. As import prices rise gradually, non-tradable employment moves in line with non-tradable output, which falls slightly before returning to steady state. Employment for both types of households increases and real wages fall. The adverse effect on labour income leads to a fall in consumption for both types of households. The fall in aggregate consumption leads to downward pressure on domestic inflation and aggregate CPI inflation.

Next, consider the open economies ($\theta = 0.6$ and $\theta = 0.8$, dashed black lines and solid blue lines respectively), where imported goods are not only used as intermediate inputs in the production of non-tradable goods but also comprise part of the consumption basket (as foreign tradable goods). The additional fall in non-tradable goods inflation relative to the case of $\theta = 0.1$ is due to the fall in real income and domestic consumption, which now exerts additional downward pressure on domestic inflation. The fall in home tradables inflation counters the sharp rise in imported inflation, leading to a fall in tradables inflation overall. More openness also leads to a larger domestic adjustment in response to the import price shock. The import price shock leads households to substitute towards relatively cheaper domestically produced goods and production factors, which moderates the fall in output. While there is a moderate and permanent fall in non-tradable employment and output, the opposite is true for the domestic tradable sector: employment and output both increase here. A greater exposure to foreign shocks is reflected in a larger fall in the natural rate of interest in the more open economies.

Front-loaded Fragmentation In the front-loaded fragmentation scenario, openness also plays a significant role in the response to an increase in the price of imported goods. Notably, in the more open economy, non-tradable inflation exhibits a more pronounced decline immediately following the shock (Figure 14). However, overall, the spike in aggregate CPI inflation is larger in the more open economy, as a result of the sharper increase in tradable inflation.

Consider the case of a relatively closed economy, where the import price shock mainly affects intermediate inputs in the production of non-tradable goods ($\theta = 0.1$). As the price of foreign inputs rises, there is a decrease in demand for these inputs, with a moderate fall

Figure 13: IRFs to a 100% Gradual Increase in Foreign Price Level.



Notes: The share of foreign tradables in the domestic household's consumption basket is denoted by θ. We show simulations for a relatively closed economy ($\theta = 0.1$) with a red dotted line, a moderately open economy ($\theta = 0.6$) with a black dashed line, and a very open economy ($\theta = 0.8$) with a blue line. All the other parameters are calibrated according to Table 1.

in non-tradable output, non-tradable employment, and real wages. As a result, aggregate consumption also falls moderately.

The same dynamics are more pronounced in the open economies ($\theta = 0.6$ and $\theta = 0.8$, dashed black lines and solid blue lines, respectively), as imported goods also affect the consumption basket. The import price shock therefore adversely affects consumption, and to a greater degree in the more open economy. The shock also affects the domestic economy as households substitute towards relatively cheaper domestically produced goods.[16] Output and employment increase in the tradable sector, while the output and employment in the non-tradable sector fall and recover quickly, yet only incompletely, from the shock.

Fall in Tradables Productivity Figure 15 shows the impulse response functions for a one-standard deviation fall in TFP for the tradable sector. As before, consider first the $\theta = 0.1$ specification (red dotted lines). In this case, imported inputs are mainly used in the production of non-tradable goods. An adverse productivity shock in the tradable sector leads to a fall in tradable output. Each unit of tradable output now requires more labour to produce, and hours worked increase gradually due to higher labour demand. The adverse TFP shock leads to an increase in marginal costs in the tradable sector, which initially leads to upward pressure on tradable inflation. The fall in real wages leads to a fall in consumption. This is largely driven by a fall in the consumption of unconstrained households, who receive firm profits. Constrained households, who consume only out of labour income, experience a smaller fall in consumption. This shock also leads to a larger increase in the labour supply of unconstrained households relative to constrained households.

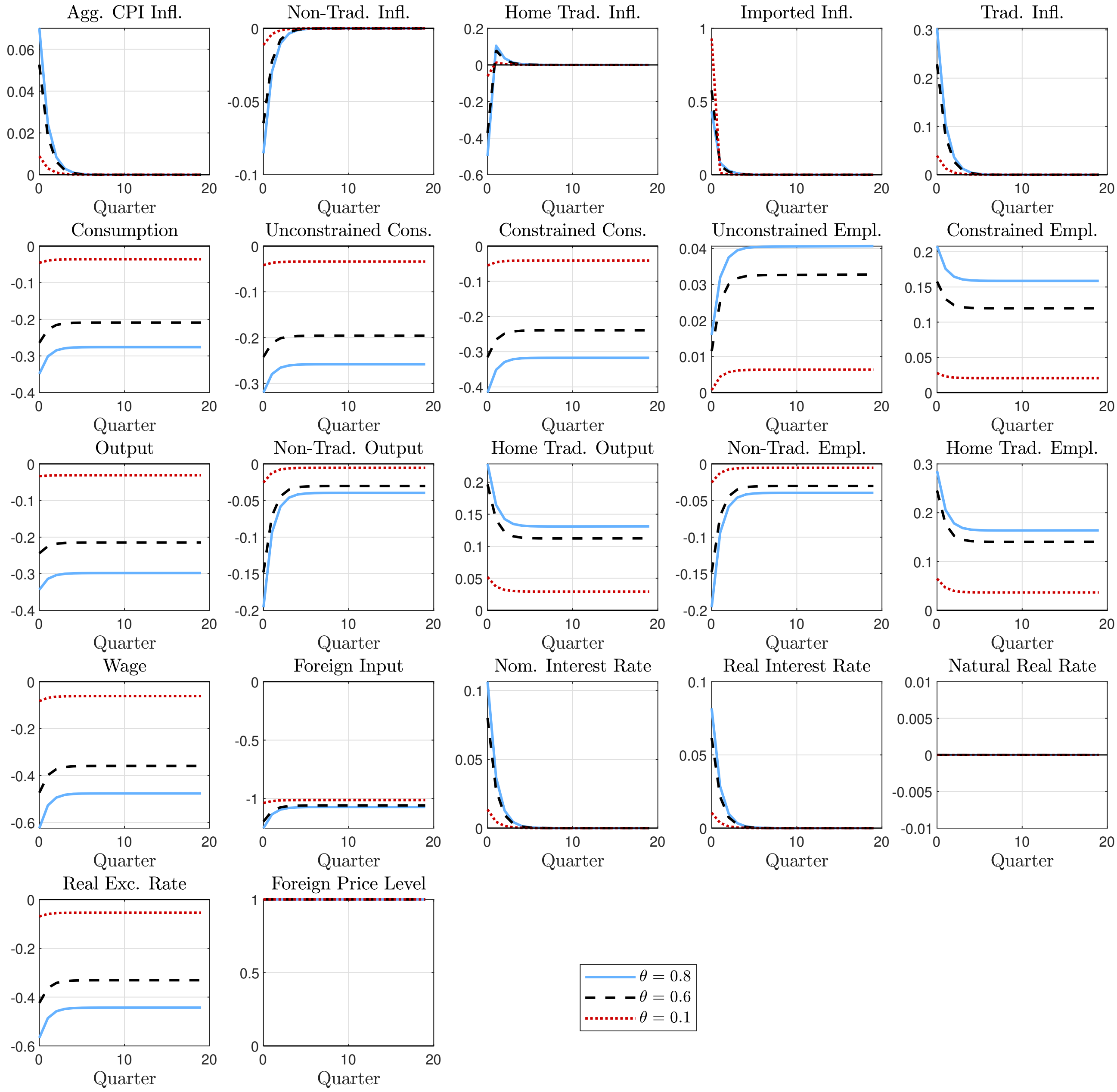
In a more open economy ($\theta = 0.6$ and $\theta = 0.8$), the preference for home-produced tradables is weaker, and the presence of foreign-produced tradables mitigates the adverse effect of the domestic productivity shock. The shock affects unconstrained households to a greater extent in an open economy, as consumption falls by more and employment increases by more for these households. Total consumption falls by more in the open economies as a result. The labour supply of both types of households, but particularly the unconstrained households, also helps to mitigate the effects of this shock: employment in the tradable sector increases, partially offsetting losses in productivity. The fall in productivity leads to a fall in the real wage. As in the $\theta = 0.1$ case, the negative productivity shock in the tradable sector has some spillovers for the non-tradable sector, with non-tradable employment and output falling sharply but recovering quickly. While the effect on output is less severe in the more open economies, tradables inflation and aggregate CPI inflation are roughly similar regardless of the degree of openness.

C.2 Higher share of imported inputs in production (κ)

In this section, we consider our fragmentation scenarios under a higher calibration for κ, which captures the share of imported inputs used in the production of non-tradables. Relative to the baseline calibration of $\kappa \approx 0$, a higher κ reflects a tighter constraint on domestic

[16]See Section C.4 for a discussion of the role of elasticities of substitution between tradable and non-tradable goods.

Figure 14: IRFs to a 100% Front-loaded Increase in Foreign Price Level.

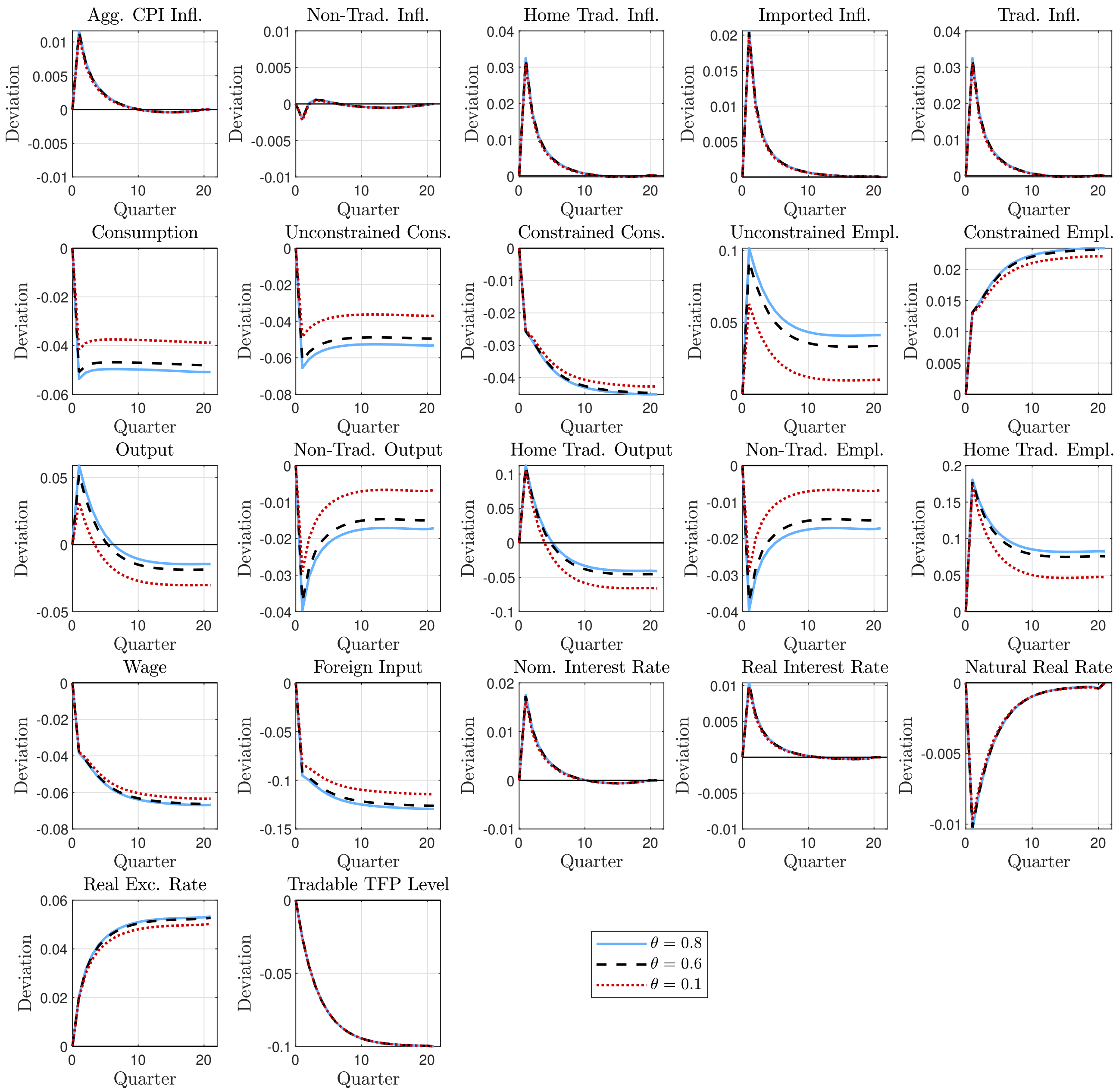


Notes: The share of foreign tradables in the domestic household's consumption basket is denoted by θ. We show simulations for a relatively closed economy ($\theta = 0.1$) with a red dotted line, a moderately open economy ($\theta = 0.6$) with a black dashed line, and a very open economy ($\theta = 0.8$) with a blue line. All the other parameters are calibrated according to Table 1.

supply capacity as import prices increase.[17]

[17]Non-tradable goods are produced using a Cobb-Douglas function combining labour and an imported inputs, which keeps the labour share of total factor expenditures constant even as import prices rise. The negative effects on aggregate demand can be even more pronounced under CES production with low substitutability between inputs, as higher import prices reduce the share of income accruing to domestic factors of production, weakening aggregate demand and dampening inflationary pressures. This effect is even stronger in a TANK

Figure 15: IRFs to a 10% Gradual and Permanent Decrease in Tradable TFP.



Notes: The share of foreign tradables in the domestic household's consumption basket is denoted by θ. We show simulations for a relatively closed economy ($\theta = 0.1$) with a red dotted line, a moderately open economy ($\theta = 0.6$) with a black dashed line, and a very open economy ($\theta = 0.8$) with a blue line. All the other parameters are calibrated according to Table 1.

Gradual Fragmentation Figure 16 presents the gradual fragmentation scenario for our baseline calibration (dashed black lines) and a higher κ (solid blue lines). As in the baseline calibration, the use of the foreign input falls in response to an increase in import prices.

framework, which features households who depend heavily on labour income. See Auclert, Monnery, Rognlie, and Straub (2023), Chan, Diz, and Kanngiesser (2024), and Gnocato (2025).

The effect on domestic supply is reflected in the non-tradable sector, as output falls to a greater extent, stabilising at a permanently lower level relative to the baseline calibration. However, in an economy where production is more dependent on imported inputs, an increase in the price of the foreign input leads to substitution towards the cheaper production input, labour. As a result, employment in the non-tradable sector increases following an initial drop, and stabilises at a permanently higher level. The domestic adjustment in response to this shock extends to the tradable sector, where output and employment increase to a greater extent. With greater dependence on imported inputs in non-tradable production, the reallocation from non-tradables to tradables in response to the import price shock is therefore more pronounced than in the baseline model, as the domestic tradable sector not only becomes more competitive with respect to foreign tradables, but also more competitive relative to the non-tradable sector.[18]

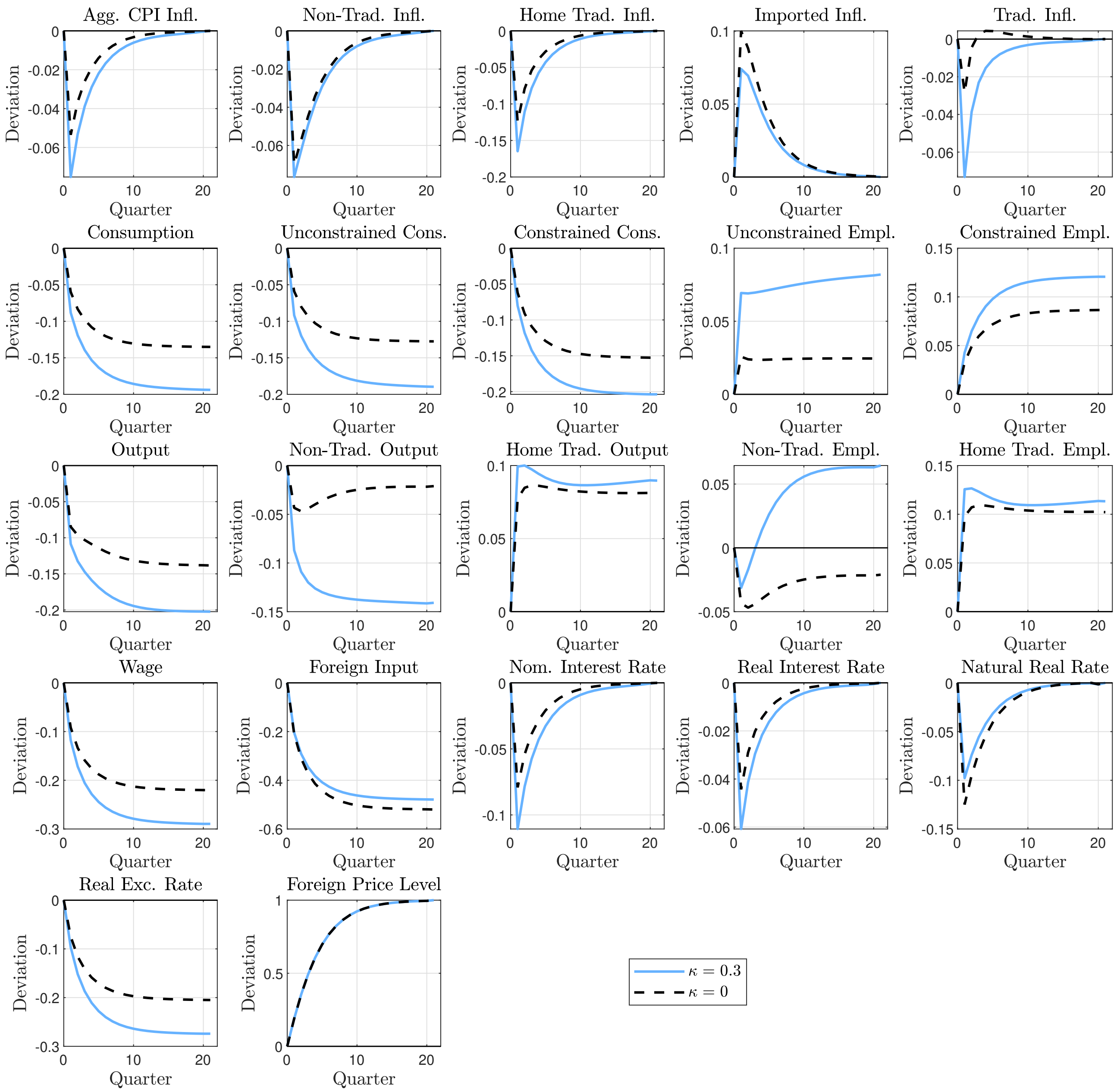
In the gradual scenario, the increase in import prices affects demand through lower real disposable income for constrained households and lower real permanent income for unconstrained households. Households compensate for the fall in income by increasing labour supply. This effect outweighs the increase in labour demand from factor substitution. As a result, real wages fall for both types of households and to a greater extent relative to the baseline model. While labour supply increases, consumption also falls to a greater degree for both types of households given the more adverse effect on the terms-of-trade. Relative to the baseline model, non-tradable inflation falls by more despite the increased dependence on imported inputs in production. This is attributable to a fall in labour costs (which offsets the increase in imported input prices) and a larger fall in domestic demand relative to the baseline model.

Front-loaded Fragmentation In our baseline calibration, this scenario yielded a stagflationary dynamic for policymakers, with a fall in output and a sharp increase in aggregate CPI inflation. Relative to the baseline calibration, a higher κ leads to a less severe trade-off for policymakers, with a larger fall in output and a more moderate increase in inflation (see Figure 17).

As in the gradual scenario, the effect of higher κ on domestic supply is reflected in the non-tradable sector, where output falls to a greater extent, stabilising at a permanently lower level relative to the baseline calibration. As labour becomes a relatively cheaper production

[18]This exercise highlights how the impact of the import price shock varies across sectors, as only the non-tradable sector uses imported inputs in production. As a shock that affects the relative price of imports to exports and thereby the competitiveness of the non-tradable sector vis-à-vis the domestic tradable sector, it prompts a reallocation of resources. Our positive implications are similar to Guerrieri, Lorenzoni, Straub, and Werning (2021), who study the effect of asymmetric shocks in a two-sector model with downward wage rigidities and costly labor reallocation. Even with perfect labour mobility across sectors, our import price shock operates like a cost-push shock, leading to inflation in the tradable sector and unemployment in the non-tradable sector, which is the only sector with nominal rigidities. See Section C.5 for the case where wage rigidities are also present.

Figure 16: IRFs to a 100% Gradual Increase in Foreign Price Level.



Notes: The share of foreign input in the non-tradable production function is denoted by κ. The results are generated under a TANK calibration where $\kappa = 0.3$ is shown in the solid blue lines, while $\kappa = 0$ is shown in the black dashed lines. All the other parameters are calibrated according to Table 1.

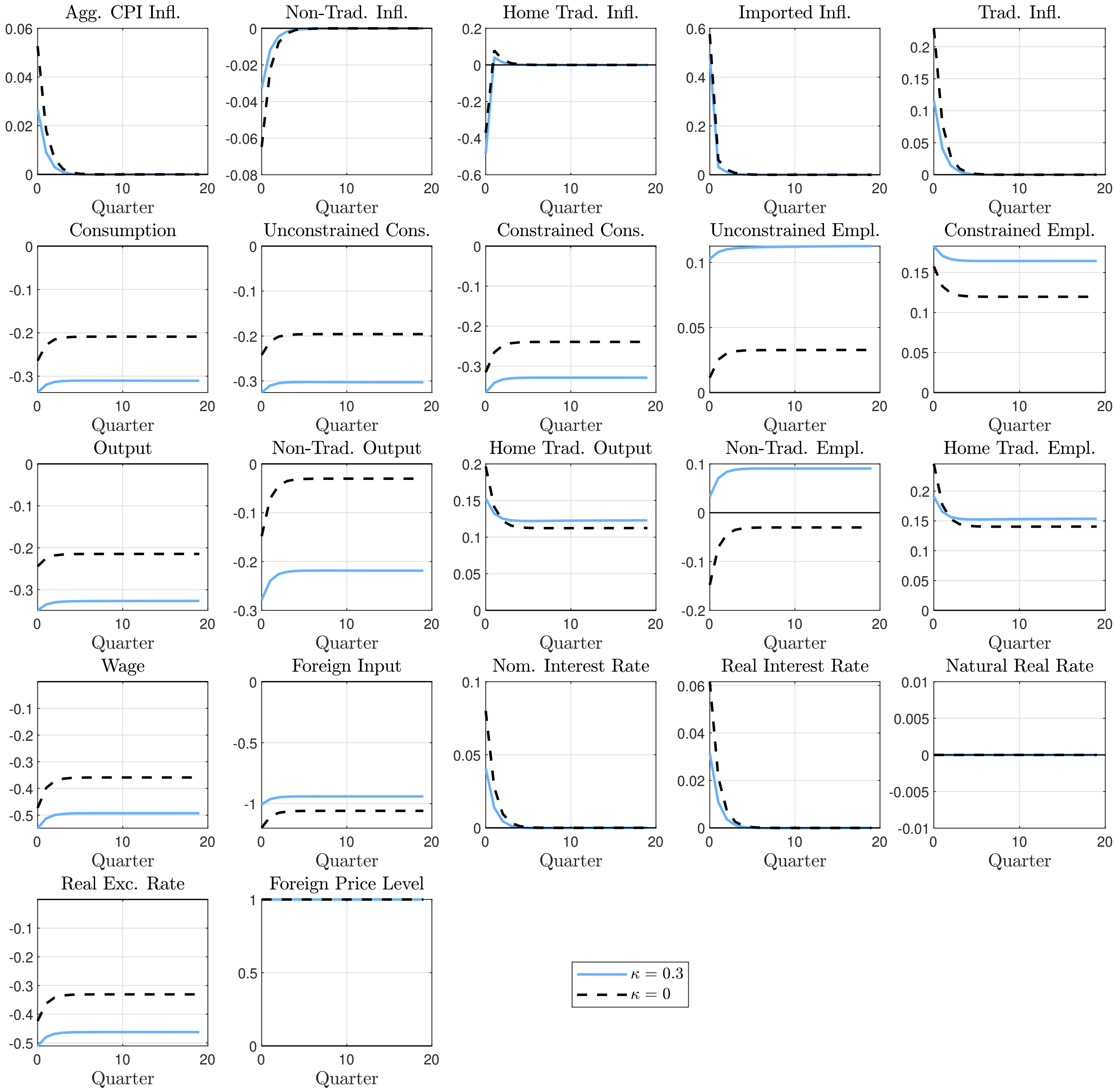
input, employment in the non-tradable sector increases, settling at a permanently higher level. There is a moderate degree of reallocation to the domestic tradable sector, with output and employment increasing, but to a similar extent as in the baseline calibration.

The increase in import prices has a negative effect on consumption, through lower real incomes for both types of households. This fall in consumption is larger in the case of higher κ, as real wages fall by more. Labour supply increases for both types of households. Relative to the baseline model, non-tradable inflation falls by less, as production is more dependent in imported inputs whose prices increase immediately in the front-loaded scenario. This increase in marginal costs is only slightly offset by a larger fall in real wages relative to the baseline scenario. Therefore, as in the baseline calibration, the fall in non-tradables inflation in the front-loaded scenario is not enough to offset the large spike in tradables inflation, and aggregate CPI inflation increases as a result, leading to a stagflationary scenario for policymakers.

Fall in Tradables Productivity $A_{T,t}$ The parameter we vary in this exercise, κ, only affects the non-tradable sector. However, there are important transmission mechanisms through the real exchange rate. In the baseline calibration ($\kappa \approx 0$, black dashed lines in Figure 18), a permanent adverse tradables TFP shock leads to a real exchange rate depreciation. There is a fall in consumption and an increase in labour supply for both types of households. The depreciation also shifts demand from foreign to home tradables. While output and employment initially fall in the non-tradable sector, they recover as demand switches towards this sector as well.

Next, consider the case where non-tradables production uses a higher share of imported inputs ($\kappa = 0.3$, blue solid lines in Figure 18). In this case, the adverse tradables TFP shock generates a more moderate real exchange rate depreciation. As a result, the increase in marginal costs faced by non-tradable firms is attenuated relative to the baseline. Over time, and relative to the baseline calibration, this sector produces less, with more labour, and less foreign inputs. The real wage falls by more, given the lower level of labour demand in the non-tradable sector, relative to the baseline calibration. This weighs on consumption, particularly of constrained households who consume only out of labour income. Home tradables inflation is weaker due to lower demand and lower labour costs, despite the adverse shock to productivity. This scenario, which led to a small increase in aggregate CPI inflation in the baseline calibration, is even less inflationary in the case where imported inputs are a greater share of non-tradables production.

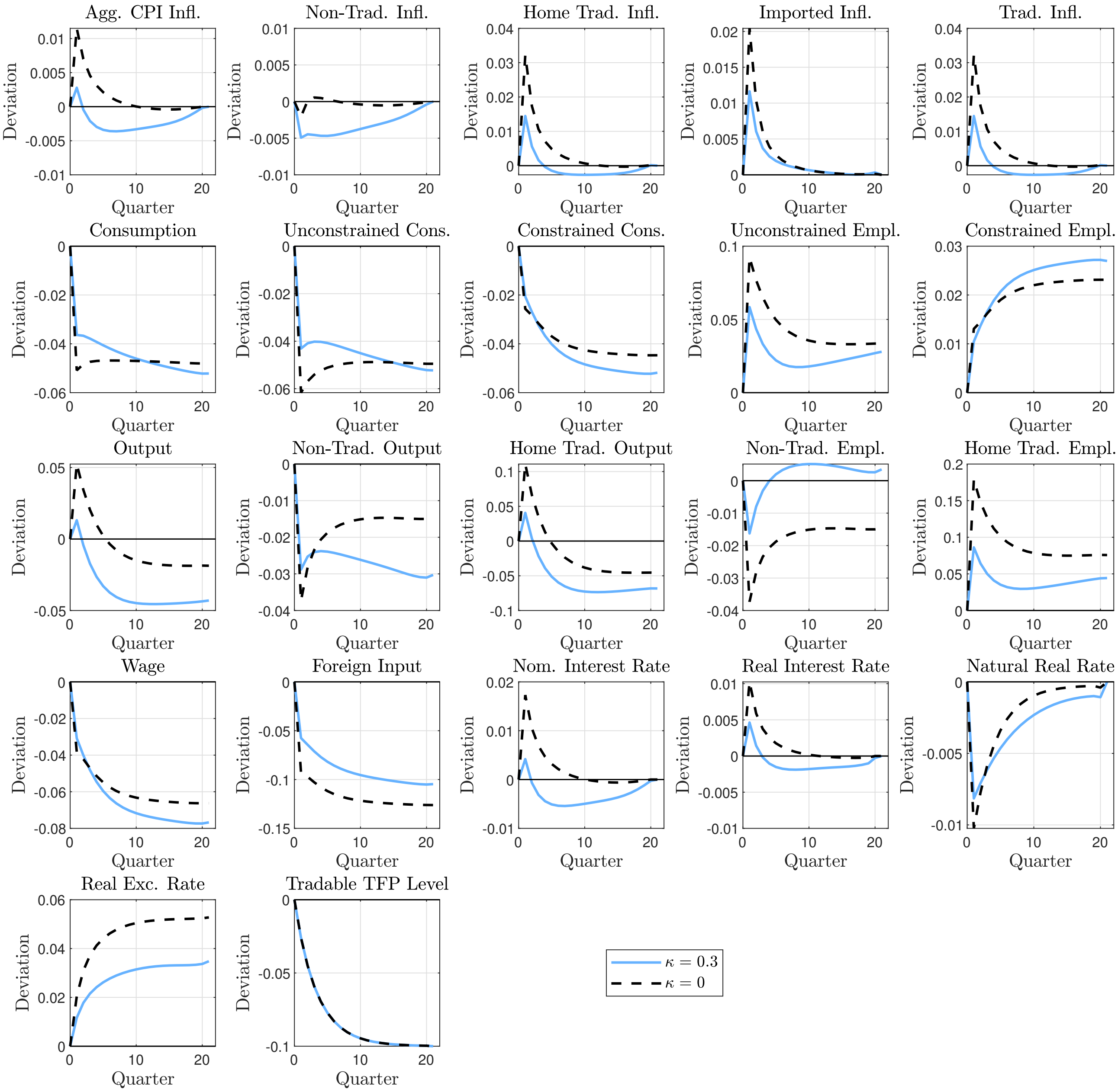
Figure 17: IRFs to a 100% Front-loaded Increase in Foreign Price Level.



Notes: The share of foreign input in the non-tradable production function is denoted by κ. The results are generated under a TANK calibration where $\kappa = 0.3$ is shown in the solid blue lines, while $\kappa = 0$ is shown in the black dashed lines. All the other parameters are calibrated according to Table 1.

In summary, higher κ, which captures a greater degree of dependence of production on imported inputs, does not change the qualitative interpretations and policy implications we draw from the various fragmentation scenarios. This calibration represents a more severe constraint on domestic supply as import prices increase, exacerbating the relative price dynamics of the import price shocks. However, the demand-side implications remain largely unchanged: factor substitution (towards labour) is not enough to stimulate aggregate de-

Figure 18: IRFs to a 10% Gradual and Permanent Decrease in Tradable TFP.



Notes: The share of foreign input in the non-tradable production function is denoted by κ. The results are generated under a TANK calibration where $\kappa = 0.3$ is shown in the solid blue lines, while $\kappa = 0$ is shown in the black dashed lines. All the other parameters are calibrated according to Table 1.

mand. The fall in real wages prompts an increase in labour supply and a fall in consumption. Consequently, the conclusions from our baseline model hold: the fall in consumption leads to disinflationary pressures and stagnation in the gradual scenario. In the front-loaded scenario, the fall in consumption and downward pressure on non-tradables inflation is not sufficient to outweigh the sharp increase in tradables inflation, resulting in a tradeoff for policymakers. The adverse TFP scenario is still moderately inflationary, though less so. A greater share of imported inputs in non-tradables production limits labour demand in this sector. An adverse TFP shock in the tradable sector leads to lower marginal costs in the domestic sectors, which weakens aggregate CPI inflation.

C.3 Role of Price Flexibility

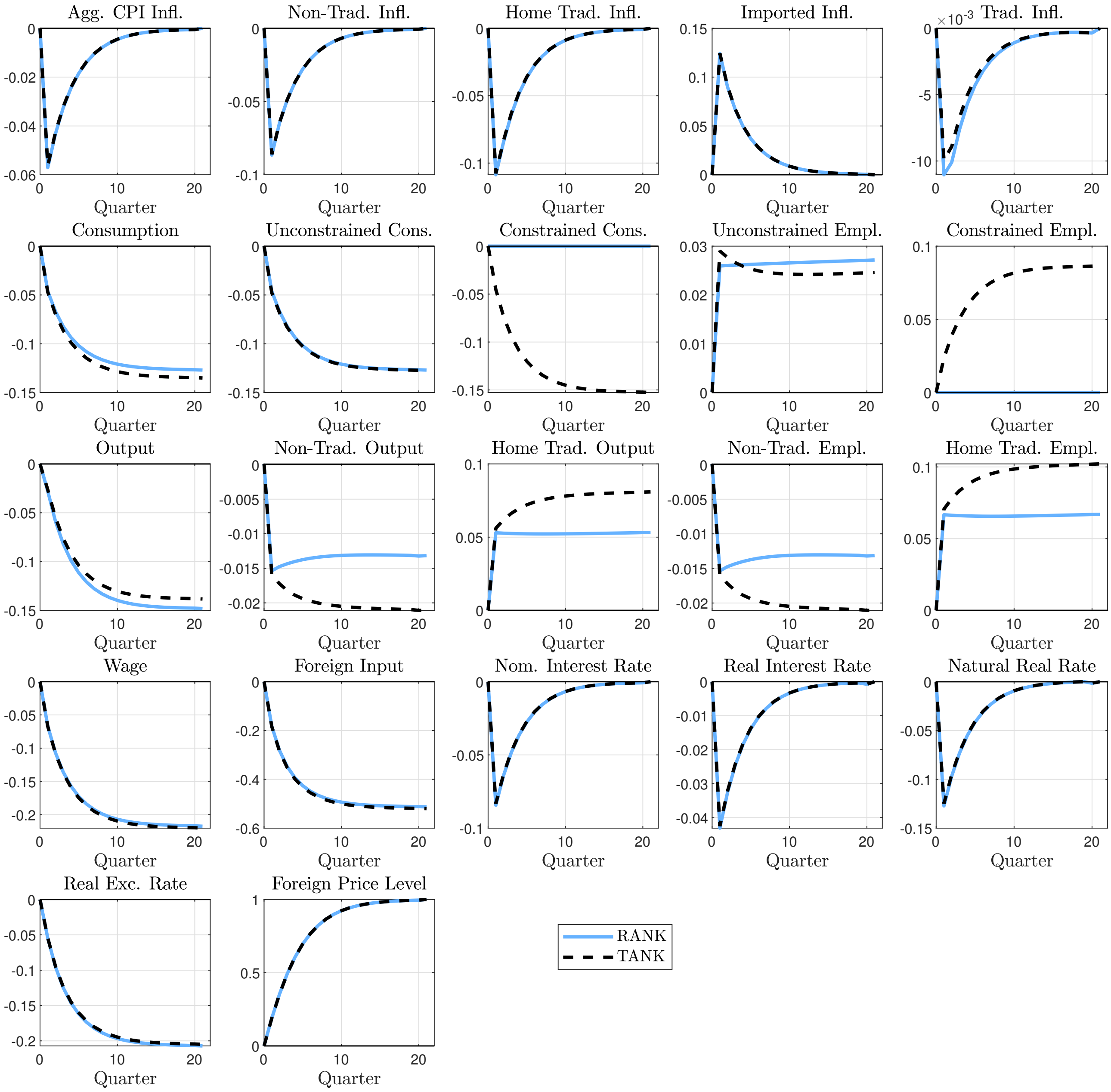
Under Rotemberg pricing, our model does not capture the increased frequency of price adjustments following the recent sizable and front-loaded increase in energy prices (Cavallo, Lippi, and Miyahara (2024), Morales-Jiménez and Stevens (2024), Montag and Villar Vallenas (2025), etc.). Our main calibration uses an empirically realistic average price duration of three quarters (9 months). However, to better understand the role of price flexibility, we run our specification with an implied duration of 1.25 quarters (slightly less than 4 months).

This change mainly affects the non-tradable sector, as only non-tradable firms face nominal rigidities. Indeed, in all three scenarios, we find that non-tradable inflation falls relatively more than in our baseline calibration. In line with the empirical evidence post-2022, a higher frequency of price adjustment matters particularly in the front-loaded case, where non-tradable inflation falls by nearly twice as much as in the baseline calibration. This leads to a smaller increase in aggregate CPI and therefore in the nominal interest rate. Our main conclusions remain robust to the higher frequency of price change.

Gradual Fragmentation In the case where import prices rise gradually, the differences relative to the baseline calibration (Figure 7) are most salient in the short-run. With more flexible prices (Figure 19), non-tradable output and employment fall by less, while prices in the non-tradable sector adjust, and fall, by more in response to the import price shock. Meanwhile, output and employment in the domestic tradable sector increase by less as well. Consequently, total output falls by less in the short run. As non-tradables inflation falls by more, while domestic tradables inflation falls by less, the response of aggregate CPI inflation is similar to the baseline calibration.

Front-loaded Fragmentation The front-loaded nature of the import price shock in this scenario exacerbates the dynamics in the gradual fragmentation scenario. Relative to the baseline calibration (Figure 8), more flexible prices allow non-tradables inflation to fall to a greater extent, while moderating the fall in non-tradables output and employment (Figure 20). Home tradables output and employment increase by less as well. The much larger fall in non-tradables inflation moderates the spike in aggregate CPI. As a result, real wages do not fall by as much as the baseline calibration. Consequently, both constrained and unconstrained household consumption do not fall by as much as the baseline calibration. As output falls by less and aggregate CPI inflation increases by less, this scenario is less stagflationary under more flexible prices.

Figure 19: IRFs to a 100% Gradual Increase in Foreign Price Level.

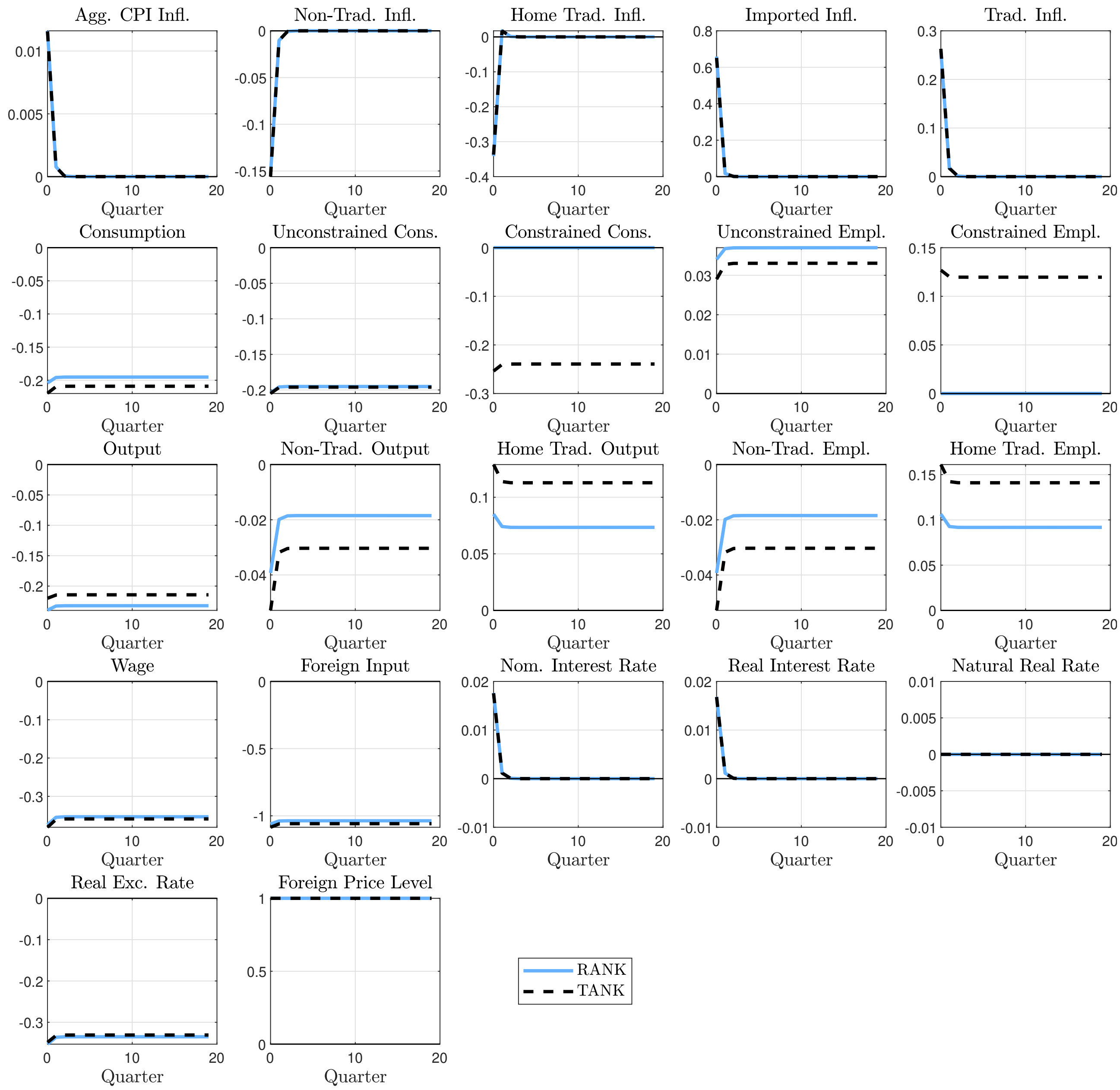


Notes: The price rigidity in the non-tradable sector is denoted by ξ. The RANK case ($\lambda = 0$) with baseline is shown in the solid blue lines, while the TANK case ($\lambda = 0.3$) is shown in the black dashed lines, with implied price duration of 1.25 quarters ($\xi \approx 3$). All the other parameters are calibrated according to Table 1.

Fall in Tradables Productivity From Figure 21, the most salient difference in this extension relative to the baseline calibration is in the behaviour of the RANK responses.[19] In the case

[19] The difference in the TANK responses in this extension and the baseline calibration is negligible. The TFP shock affects the tradable sector, where prices are determined in global markets. Firm profits are received from both sectors, and accrue to unconstrained households. However, only firm profits in the non-tradable sector are affected by increased price flexibility.

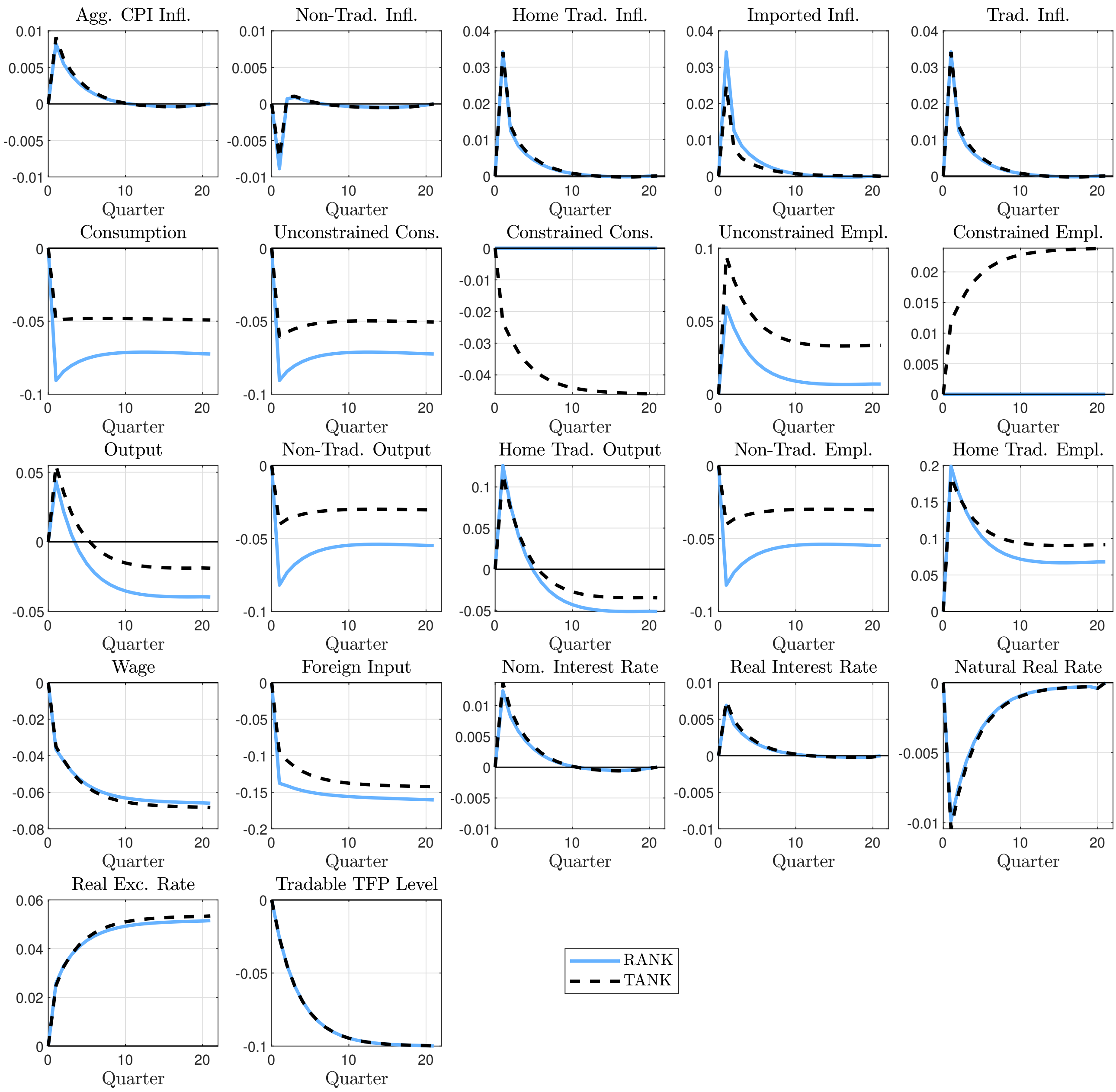
Figure 20: IRFs to a 100% Front-loaded Increase in Foreign Price Level.



Notes: The price rigidity in the non-tradable sector is denoted by ξ. The RANK case ($\lambda = 0$) with baseline is shown in the solid blue lines, while the TANK case ($\lambda = 0.3$) is shown in the black dashed lines, with implied price duration of 1.25 quarters ($\xi \approx 3$). All the other parameters are calibrated according to Table 1.

where tradables productivity deteriorates to a permanently lower level, more flexible prices also lead to larger, more gradual fall in non-tradables output and employment. The margin of adjustment is in prices instead, where they fall sharply and by more in the non-tradable sector with flexible prices. The fall in non-tradables inflation is greater than the baseline calibration, but still minor, leaving aggregate CPI inflation similar in magnitude (Figure 21).

Figure 21: IRFs to a 10% Gradual and Permanent Decrease in Tradable TFP.



Notes: The price rigidity in the non-tradable sector is denoted by ξ. The RANK case ($\lambda = 0$) with baseline is shown in the solid blue lines, while the TANK case ($\lambda = 0.3$) is shown in the black dashed lines, with implied price duration of 1.25 quarters ($\xi \approx 3$). All the other parameters are calibrated according to Table 1.

C.4 Non-unitary Elasticities of Substitution

In this section, we present our main results for a higher elasticity of substitution between domestic and foreign tradable goods ($\mu = 6$) and lower elasticity of substitution between tradable and non-tradable goods ($\iota = 0.55$), following Corsetti, Dedola, and Leduc (2009). Keeping the remaining parameters unchanged, this exercise shows that our main results are not dependent on the assumption of unitary elasticity of substitution between non-tradables and tradables and between foreign and domestic tradables.

Gradual Fragmentation In Figure 22, the gradual scenario still leads to stagnation, as aggregate CPI inflation falls alongside output. However, the outcomes are less adverse than in the baseline calibration (Figure 7). The import price shock still leads to a fall in non-tradable output and employment, with a short-run impact comparable to the baseline case. Comparing the two calibrations suggests that the medium-term recovery in the non-tradable sector in the baseline calibration is in part driven by substitution from tradables to non-tradables. Instead, in this calibration, output and employment in the the non-tradable sector remains depressed in the medium-term.

Increased substitutability between home and foreign tradables, and lower substitutability between tradables and non-tradables implies that this is a less adverse terms-of-trade shock for the domestic economy. As the drop in aggregate CPI inflation is smaller, real wages do not fall by as much. Consequently, aggregate consumption does not fall by as much, as the drop in unconstrained and constrained household consumption is less severe. Moreover, the increase in employment by both types of households is much smaller in this calibration. Relative to the baseline calibration, aggregate CPI inflation falls by less, as both non-tradables and domestic tradables inflation both fall to a much smaller extent. Along with the smaller fall in the natural real rate of interest, these responses suggest that the demand-side impact of this shock is smaller.

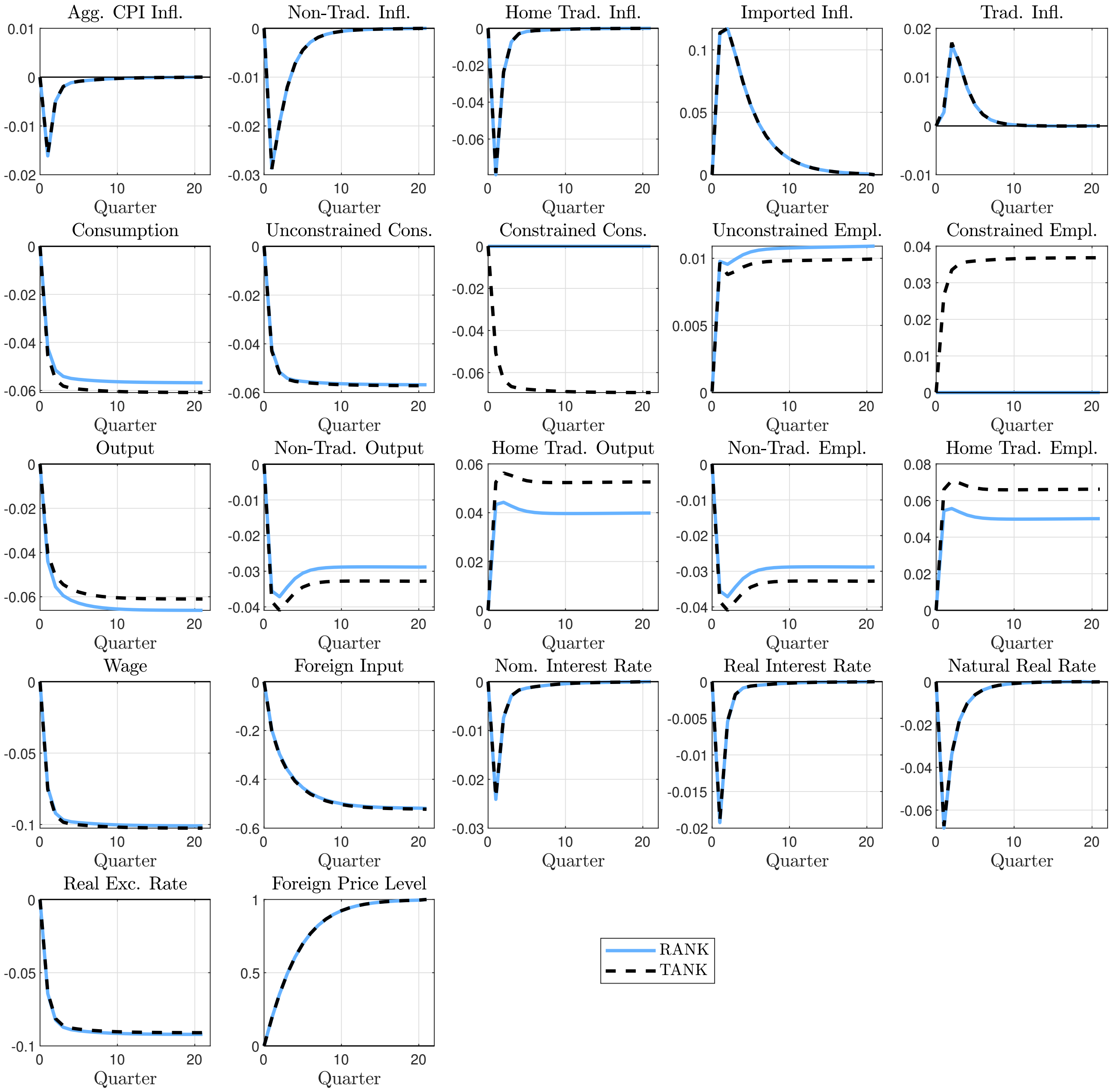
Front-loaded Fragmentation From Figure 23, this calibration is less important for the case of a front-loaded import price shock, as the outcome is still stagflationary with a trade-off of the same magnitude as in the baseline calibration (Figure 8). The only difference from the baseline calibration is a sectoral rebalancing: there is a larger fall in non-tradable output and employment on impact and over the medium-term, which is reallocated to the home-tradable sector. Aggregate output and employment remain unchanged, and the demand-side effect is nearly identical to the baseline calibration.

Fall in Tradables Productivity In Figure 24, an adverse shock to tradables TFP leads to a fall in home tradables output over time, and an increase in the amount of labour employed in this sector. Relative to the baseline calibration (Figure 9), output and employment in the non-tradable sector falls by more. As non-tradables are less substitutable with tradables consumption, this scenario remains moderately inflationary.

C.5 Wage rigidity

We extend the RANK model introduced in Section 3.1 to incorporate nominal wage rigidities.

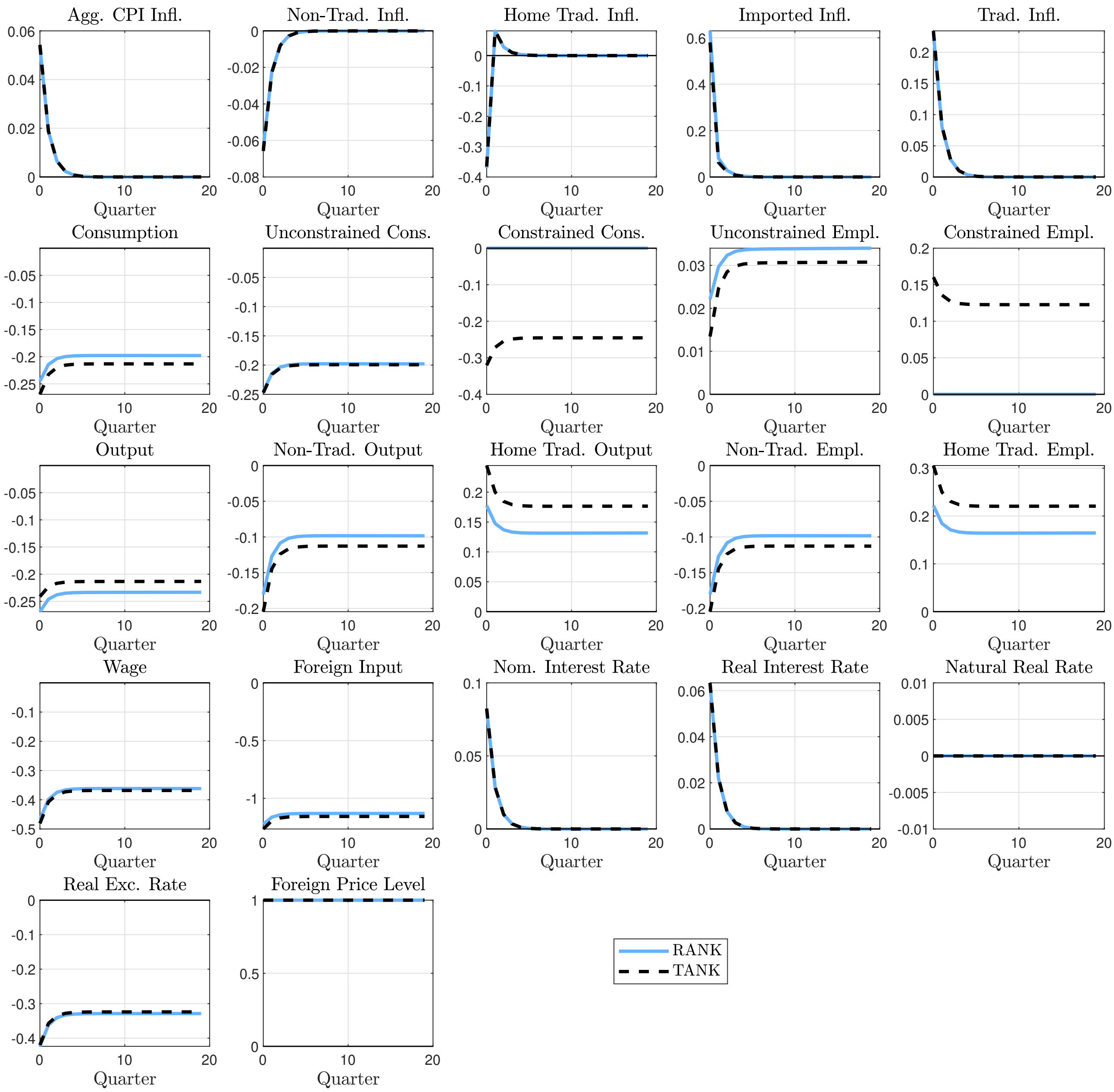
Figure 22: IRFs to a 100% Gradual Increase in Foreign Price Level.



Notes: The elasticity of substitution between tradable goods (μ) is set to 6. The elasticity of substitution and between tradable and non-tradable goods (ι) is set to 0.55. The RANK case ($\lambda = 0$) is shown in the solid blue lines, while the TANK case ($\lambda = 0$) is shown in the black dashed lines. All the other parameters are calibrated according to Table 1.

Households Relative to the RANK model in Section 3.1, the key difference we introduce is that the labour supply chosen by households is provided to a union in return for a nominal wage W_t. The union allocates the workers into categories indexed by $j \in [0, 1]$ and sells these units of labour varieties, $N_t(j)$, at wage $W_t(j)$. Due to imperfect substitutability among labour types, the union can act as a monopolist over each variety.

Figure 23: IRFs to a 100% Front-loaded Increase in Foreign Price Level.



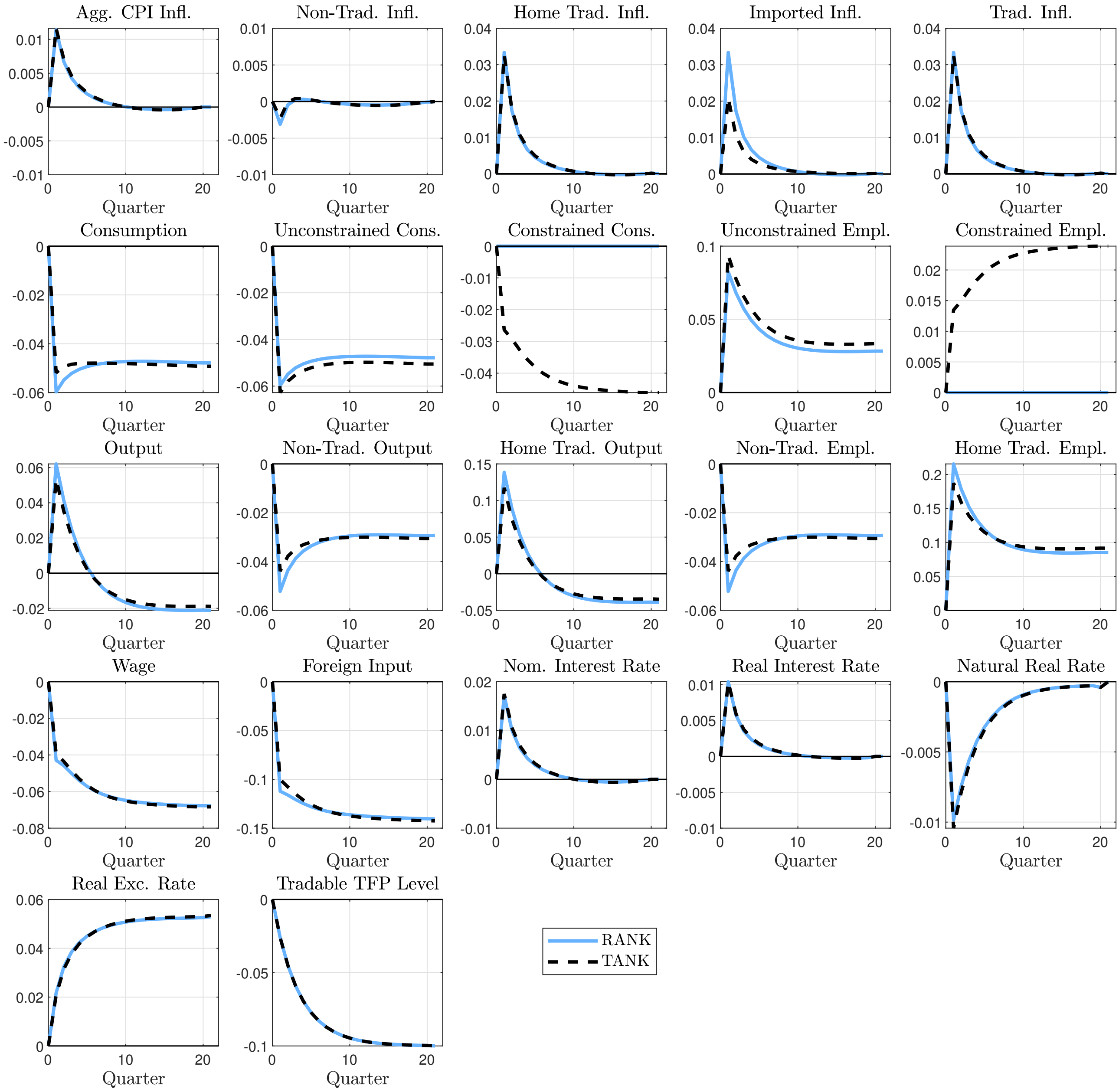
Notes: The elasticity of substitution between tradable goods (μ) is set to 6. The elasticity of substitution and between tradable and non-tradable goods (ι) is set to 0.55. The RANK case ($\lambda = 0$) is shown in the solid blue lines, while the TANK case ($\lambda = 0$) is shown in the black dashed lines. All the other parameters are calibrated according to Table 1.

Labour Packers Varieties $N_t(j)$ are in turn combined by labour "packers" according to a CES production function,

$$N_t = \left[\int_0^1 N_t(j)^{1-\frac{1}{\epsilon_w}} dj \right]^{\frac{1}{1-\frac{1}{\epsilon_w}}}$$

where $N_t(j)$ denotes the demand for a specific labour variety j, while N_t denotes aggregate

Figure 24: IRFs to a 10% Gradual and Permanent Decrease in Tradable TFP.



Notes: The elasticity of substitution between tradable goods (μ) is set to 6. The elasticity of substitution and between tradable and non-tradable goods (ι) is set to 0.55. The RANK case ($\lambda = 0$) is shown in the solid blue lines, while the TANK case ($\lambda = 0$) is shown in the black dashed lines. All the other parameters are calibrated according to Table 1.

labour demand. The elasticity of substitution between labour varieties is ϵ_w. After labour packers assemble the labour bundle, they supply it at wage W_t to firms, which is then used in the production process. Labour packers maximise the following objective,

$$\max_{N_t(j)} \left\{ W_t N_t - \int_0^1 N_t(j) W_t(j) dj \right\}$$

subject to the CES production function. The first-order condition,

$$W_t N_t^{\frac{1}{\epsilon_w}} N_t(j)^{-\frac{1}{\epsilon_w}} - W_t(j) = 0$$

leads to following expression for labour demand,

$$N_t(j)^d = \left(\frac{W_t(j)}{W_t}\right)^{-\epsilon_w} N_t.$$

As the labour packers are perfectly competitive, we can use the zero-profit condition to calculate the wage index,

$$\begin{aligned} W_t N_t - \int_0^1 N_t(j) W_t(j) dj = 0 \implies \\ W_t N_t = \int_0^1 \left(\frac{W_t(j)}{W_t}\right)^{-\epsilon_w} N_t W_t(j) dj \\ W_t = \left(\int_0^1 W_t(j)^{1-\epsilon_w} dj\right)^{\frac{1}{1-\epsilon_w}}. \end{aligned}$$

Labour Unions The labour union maximises

$$\max_{W_t(j)} \delta_t N_t^d W_t(j) - \frac{N_t^{1+\phi}}{1+\phi}$$

subject to

$$N_t(j)^d = \left(\frac{W_t(j)}{W_t}\right)^{-\epsilon_w} N_t^d.$$

This is equivalent to the maximisation of household utility subject to the budget constraint and the demand for labour. The first order condition is given by

$$\delta_t \left(\frac{W_t(j)}{W_t}\right)^{-\epsilon_w} (1-\epsilon_w) N_t^d + \epsilon_w \left[\left(\frac{W_t(j)}{W_t}\right)^{-\epsilon_w} N_t^d\right]^{\phi} \left(\frac{W_t(j)}{W_t}\right)^{-\epsilon_w - 1} \frac{N_t^d}{W_t} = 0,$$

which yields

$$W_t(j) = \frac{\epsilon_w}{\epsilon_w - 1} \frac{(N_t^d)^{\phi}}{C_t^{\sigma}},$$

where $\frac{\epsilon_w}{\epsilon_w - 1} = \mathcal{M}^w$ and $mc_t^w = \frac{(N_t^d)^{\phi}}{C_t^{\sigma}}$. This characterizes the flexible wage setting. To introduce nominal and real wage stickiness, we assume that with probability θ_w, a union cannot reoptimise its wage and is instead bound to a wage that is indexed to a composite price index from the previous period,

$$W_t(j) = \begin{cases} W_{t-1}(j) \left((\Pi_w^{ss})^{1-\xi_w} (\Pi_{t-1}^w)^{\xi_w}\right) & \text{with prob } \theta_w \\ W_t^*(j) & \text{with prob } 1-\theta_w \end{cases}$$

Therefore,

$$W_{t+s}(j) = W_t^*(j)\left(\Pi_{ss}^W\right)^{s(1-\xi_w)}\left(\prod_{g=0}^{s-1}\left(\left(\Pi_{t+g}^W\right)^{\xi_w}\right)\right) = W_t^*(j)\left[\left(\Pi_{ss}^W\right)^{s(1-\xi_w)}\left(\frac{W_{t+s-1}}{W_{t-1}}\right)^{\xi_w}\right].$$

Given this demand constraint and assuming that a union j always meets the demand for its labour at the current wage, labour unions solve the following optimisation problem,

$$\max_{W_t^*(j)} E_t \sum_{s=0}^{\infty}(\theta_w)^s \Lambda_{t,t+s}P_{t+s}\left[\left(\frac{W_t^*(j)}{P_{t+s}} - mc_{t+s}^W\right)\left(\frac{W_t^*(j)}{W_{t+s}}\right)^{-\frac{M_w}{M_w-1}} N_{t+s}\right]. \tag{B.5}$$

Taking the derivative with respect to $W_t^*(j)$ delivers the familiar wage inflation schedule,

$$\begin{aligned}
\frac{f_t^{W,1}}{f_t^{W,2}}\mathcal{M}_w &= w_t^* = \frac{W_t^*}{W_t} = \left(\frac{1-\theta_w\left(\zeta_t^W\right)^{\frac{1}{M_w-1}}}{1-\theta_w}\right)^{1-\mathcal{M}_w} \\
f_t^{W,1} &= N_t\frac{mc_t^W}{w_t} + \theta_w E_t\left[\left(\Lambda_{t,t+1}\right)\left(\frac{\Pi_{t+1}^W}{\Pi_{t+1}^{CPI}}\right)\left(\frac{\Pi_{t+1}^W}{\Pi_{ss}^W}\right)^{\frac{M_w}{M_w-1}} f_{t+1}^{W,1}\right] \\
f_t^{W,2} &= N_t + \theta_w\beta E_t\left[\left(\Lambda_{t,t+1}\right)\left(\frac{\Pi_{t+1}^W}{\Pi_{t+1}^{CPI}}\right)\left(\frac{\Pi_{t+1}^W}{\Pi_{ss}^W}\right)^{\frac{1}{M_w-1}} f_{t+1}^{W,2}\right] \\
\zeta_t^W &= \Pi_t^W/\Pi_{ss}^W, \\
w_t &= \Pi_t^W/\Pi_t w_{t-1} \\
\mathcal{D}_t^W &= (1-\theta_w)\left(\frac{1-\theta_w\left(\zeta_t^W\right)^{\frac{1}{M_w-1}}}{1-\theta_w}\right)^{\mathcal{M}_w} + \theta_w\left(\zeta_t^W\right)^{\frac{M_w}{M_w-1}}\mathcal{D}_{t-1}^W
\end{aligned}$$

where $\mathcal{D}_t^W$ is wage dispersion. We calibrate $\theta_w = 0.92$, $\xi_w = 0$, $\epsilon_w = 11$ as in Schmitt-Grohé and Uribe (2006) and Chan, Diz, and Kanngiesser (2024).

Gradual Fragmentation Figure 25 presents the gradual fragmentation scenario for a calibration with high wage stickiness ($\theta_w = 0.92$). While the fall in real wages is more gradual with respect to the baseline model (Figure 4), a salient difference is the behaviour of employment, which falls by more in the non-tradable sector and no longer increases in the home tradable sector. Aggregate employment declines, rather than increasing as it does in the baseline calibration. Output in both sectors falls, following a similar trajectory to employment. As a result, aggregate output falls to a greater extent, as home tradables output no longer increases as in the baseline calibration.

Consumption falls by more in the short-run, settling at a similar level to that in the baseline model. Although aggregate employment falls, the more moderate decrease in real wages provides some support for consumption. Marginal costs are also affected by the more modest decline in real wages, which leads to a smaller fall in non-tradables inflation. However, this is outweighed by a sharper fall in home-tradables inflation as demand decreases. As a result, aggregate CPI falls by more and this scenario leads to stagnation, as in our baseline calibration.

The demand-side effect of a gradual import price shock is therefore broadly similar to the baseline calibration, as wage indexation slows the fall in real wages but leads to large falls in employment. Wage indexation *moderates* the disinflationary pressures present in the baseline calibration: despite the larger fall in output, there is a roughly similar fall in aggregate CPI and a slight overshoot in the medium term. This scenario remains one of stagnation, as aggregate CPI inflation falls alongside a larger fall in aggregate output.

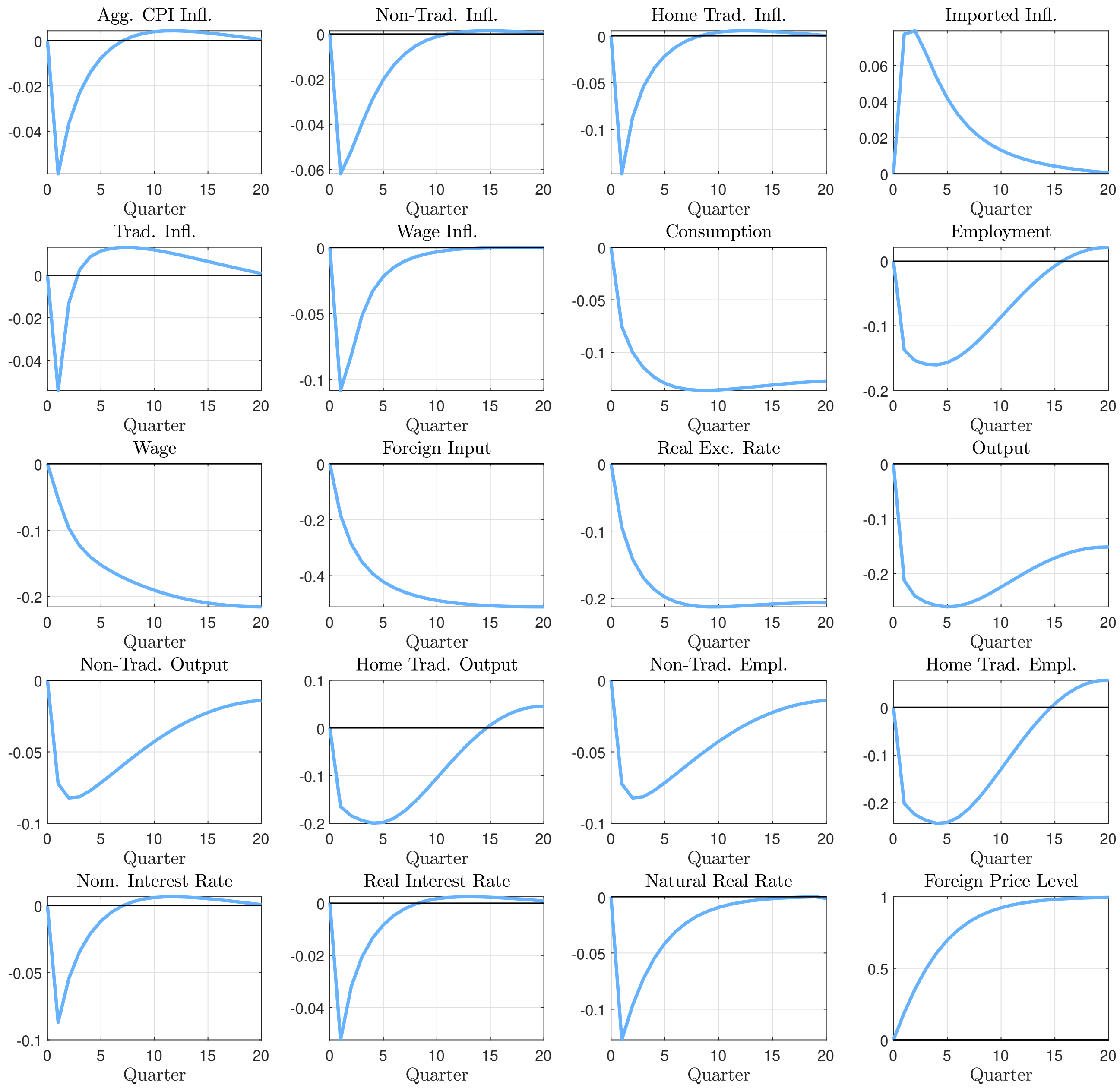
Front-loaded Fragmentation In our baseline calibration with flexible wages (Figure 5), this scenario led to a stagflationary outcome and a tradeoff for policymakers. With wage stickiness (Figure 26), this tradeoff is more severe, as output falls to a much greater extent, alongside aggregate CPI outturns that are larger and more persistent. As in the gradual scenario, nominal wage rigidities mitigate the fall in real wages and relative to the baseline calibration, real wages fall by less initially. In contrast to the increase in employment under flexible wages, employment falls significantly. At the sectoral level, this is attributable to the large fall in home tradables employment (which increased in the flexible wage case). Non-tradable employment also falls by more in the case of sticky wages. Aggregate and sectoral output evolve in line with employment dynamics

The demand-side implications remain the same for this scenario: the more moderate fall in real wages counteracts the large fall in employment, yielding a similar fall in real incomes for households as in the baseline model. As a result, the fall in consumption is slightly larger than in the baseline calibration.

The spike in aggregate CPI inflation is larger, as non-tradable inflation now increases and remains persistently above steady state. Despite the fall in consumption, non-tradable inflation increases with higher wage stickiness, as the fall in real wages is much smaller and no longer sufficient to offset the increase in imported input costs. As a result, aggregate CPI is slightly higher on impact and more persistent relative to the baseline calibration.

Fall in Tradables Productivity Figure 27 presents the responses to an adverse productivity shock in the tradable goods sector with higher wage stickiness. As in the other two scenarios, nominal wage rigidities mitigate the fall in wages that would otherwise occur under flexible wages, resulting in a more moderate decline in the real wage relative to the baseline with flexible wages (Figure 6). The increase in marginal costs leads to a prolonged contraction in tradable output, while the increase in tradable employment is smaller and more gradual compared to the flexible-wage case. The most notable difference with respect to the baseline calibration is the behaviour of aggregate employment; as the increase in tradable

Figure 25: IRFs to a 100% Gradual Increase in Foreign Price Level.

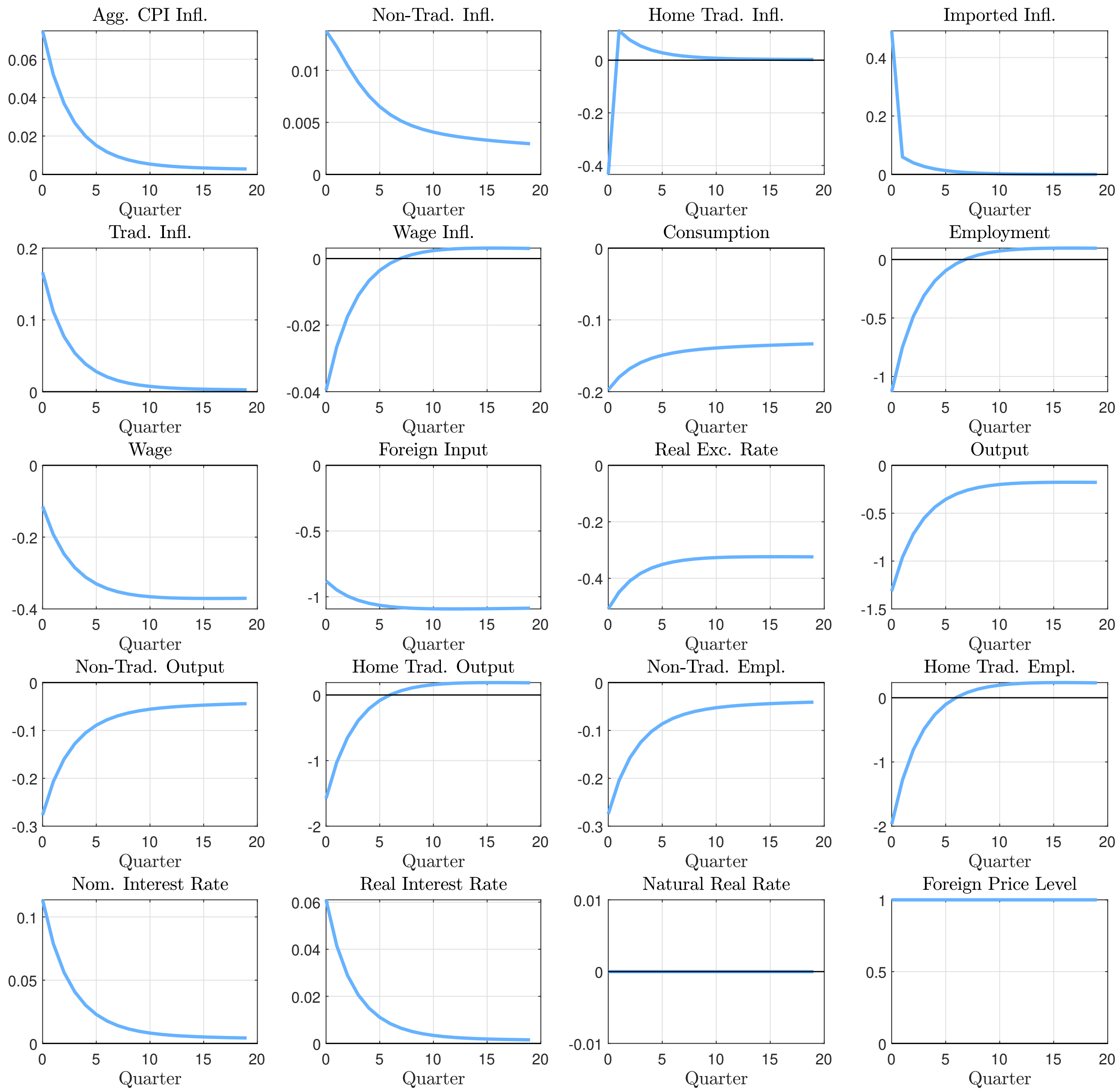


Notes: The results are generated under a RANK calibration with $\theta_w = 0.92, \xi_w = 0, \epsilon_w = 11$. All the other parameters are calibrated according to Table 1.

employment is much smaller with sticky wages, it no longer outweighs the larger fall in non-tradable employment. Aggregate employment falls initially and increases only slightly thereafter. Aggregate consumption falls by roughly the same amount in the sticky-wage case, as real wages decline more moderately but employment also falls. Aggregate CPI inflation is similar in magnitude, but slightly more persistent, as non-tradable inflation no longer falls, but increases as marginal costs increase.

To summarise, higher nominal wage rigidity does not change the qualitative interpre-

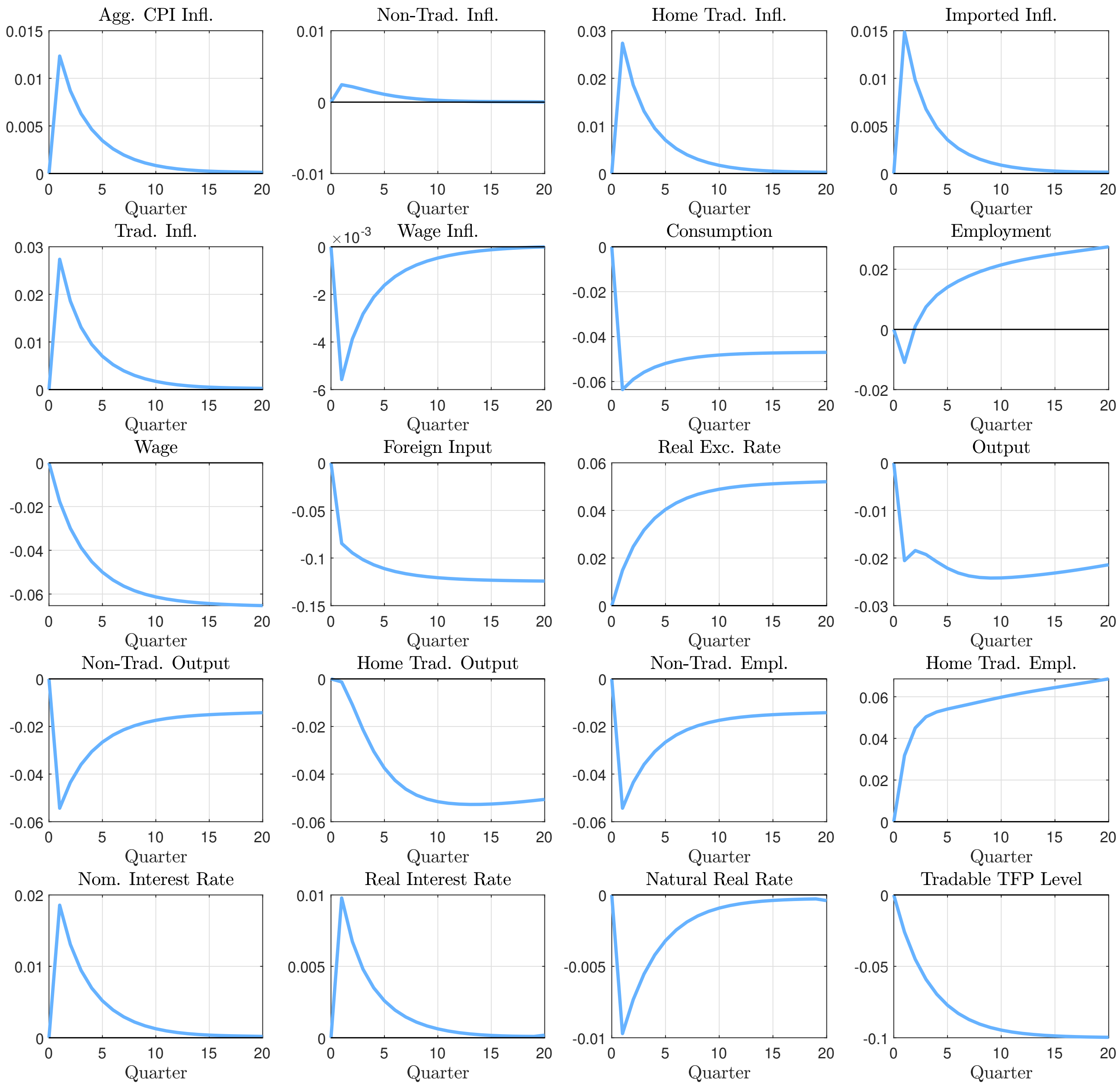
Figure 26: IRFs to a 100% Front-loaded Increase in Foreign Price Level.



Notes: The results are generated under a RANK calibration with $\theta_w = 0.92, \xi_w = 0, \epsilon_w = 11$. All the other parameters are calibrated according to Table 1.

tations and policy implications we draw from the various fragmentation scenarios. The demand-side effects in the various scenarios are largely similar, as wage indexation slows the fall in real wages but leads to a large decline in employment. As a result, wage indexation moderates the disinflationary effect in the gradual scenario: despite the larger fall in output, there is a roughly similar fall in aggregate CPI and a slight overshoot in the medium term. However, this scenario remains one of stagnation, as aggregate CPI inflation falls alongside a larger fall in aggregate output. In the front-loaded scenario, wage stickiness ex-

Figure 27: IRFs to a 10% Gradual and Permanent Decrease in Tradable TFP.



Notes: The results are generated under a RANK calibration with $\theta_w = 0.92, \xi_w = 0, \epsilon_w = 11$. All the other parameters are calibrated according to Table 1.

acerbates the trade-off in the stagflationary scenario: there is a significant fall in output while the increase in aggregate CPI inflation is slightly higher on impact and more persistent. This is attributable to the behaviour of non-tradables inflation, which increases persistently as wage stickiness prevents a larger fall in real wages. Finally, the negative TFP scenario is still moderately inflationary, but more persistent. Wage stickiness mitigates the increase in tradable sector employment, while the demand-side impact is roughly similar as the more modest decline in real wages is offset by the larger fall in aggregate employment.