Debt targets and fiscal consolidation in a Euro Area HANK model*

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Abstract

This paper develops a world economy HANK model for the Euro Area (EA) Core and Periphery, which captures key features of EA cross- and within-country heterogeneity, to study debt target reforms. We show that fiscal consolidation under the current EA institutional arrangements is quite costly across and within countries, particularly affecting households in the Periphery. Reforming the EA debt targets closer to their historical values can significantly mitigate these welfare losses and make fiscal consolidation more affordable for households in the Periphery. Surprisingly, Core's fiscal expansion to facilitate Periphery's consolidation would not benefit most households in the Periphery, as it would reduce its household income and

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consumption due to decreased international competitiveness of periphery-produced goods. Potential cross-country fiscal externalities could increase the benefits of national fiscal reforms, especially for poor-wealth households. Finally, we find that the welfare-maximizing EA-wide debt target lies between the member states' current debt-to-output ratios.

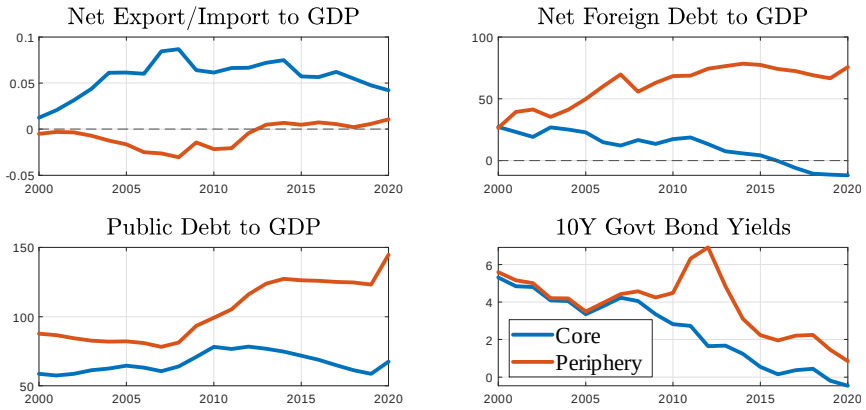
Keywords: Fiscal Consolidation, Debt Targets, Monetary Union, Inequality, Welfare
JEL Classification: E21, H31, E62, H50

1 Introduction

Two major economic crises have severely impacted the Euro Area (EA): the Great Recession in 2007-08, which led to the European Debt Crisis in 2010, and the COVID-19 pandemic in 2020. The cumulative effect of these crises has left the EA with historically high public debt levels far exceeding the 60% reference value set by the Maastricht Treaty (MT) and operationalized by the Stability Growth Pact (SGP). The high public debt levels, especially of the Periphery, raise concerns about whether the EA member states can meet the fiscal targets implied by the MT/SGP in the foreseeable future and at what economic and social costs (see, e.g., Darvas *et al.,* 2018; Blanchard *et al.,* 2021; and Cuerpo *et al.*, 2022).[1]

This paper evaluates the impact of reforms to EA debt targets through the lens of a world economy Heterogeneous Agents New Keynesian (HANK) model. Our analysis focuses not only on the macroeconomic effects across EA countries, but also on the implications for inequality within them. This dual focus is motivated by the presence of both cross- and within-country heterogeneity in the EA, as illustrated in Figure 1 and Table 1, respectively.

Figure 1: EA Core-Periphery Imbalances.



Note: The Core is defined as the GDP-weighted average of Austria, Germany and Netherlands while the Periphery is defined as the weighted average of Spain, Italy, Portugal and Greece. Sources: Eurostat.

Figure 1 shows how the recent global crises have disproportionately affected EA member states due to inherent macroeconomic imbalances. The Core, with sound public finances, has maintained fiscal and trade surpluses, resulting in lower public and net external debt. In contrast, the Periphery, with relatively weaker public finances, has experienced fiscal and trade deficits, leading to consistently higher public and net external debt. While these imbalances are directly reflected in the interest rate differentials faced by the Periphery compared to the Core in the international financial markets, they could

[1] Recently, European Institutions have launched a proposal on reforming the current fiscal framework, which led to an initial political agreement (see, e.g., European Commission, 2024).

also function as cross-border externalities within the monetary union. For instance, high debt levels in the Periphery may lead to increased interest rates across the entire monetary union. To address this, the MT and SGP have preemptively introduced fiscal targets, such as debt targets (see, e.g., Beetsma and Uhlig, 1999). Debt targets were originally implemented to promote fiscal discipline across the monetary union and prevent countries with low debt from experiencing negative spillovers. However, the scope and exact level of such debt targets remain the subject of ongoing debate.

Cross-country heterogeneity coexists with economic disparities within each country, as shown in Table 1. Specifically, the Periphery exhibits consistently lower wealth inequality and higher income inequality than the Core. This introduces another layer of complexity to the debate on debt targets. Existing inequality would affect the impact of debt targets (see, e.g., Brinca *et al.*, 2021). At the same time, these targets would shape national fiscal policies, which, in turn, significantly affect within-country inequalities.

Table 1: Within EA countries inequality

Statistic	Core	Periphery
Gini wealth	0.74^a	0.60^a
Wealth share of top 10%	59^c	46^c
Wealth share of bottom 40%	0^c	5^c
Gini of net income	0.29^b	0.33^b
Net income share of top 10%	23^b	25^b
Net income share of bottom 40%	22^b	19^b

Note: Income and wealth inequality measures for Core and Periphery from the following sources: [a]Cowell and Van Kerm (2015) use data only for late 2010/early 2011; [b]World Income Inequality Database, 2010-2020 (UNU-WIDER 2022); [c]OECD.Stat between 2009-2019. Income refers to equivalized net household income (OECD modified), while net worth refers to the sum of net financial and net housing wealth at the household level. Core-Periphery are defined as in Figure 1.

We contribute to the EA fiscal targets debate by developing a world economy HANK model that captures key features of both cross- and within-country heterogeneity observed in the EA. We then use this model as a laboratory to study the impact of debt target reforms in a monetary union. Specifically, we examine whether there is scope for reforming the EA debt targets and who would benefit from such reforms across and within countries.[2] Additionally, we examine whether cross-country fiscal externalities may affect our results. Finally, we compute EA-wide 'optimized' debt targets.

Our model comprises two countries and the Rest-of-the-World (RoW). Each country

[2]Proposals to reform the Euro Area fiscal rules have been put forward by see, e.g., Wyplosz (2019), Beetsma and Larch (2019), Beuve *et al.* (2019), Blanchard *et al.* (2021), Marimon and Wicht (2021) and Fuest (2022).

consists of heterogeneous households, firms, a mutual fund and a national government. Financial markets are incomplete à la Bewley-Huggett-Aiyagari (Bewley, 1986; Huggett, 1993; Aiyagari, 1994). The model features standard New Keynesian elements in the form of nominal price and wage rigidity. The two countries trade goods with each other and with the RoW. Furthermore, each country borrows from (or lends to) the RoW with a sovereign premium that is elastic to net external debt in the spirit of Schmitt-Grohé and Uribe (2003). To capture cross-country externalities, we also allow the sovereign premium to depend not only on each country's net external debt but also on the net external debt of the other member state. To mimic the EA, the two countries fix the bilateral nominal exchange rate, and a single monetary authority sets the nominal interest rate according to a Taylor rule. We assume independent national fiscal policies.

The model is calibrated for the EA Core and Periphery over the 2000-2019 period. Our quantitative solution captures the key features of the EA macroeconomic narrative, as illustrated in Figure 1, as well as the within-country distributional statistics shown in Table 1. We refer to this stationary equilibrium as the *Status Quo (SQ)*. Thus, our model is well-suited for studying not only the cross- but also the within-country implications of fiscal reforms.

Initially, we study a benchmark fiscal scenario that complies with the MT reference value, where both countries should reduce the public debt-output ratio to 60%. We refer to this scenario as *Fiscal Formality* (*FF*). Then, we evaluate alternative EA debt targets in comparison to *FF*. Motivated by the ongoing public debate (see, e.g., Blanchard *et al.,* 2021; Francová *et al.*, 2021; and Regling, 2022), we consider the following reforms. First, we consider a reform that relaxes the debt target for highly indebted countries to reflect their current fiscal stance better while it does not require any fiscal consolidation from low-indebted countries. Following Francová *et al.* (2021), we set the public debt-output target for this fiscal scenario at 100% for the Periphery. Francová *et al.* (2021) suggest a debt target equal to 100%, as it reflects the current EA cross-sectional average, similar to how the MT debt target was originally adopted.[3] We refer to this scenario as *Fiscal Realism* (*FR*). Additionally, we examine whether a fiscal expansion in the Core would facilitate fiscal consolidation in the Periphery. Blanchard *et al.* (2017) have also studied this issue within the context of a New Keynesian two-country model. To mimic this fiscal scenario, we allow the Core to increase its public debt-output ratio to 100%, while the Periphery should decrease its ratio to 100%. We refer to this scenario as *Fiscal Accommodation* (*FA*). This scenario enables us to assess asymmetric national fiscal policies, particularly whether fiscal consolidation in the Periphery is less welfare-costly during periods of expansion in the Core. Finally, we explore the EA-wide 'optimized' debt targets by searching over a grid that spans from the 60% reference value of MT to 145%, the *SQ* debt-output ratio

[3]The EA average in 2020, where our policy experiment starts, is equal to 97.2%.

in the Periphery.

Key findings. We find that the *FF* scenario is quite costly across and within countries. These costs are unevenly distributed among countries and households. In particular, relatively wealth-poor households in the Periphery incur the highest welfare losses. At the same time, the *FF* scenario thickens the lower tail of the wealth distribution by increasing the population share of borrowers and decreasing their wealth. A revision of EA debt targets from the *FF* to the *FR* significantly mitigates the welfare losses of households at any level of wealth for both countries while mitigating the rise in all wealth inequality statistics. Consequently, a reform such as the *FR* does not generate a conflict of interest across or within countries. However, going beyond the *FR* scenario by allowing the Core to expand while the Periphery consolidates *FA* would generate a conflict of interest between households of the Core and the vast majority of households in the Periphery. The existence of cross-country fiscal externalities could increase the benefits of national fiscal reforms, such as fiscal consolidation in the Periphery, for the entire union, especially for households at the lower end of the wealth distribution. Finally, our results indicate that the 'optimized' EA debt-output target lies between the *SQ* debt-output ratios of the two countries, i.e., between 67% (Core) and 145% (Periphery). This suggests that, within the context of our model, the Periphery should aim for fiscal consolidation, albeit towards a looser public debt target than the reference value of the MT, while the Core should expand. Under our benchmark calibration, the 'optimized' debt target is 120%.

Related Literature. Our paper contributes to at least two strands of the literature. First, it contributes to the rapidly growing literature that studies the effects on within-country heterogeneity of various international macroeconomic shocks employing (small) open economy models, e.g., de Ferra *et al.* (2020), Giagheddu (2020), Auclert *et al.* (2021b), Aggarwal *et al.* (2023), Oskolkov (2023), and Guo *et al.* (2023). Our paper is closer to Aggarwal *et al.* (2023) and Bayer *et al.* (2024). Aggarwal *et al.* (2023) employ a many-country HANK model to study the impact of the COVID-19-induced fiscal stimulus packages on excess savings and twin deficits. Bayer *et al.* (2024) develop a two-country HANK (aka HANK^2) model and calibrate it for the EA (Germany and Italy). Bayer *et al.* (2024) focus on the effects of the monetary union on the transmission of shocks at the household level. In contrast, we develop a world economy model structured to reflect the Core-Periphery division within a monetary union.

Second, we contribute to the literature that studies the role of public debt in closed economy heterogeneous agents' models. Aiyagari and McGrattan (1998) and Flodén (2001), Desbonnet and Weitzenblum (2011), Viegas and Ribeiro (2016), and Röhrs and Winter (2017), also study the effects of public debt on welfare across the wealth distribution. Moreover, Açıkgöz *et al.* (2018) and Dyrda and Pedroni (2023) solve the fully-fledged Ramsey problem for the neoclassical growth model with heterogeneous agents to find the

optimal level of debt. In contrast, we solve for an optimized debt target under certain restrictions that make the numerical computation of the 'optimized' debt target tractable. Finally, Bayer *et al.* (2023) recently examined the liquidity premium's role in a two-asset HANK model. They find similar results to those in our paper regarding the long-run movements of interest rates and wealth inequality in a closed economy. The key mechanism in their model is the presence of two assets and the endogenous liquidity premium. The main difference with these papers is the open economy dimension. Our work complements these studies as we examine the role of public debt in an open economy framework in which public debt asymmetry across countries generates a sovereign premium for the high-indebted country vis-à-vis the less-indebted country.

To the best of our knowledge, our paper is the first to explore debt target reforms in a monetary union going beyond the representative or two-agent framework to capture the heterogeneous welfare effects of fiscal consolidation and its impact on wealth inequality.[4] Our analysis offers a novel unified approach to study the issue of debt targets in a monetary union. Our results provide a rationale for revising the EA debt targets in the direction to reflect the current economic state better, such as the *FR*.

The rest of the paper is organized as follows. Section 2 develops the model. Section 3 presents the calibration and the numerical solution of the *SQ* stationary equilibrium. Section 4 lays out the policy experiment, while Section 5 presents our main results. Section 6 conducts an extensive robustness analysis. Finally, Section 7 closes the paper. Moreover, the Supplemental Appendix (Chen *et al.* (2025)) contains technical and computational details, additional results and robustness checks.

2 Model

The model consists of two countries and the Rest of the World (RoW). The two countries are of equal size, and the structure of their economy is symmetric, while the RoW is modelled in a reduced-form way. In what follows, we present the decision problems faced by the agents of the home country, which we refer to as the Core. We refer to the

[4] There is an extensive literature on fiscal consolidation policies in a monetary union, which has been largely examined through two-country open economy Representative Agent New Keynesian (RANK) and/or a Two-Agent New Keynesian (TANK) DSGE models. A non-exhaustive list includes Coenen *et al.* (2008), Forni *et al.* (2010), Clinton *et al.* (2011), Cogan *et al.* (2013), Erceg and Linde (2013) and Philippopoulos *et al.* (2017). Like these papers, we analyze the aggregate macroeconomic and welfare implications of fiscal consolidation policies. An exception in the existing literature is Viegas and Ribeiro (2016), who use a two-country neoclassical growth model with heterogeneous agents to compare historical fiscal consolidation episodes in the European Union. In contrast to Viegas and Ribeiro (2016), our model incorporates New Keynesian features, explicitly accounts for the monetary regime of the Euro Area, and allows for richer cross-country heterogeneity, potential fiscal externalities, and sovereign premiums. Furthermore, we ensure that the within-country heterogeneity aligns with key empirical wealth and income distribution statistics.

foreign country as the Periphery and denote the respective variables with an asterisk ($*$) superscript. The decision problems faced by the agents in the Periphery are presented in Supplemental Appendix A.2. Finally, variables associated with the RoW are denoted with a tilde ($\tilde{}$) above them.

2.1 Households

2.1.1 Preferences and consumption basket

Each household's h preferences over consumption, $c_{h,t}$, and hours worked, $l_{h,t}$, are described by lifetime utility, $\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left(c_{h,t}^{1-\sigma} / (1-\sigma) - \varphi l_{h,t}^{1+\eta} / (1+\eta) \right)$, where $\beta \in (0,1)$ is the households' subjective discount factor, σ is the inverse elasiticity of intertemporal subsitution, $\frac{1}{\eta}$ is the Frisch elasticity of labor supply and $\varphi > 0$ is the relative weight of disutility of labor.

The consumption basket, $c_{h,t}$, is a constant elasticity of substitution (CES) aggregator of traded goods produced in the Core, $c_{H,h,t}$, the Periphery, $c_{F,h,t}$, and the RoW, $c_{RoW,h,t}$, given by,

$$c_{h,t} = \left[\left(\chi^H\right)^{\frac{1}{\theta}} \left(c_{H,h,t}\right)^{\frac{\theta-1}{\theta}} + \left(\chi^F\right)^{\frac{1}{\theta}} \left(c_{F,h,t}\right)^{\frac{\theta-1}{\theta}} + \left(1-\chi^H-\chi^F\right)^{\frac{1}{\theta}} \left(c_{RoW,h,t}\right)^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}} \quad (1)$$

where parameter $\theta > 0$ is the elasticity of substitution among the three traded goods, while, χ^H, χ^F, and $1-\chi^H-\chi^F$ denote the respective weights of Core, Periphery and RoW goods. Each household chooses $c_{H,h,t}$, $c_{F,h,t}$ and $c_{RoW,h,t}$ to minimize total consumption expenditure, yielding the demand functions for the three traded goods:

$$c_{H,h,t} = \chi^H \left[\frac{P_{H,t}}{P_t}\right]^{-\theta} c_{h,t},\ c_{F,h,t} = \chi^F \left[\frac{P_{F,t}}{P_t}\right]^{-\theta} c_{h,t},\ c_{RoW,h,t} = \left(1-\chi^H-\chi^F\right) \left[\frac{P_{RoW,t}}{P_t}\right]^{-\theta} c_{h,t}$$

where $P_t = \left[\chi^H (P_{H,t})^{1-\theta} + \chi^F (P_{F,t})^{1-\theta} + \left(1-\chi^H-\chi^F\right) (P_{RoW,t})^{1-\theta}\right]^{\frac{1}{1-\theta}}$ is the Core consumer price index.

We assume that the laws of one price hold for final traded goods. For Core goods sold in the Periphery, $P_{H,t} = S_t P^*_{H,t}$, and the RoW, $P_{H,t} = \widetilde{S}_t \widetilde{P}_{H,t}$, where, $P^*_{H,t}$ and $\widetilde{P}_{H,t}$ are the nominal prices of Core's good denominated in Periphery and RoW currencies, respectively. S_t and $\widetilde{S}_t$ denote the nominal exchange rates, expressed in units of the Core currency per unit of the Periphery and RoW currencies, respectively.

We solve for a monetary union regime between the Core and Periphery, where S_t is held constant at unity. $\widetilde{S}_t$ then represents the nominal exchange rate between the union and the RoW. The real exchange rates between the Core and Periphery, and with the RoW, are defined as $Q_t \equiv \frac{P^*_t}{P_t}$ and $\widetilde{Q}_t \equiv \frac{\widetilde{S}_t \widetilde{P}_t}{P_t}$, where P^*_t and $\widetilde{P}_t$ represent the aggregate

price levels in the Periphery and RoW, respectively.

2.1.2 Household productivity and income process

Households earn wage income and profits. Wage income is given by $w_t \varepsilon_{h,t} l_{h,t}$, where $w_t \equiv \frac{W_t}{P_t}$ denotes real wage rate, $\varepsilon_{h,t}$ denotes the idiosyncratic productivity, and $l_{h,t}$ denotes household's labor supply. Profits, d_t, are shared according to the idiosyncratic productivity of the households (as in, e.g., Acharya and Dogra, 2020). Thus, gross household labor income is, $w_t \varepsilon_{h,t} l_{h,t} + \varepsilon_{h,t} d_t$. Following Kindermann and Krueger (2022), we assume that the process $\varepsilon_{h,t}$ follows an augmented m-state Markov chain. In particular, there is an "ordinary" part of the Markov chain that follows a discretized log-normal AR(1) process with persistence ρ and variance σ_ε^2, while we add two additional states, one that captures the super-productive (*awesome state*) and another that captures low productivity households. For example, superstars and successful entrepreneurs fall into the former category, while poor entrepreneurs or individuals experiencing big adverse shocks belong to the latter category. These additional states help us capture better inequality at the top and bottom of the wealth and income distribution of each country.

The state space is defined as $\mathcal{E} = [\overline{\varepsilon}_1, ..., \overline{\varepsilon}_\ell, ..., \overline{\varepsilon}_m, \overline{\varepsilon}_p, \overline{\varepsilon}_r]$ where the first m elements correspond to the ordinary states with ℓ denoting its median state. The remaining two states, $\overline{\varepsilon}_p$ and $\overline{\varepsilon}_r$, represent the low productivity and the awesome states, respectively, specified as $\overline{\varepsilon}_p = \frac{\overline{\varepsilon}_1}{2}$ and $\overline{\varepsilon}_r = \overline{\varepsilon}_m^2$. The transition matrix of the augmented Markov Chain is summarized by,

$$\left[\begin{array}{c|c} \underset{m\times m}{\Gamma_{\varepsilon\varepsilon'}} & \underset{m\times 2}{\Gamma_{\varepsilon z}} \\ \hline \underset{2\times m}{\Gamma_{z\varepsilon'}} & \underset{2\times 2}{\Gamma_{zz'}} \end{array}\right] \equiv \left[\begin{array}{ccccc|cc} p_{11'}p_z & \dots & p_{1\ell'}p_z & \dots & p_{1m'}p_z & p_p & p_r \\ \vdots & \ddots & \vdots & \ddots & \vdots & \vdots & \vdots \\ p_{m1'}p_z & \dots & p_{m\ell'}p_z & \dots & p_{mm'}p_z & p_p & p_r \\ \hline 0 & \dots & 1-p_{pp'} & \dots & 0 & p_{pp'} & 0 \\ 0 & \dots & 1-p_{rr'} & \dots & 0 & 0 & p_{rr'} \end{array}\right] \tag{2}$$

where $p_z + p_p + p_r = 1$. The submatrix $\underset{m\times m}{\Gamma_{\varepsilon\varepsilon'}}$ contains transition probabilities $p_{\iota,\iota'}$, where $\iota, \iota' = 1, ..., m$, which represent the probability of transitioning from the ordinary state ε_ι to state $\varepsilon'_{\iota'}$. The matrix $\Gamma_{\varepsilon z}$ is defined as $\underset{m,2}{\Gamma_{\varepsilon z}} = \underset{m,1}{J_{m,1}} \times \underset{1,2}{[p_p, p_r]}$ where $J_{m,1}$ is a matrix of ones and p_p and p_r represent the probabilities that a household transitions into the low-productivity and high-productivity states, respectively, starting from any of the m ordinary states. Additionally, $\underset{2\times 2}{\Gamma_{zz'}}$ includes probabilities $p_{pp'}$ and $p_{rr'}$, denoting the likelihood of remaining in the low-productivity and high-productivity states, respectively. The submatrix $\underset{2\times m}{\Gamma_{z\varepsilon'}}$ contains the complementary probabilities $(1 - p_{pp'})$ and $(1 - p_{rr'})$, indicating the likelihood that a household exits the low or high productivity states and tran-

sitions to the median state, ℓ, of the ordinary productivity. Our assumptions imply that a household cannot transit directly from the awesome to the low productivity state or the opposite direction, they have to transit to the ordinary states first. Finally, we denote the invariant distribution of the Markov chain by ξ and we normalize $E[\varepsilon_t] = \sum_{\varepsilon \in \mathcal{E}} \varepsilon \xi(\varepsilon) = 1$.[5] All parameters governing the Markov chain can vary across the two countries.

2.1.3 Consumption and saving choices

Households make their consumption and saving choices given the consumption expenditure allocation and income processes described above. We assume that financial markets are incomplete as in Bewley (1986), Hugget (1993) and Aiyagari (1994). Nevertheless, households can partially self-insure against idiosyncratic shocks by saving in a domestic mutual fund. We also allow some borrowing among households via IOUs. Moreover, we assume that hours worked are determined at the labor union level, that is, each household h takes their hours worked, $l_{h,t}$, as given (see Auclert *et al.*, 2024).

Given initial values for $a_{h,-1}, \varepsilon_{h,0}$, the typical household h chooses plans $\{c_{h,t}\}_{t=0}^{\infty}$ and $\{a_{h,t}\}_{t=0}^{\infty}$ that solve the problem,

$$V_0(a_{h,-1}, \varepsilon_{h,0}) = \max_{\{c_{h,t}, a_{h,t}\}_{t=0}^{\infty}} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{(c_{h,t})^{1-\sigma}}{1-\sigma} - \varphi \frac{(l_{h,t})^{1+\eta}}{1+\eta} \right), \tag{3}$$

s.t.

$$c_{h,t} + a_{h,t} = R\left(a_{h,t-1}, i^a_{t-1}, \tau^a_t\right) \frac{P_{t-1}}{P_t} a_{h,t-1} + (1-\tau^l_t)\left(w_{h,t}\varepsilon_{h,t} l_{h,t} + \varepsilon_{h,t} d_t\right)^{1-\tau^p_t}, \tag{4}$$

$$a_{h,t} \geq -\underline{a}_t \text{ and } c_{h,t} \geq 0$$

where $c_{h,t}$ is the CES aggregator defined in (1). Households are subject to a tax and transfer tax schedule as in Heathcote *et al.* (2017), with parameters τ^p_t and τ^l_t to determine tax progressivity and the average level of taxation in the economy, respectively. In addition, $R\left(a_{h,t-1}, i^a_{t-1}, \tau^a_t\right)$ denotes the post-tax gross nominal interest rate that the typical household faces. Specifically, households with positive net savings, $a_{h,t-1} > 0$, invest their assets in the domestic mutual fund earning a nominal net return equal to i^a_{t-1}. The national government imposes a tax on the net return equal to τ^a_t, thus the post-tax nominal net return is equal to $(1-\tau^a_t)\, i^a_{t-1}$. On the other hand, households with negative net savings, $a_{h,t-1} < 0$, borrow from other households incurring a wasted intermediation cost. This creates a wedge, Δ, between the interest rate paid by the domestic mutual fund and the interest rate paid for IOUs, which is equal to $1 + i^a_{t-1} + \Delta$. This assumption generates

[5] We assume that there exists n_0 such that $[\Pr(\varepsilon_{t+1} = \varepsilon' | \varepsilon_t = \varepsilon)]^n > 0$, for all $\varepsilon', \varepsilon \in \mathcal{E}$ and for all $n > n_0$, where $n \in \mathbb{N}_+$. This assumption guarantees that a unique invariant distribution exists (see, e.g. Açıkgöz, 2018). In the numerical implementation, we check whether this assumption holds.

a mass of households around zero net savings but with the option of borrowing with a penalty. We also introduce an ad-hoc borrowing limit, $\underline{a}_t$, which may vary over time. This limit is a fraction, λ, of per capita real output, i.e., $\underline{a}_t \equiv \lambda \frac{P_{H,t}}{P_t} Y_{H,t}$. The latter captures the idea that borrowing constraints tighten (or loosen) during economic downturns (or booms) but are time invariant at a stationary equilibrium. In Supplemental Appendix A.1.1, we show the dynamic programming formulation of the household's problem and we discuss in detail how we compute the model with the time-varying borrowing constraint.

2.1.4 Wage setting

We adopt the framework of Auclert *et al.* (2024) to incorporate nominal wage rigidities in heterogeneous households.[6] Households sell labor services to a continuum of unions with mass one. Each union sets nominal wages to maximize the welfare of the average household but faces Rotemberg type adjustment costs. In symmetric equilibrium, all unions set the same wage and all households supply the same number of hours. This setup yields a standard wage Phillips Curve,

$$\ln\left(1+\pi_t^w\right) = \kappa_w \left[\varphi\left(L_t\right)^{1+\eta} - \frac{1}{\mu_w}\left(1-\tau_t^p\right)\left(1-\tau_t^l\right)U_t^{CW}\right] + \beta \ln\left(1+\pi_{t+1}^w\right) \tag{5}$$

where $1+\pi_t^w \equiv \frac{W_t}{W_{t-1}}$ and $U_t^{CW} \equiv \left(\frac{W_t}{P_t}L_t + d_t\right)^{-\tau_t^p} \frac{W_t L_t}{P_t} \int_h \left[\left(\varepsilon_{h,t}\right)^{1-\tau_t^p} c_{h,t}^{-\sigma}\right] dh$, denotes wage inflation and a productivity-weighted aggregate of marginal consumption, respectively. See Supplemental Appendix A.1.2 for technical details.

2.2 Financial sector

We assume that international capital flows take place via a mutual fund, as in Auclert *et al.* (2021b). A risk-neutral mutual fund issues claims to Core households with an aggregate nominal value of $P_t A_t = P_t \int_h a_{h,t} dh$ at the end of period t, paying a nominal net return of i_t^a. The Core mutual fund has access to domestic and international asset markets, can invest in domestic government bonds, $P_t B_t$, earning a nominal interest rate $i_{H,t}$, and can borrow from or lend to the RoW at a nominal interest rate $i_{RoW,t}$ through international assets denominated in RoW currency, $\widetilde{P}_t \widetilde{F}_t$.

The objective of the mutual fund is to maximize the expected real return $E_t\left[1+r_t^a\right] \equiv \frac{1+i_t^a}{1+\pi_{t+1}}$ on its liability A_t, by choosing to invest in B_t and $\widetilde{F}_t$. This leads to the following

[6] Auclert *et al.* (2024) incorporate the sticky-wage micro-founded framework from Erceg et al. (2000) into a heterogeneous agent model.

no-arbitrage conditions for periods $t \geq 1$ (see Supplemental Appendix A.1.3).

$$1 + r_t^a = \frac{1 + i_t^a}{1 + \pi_{t+1}} = \frac{1 + i_{RoW,t}}{1 + \widetilde{\pi}_{t+1}} \frac{\widetilde{Q}_{t+1}}{\widetilde{Q}_t} = \frac{1 + i_{H,t}}{1 + \pi_{t+1}} \tag{6}$$

where $1+\pi_{t+1} \equiv \frac{P_{t+1}}{P_t}$ and $1+\widetilde{\pi}_{t+1} \equiv \frac{\widetilde{P}_{t+1}}{\widetilde{P}_t}$ are Core's and RoW inflation rates, respectively. In the event of an unexpected aggregate event, capital gains in period 0 are permitted, i.e., $r_0^a \neq r_{-1}^a$. We assume that r_0^a is a weighted average of the realized returns on domestic government bonds and international assets.

2.3 Firms and price setting

There are two types of firms in the model. A competitive final good packer and a continuum of monopolistically competitive intermediate good firms. The final good firm produces the Core's traded good, $Y_{H,t}$, by combining intermediate varieties j using a Dixit-Stiglitz aggregator, $Y_{H,t} = \left(\int_0^1 (Y_{H,j,t})^{\frac{1}{\mu}} dj\right)^{\mu}$, where μ denotes the markup which determines the elasticity of substitution among the differentiated intermediate goods. Each intermediate firm employs labor to produce variety j using a linear technology, $Y_{H,j,t} = Z n_{j,t}$, where Z is aggregate labor productivity. They set their prices subject to Rotemberg type adjustment costs. The firm's optimization problem results in a standard New Keynesian Phillips Curve:

$$\ln\left(\frac{1 + \pi_{H,t}}{1 + \pi_H}\right) = \kappa\left(\frac{P_t}{P_{H,t}}\frac{w_t}{Z} - \frac{1}{\mu}\right) + \frac{1}{1 + r_t^a}\frac{Y_{H,t+1}}{Y_{H,t}} \ln\left(\frac{1 + \pi_{H,t+1}}{1 + \pi_H}\right) \tag{7}$$

where $1 + \pi_{H,t} \equiv \frac{P_{H,t}}{P_{H,t-1}}$ denotes inflation of Core's output deflator and π_H is the steady-state inflation rate. The real profits of each intermediate firm which are rebated to households are given by $d_t = \frac{P_{H,t}}{P_t} Y_{H,t} - w_t N_t - \frac{P_{H,t}}{P_t}\psi_t$ where ψ_t denotes the quadratic adjustment cost.[7]

2.4 Government

The period-by-period government budget constraint in the Core country is (in real terms),

$$B_t + \frac{\tau_t^a i_{t-1}^a A_{t-1}^+}{1 + \pi_t} + w_t L_t + d_t - \left(1 - \tau_t^l\right)\left(w_t L_t + d_t\right)^{1-\tau_t^p} E_t = \frac{\left(1 + i_{H,t-1}\right) B_{t-1}}{1 + \pi_t} + \frac{P_{H,t} G_{H,t}}{P_t} \tag{8}$$

where $E_t \equiv \sum_{\varepsilon \in \mathcal{E}} \left(\varepsilon_{h,t}\right)^{1-\tau_t^p} \xi\left(\varepsilon\right)$ and $A_{t-1}^+ \equiv \int_h \mathbb{I}_{a_{h,t-1}>0} a_{h,t-1} dh$. Thus, $w_t L_t + d_t - \left(1 - \tau_t^l\right)\left(w_t L_t + d_t\right)_t^{1-\tau_t^p} E_t$ are tax revenues net of transfers from labor, while $\frac{\tau_t^a i_{t-1}^a A_t^+}{1+\pi_t}$

[7] $\psi_t \equiv \frac{\mu}{\mu - 1}\frac{1}{2\kappa}\left[\ln(\frac{P_{H,t}}{P_{H,t-1}}) - \ln\left(1 + \pi_H\right)\right]^2 Y_{H,t}$

are tax revenues from capital income. Moreover, B_t denotes the end-of-period domestic government debt, borrowed via the mutual fund at the nominal interest rate $i_{H,t}$. Government spending, $G_{H,t}$, is exclusively allocated to domestically produced goods ($g_{H,t} \equiv \frac{G_{H,t}}{Y_{H,t}}$). The Core government follows a simple fiscal rule, with the labor income tax defined as:

$$\tau_t^l = \overline{\tau}^l + \gamma_l \left(b_{t-1} - \overline{b} \right) \tag{9}$$

where $\overline{\tau}^l$ is the tax target, $\gamma_l \geq 0$ is the feedback policy coefficient on public debt to output ratio in the Core, $b_{t-1} = \frac{B_{t-1}}{\frac{P_{H,t-1}}{P_{t-1}} Y_{H,t-1}}$, while $\overline{b}$ denotes the debt target. The Periphery's government budget constraint and fiscal rules are analogously defined in Supplemental Appendix A.2.3. The public debt-to-output targets for the Core and Periphery, denoted $\overline{b}$ and $\overline{b}^*$, respectively, are central to the policy experiments discussed below.

2.5 The evolution of international assets

The evolution of net foreign assets in the Core country (in real terms) is as follows,[8]

$$\begin{aligned} \widetilde{Q}_t \widetilde{F}_t = & \left(\frac{1 + i_{RoW,t-1}}{1 + \widetilde{\pi}_t} \right) \widetilde{Q}_t \widetilde{F}_{t-1} + \Delta_{t-1} \frac{P_{t-1}}{P_t} \\ & + \left(\frac{P_{H,t}}{P_t} C_{H,t}^* - \frac{P_{F,t}}{P_t} C_{F,t} \right) + \left(\frac{P_{H,t}}{P_t} \widetilde{C}_{H,t} - \frac{P_{RoW,t}}{P_t} C_{RoW,t} \right) \end{aligned} \tag{10}$$

where $\frac{P_{H,t}}{P_t} C_{H,t}^* - \frac{P_{F,t}}{P_t} C_{F,t}$ and $\frac{P_{H,t}}{P_t} \widetilde{C}_{H,t} - \frac{P_{RoW,t}}{P_t} C_{RoW,t}$ are net exports (imports) of the Core to the Periphery and the RoW, respectively. When $\widetilde{F}_t < 0 \, (> 0)$, the country is a net debtor (a net creditor) vis-à-vis the RoW. Finally, $\Delta_{t-1} \equiv \Delta \left(A_{t-1} - A_{t-1}^+ \right)$ represents the aggregate resource cost linked to the intermediation of IOU households.

2.6 Monetary policy in the union

The two countries form a monetary union, as such the bilateral nominal exchange rate is set exogenously, $S_t = 1$, thus, only one of the nominal interest rates can be set independently by the single monetary authority, here $i_{H,t}$, while, Periphery's nominal interest rate, $i_{F,t}^*$, is an endogenous variable.[9] Furthermore, we assume that the central bank of the EA sets, $i_{H,t}$, according to a Taylor-type interest rate rule, responding to EA inflation, which is the weighted average of the Core, π_t, and Periphery, π_t^*, CPI inflation rates:

$$i_{H,t} = \overline{\imath} + \phi_\pi \left(\varsigma \left(\pi_t - \bar{\pi} \right) + (1 - \varsigma) \left(\pi_t^* - \bar{\pi} \right) \right) \tag{11}$$

[8] The derivation is presented in Supplemental Appendix A.1.7.

[9] Under a flexible exchange rate regime, the bilateral nominal exchange rate, S_t, would be an endogenous variable and the two countries nominal interest rates, $i_{H,t}$ and $i_{F,t}^*$, could be exogenously set by two independent national monetary authorities.

where $\bar{\imath}$ and $\bar{\pi}$ are monetary policy targets, $\phi_\pi > 1$, is the feedback monetary policy coefficient on EA CPI inflation, while $0 \leq \varsigma \leq 1$ is the weight given by the EA central bank to Core's vis-à-vis Periphery's inflation deviations from the target.

2.7 Rest of the World

We assume that the world economy closes with the RoW. The RoW trade with the monetary union in world goods and assets market.

2.7.1 Goods markets

Total RoW demand, $\widetilde{Y}$, the aggregate world price level, $\widetilde{P}_t$, and the price of the traded good produced by the RoW, $\widetilde{P}_{RoW,t}$, are taken as given by the member states of the monetary union. We also assume that union prices do not affect the RoW aggregate price level. The RoW demand for Core and Periphery goods takes the standard form, $\widetilde{C}_{H,t} = \left(\widetilde{P}_{H,t}/\widetilde{P}_t\right)^{-\widetilde{\theta}_H} \widetilde{Y}$, $\widetilde{C}_{F,t} = \left(\widetilde{P}_{F,t}/\widetilde{P}_t\right)^{-\widetilde{\theta}_F} \widetilde{Y}$, where, $\widetilde{P}_{H,t}$ and $\widetilde{P}_{F,t}$, are prices of the Core and Periphery goods denominated in the RoW currency with associated price elasticities, $\widetilde{\theta}_H$ and $\widetilde{\theta}_F$, respectively. Similarly, the RoW produces a traded good from which $C_{RoW,t}$ and $C^*_{RoW,t}$ are imported by the Core and the Periphery at price $\widetilde{P}_{RoW,t}$. The laws of one price for the goods produced in the RoW imply that $P_{RoW,t} = P^*_{RoW,t} = \widetilde{S}_t \widetilde{P}_{RoW,t}$.

2.7.2 Asset markets

The RoW lends to (or borrows from) the Core/Periphery mutual funds in the world financial markets. We assume that the international nominal interest rates faced by member countries are debt elastic in the spirit of Schmitt-Grohé and Uribe (2003). Specifically, the borrowing cost of the Core from the RoW, $i_{RoW,t}$, is given by,

$$1 + i_{RoW,t} = (1 + \tilde{\imath}) + \zeta \left\{ \exp\left[(1 - \varpi)\left(nfd_t - \overline{nfd} \right) + \varpi \left(nfd^*_t - \overline{nfd}^* \right) \right] - 1 \right\} \qquad (12)$$

where nfd_t and nfd^*_t represent the net external debt to output ratios for the Core and Periphery, respectively.[10] The borrowing cost of the Core is an increasing (decreasing) function of Core's net external debt (assets), nfd_t, relative to a threshold, $\overline{nfd}$. Furthermore, we incorporate a direct cross-country fiscal externality, meaning that the borrowing cost of the Core may also depend on deviations of the Periphery's net external debt to output ratio, nfd^*_t, from its threshold, $\overline{nfd}^*$. When net external debt exceeds these thresholds, the sovereign premium is positive, otherwise, it is negative. The parameter, $\zeta > 0$,

[10] In the model, $\widetilde{F}_t$ and $\widetilde{F}^*_t$, are defined as net foreign assets, as such a negative value implies net foreign debt. Thus, $nfd_t \equiv -\frac{\widetilde{S}_t \widetilde{P}_t \widetilde{F}_t}{P_{H,t} Y_{H,t}} = -\widetilde{Q}_t \widetilde{F}_t \left(\frac{P_{H,t}}{P_t} Y_{H,t}\right)^{-1} \geq 0$ and $nfd^*_t \equiv -\frac{\widetilde{S}_t \widetilde{P}_t \widetilde{F}^*_t}{P^*_{F,t} Y^*_{F,t}} = -\frac{\widetilde{Q}_t}{Q_t} \widetilde{F}^*_t \left(\frac{P^*_{F,t}}{P^*_t} Y^*_{F,t}\right)^{-1} \geq 0$.

governs the elasticity of international nominal interest rate on net external debt, while $\varpi \in [0,1)$ captures the strength of the direct fiscal externality. Lastly, $\tilde{\imath}$ denotes the time-invariant component of the world interest rate, which is exogenously determined in the model. The borrowing cost of the Periphery from the RoW, $i^*_{RoW,t}$, is analogously defined as follows

$$1 + i^*_{RoW,t} = (1 + \tilde{\imath}^*) + \zeta^* \left\{ \exp\left[(1 - \varpi^*) \left(nfd^*_t - \overline{nfd}^* \right) + \varpi^* \left(nfd_t - \overline{nfd} \right) \right] - 1 \right\} \quad (13)$$

where $\tilde{\imath}^*$, $\zeta^* > 0$ and $\varpi^* \in [0,1)$ are the respective parameters for the Periphery.

2.8 Clearing market conditions

The Core labor, asset and goods market clearing conditions are as follows:

$$N_t = L_t \quad (14)$$

$$A_t = B_t + \widetilde{Q}_t \widetilde{F}_t \quad (15)$$

$$Y_{H,t} = C_{H,t} + C^*_{H,t} + \widetilde{C}_{H,t} + G_{H,t} + \psi_t \quad (16)$$

where $A_t \equiv \int_h a_{h,t} dh$, $C_{H,t} \equiv \int_h c_{H,h,t} dh$, while $C^*_{H,t}$ and $\widetilde{C}_{H,t}$ denote the quantities of Core-produced goods demanded by the Periphery and RoW, respectively.

2.9 Decentralized Equilibrium

Given the monetary union regime, where $S_t = 1$ for all t, the single monetary authority sets $\{i_{H,t}\}_{t=0}^{\infty}$ according to equation (11) given monetary policy targets $\left\{\overline{\imath}, \overline{\pi}\right\}$, national fiscal authorities set $\{\tau^l_t,\ \tau^{l*}_t\}_{t=0}^{\infty}$ according to simple fiscal rules given the exogenous national fiscal policy targets $\{\overline{\tau}^l,\ \overline{\tau}^{l*},\ \overline{b},\ \overline{b}^*,\ \tau^p,\ \tau^{p*},\ \tau^a,\ \tau^{a,*},\ g_H,\ g^*_F\}$, given initial conditions $\{\frac{B_0}{\frac{P_{H,0}}{P_0} Y_{H,0}},\ \frac{B^*_0}{\frac{P^*_{F,0}}{P^*_0} Y^*_{F,0}},\ \widetilde{F}_0,\ \widetilde{F}^*_0,\ \frac{P_{H,0}}{P_0},\ \frac{P^*_{F,0}}{P^*_0},\ \widetilde{Q}_0,\ Q_0\}$ and the initial wealth distributions $\{\Lambda_0(a_{-1}, \varepsilon_0),\ \Lambda^*_0(a^*_{-1}, \varepsilon^*_0)\}$, a *Decentralized Equilibrium* is a path of prices $\{i^*_{F,t},\ \frac{P_{H,t}}{P_t},\ \frac{P^*_{F,t}}{P^*_t},\ \frac{P_{RoW,t}}{P_t},\ \frac{P^*_{RoW,t}}{P^*_t},\ \frac{\widetilde{P}_{H,t}}{\widetilde{P}_t},\ \frac{\widetilde{P}^*_{F,t}}{\widetilde{P}^*_t},\ w_t,\ w^*_t,\ r_{H,t},\ r^*_{F,t},\ i^a_t,\ i^{a,*}_t,\ i_{RoW,t},\ i^*_{RoW,t},\ Q_t,\ \widetilde{Q}_t,\ \pi_t,\ \pi^*_t,\ \pi_{H,t},\ \pi^*_{F,t},\ \pi^w_t,\ \pi^{w,*}_t\}_{t=1}^{\infty}$, policies $\{q^a_t(a_{t-1}, \varepsilon_t),\ q^c_t(a_{t-1}, \varepsilon_t),\ q^{a*}_t\left(a^*_{t-1}, \varepsilon^*_t\right),\ q^{c*}_t\left(a^*_{t-1}, \varepsilon^*_t\right)\}_{t=1}^{\infty}$, cross-sectional distributions $\{\Lambda_t(a_{t-1}, \varepsilon_t),\ \Lambda^*_t(a^*_{t-1}, \varepsilon^*_t)\}_{t=1}^{\infty}$, and aggregate quantities $\{C_t,\ C^*_t,\ C_{H,t},\ C^*_{H,t}, \widetilde{C}_{H,t},\ C_{F,t},\ C^*_{F,t}, \widetilde{C}_{F,t},\ C_{RoW,t},\ C^*_{RoW,t},\ Y_{H,t},\ Y^*_{F,t},\ N_t,\ N^*_t\ L_t,\ L^*_t,\ A_t,\ A^*_t,\ B_t,\ B^*_t,\ \widetilde{F}_t,\ \widetilde{F}^*_t,\ d_t,\ d^*_t,\ G_{H,t},\ G^*_{F,t},\ \psi_t,\ \psi^*_t\}_{t=1}^{\infty}$, such that: (i) Core and Periphery households and firms optimize their objective functions given prices and policy; (ii) Core and Periphery labor unions choose nominal wages optimally; (iii) Core and Periphery mutual funds maximize their expected real returns; (iv) Core and Periphery local labor and financial markets clear; (v) the world economy closes with a reduced form RoW; (vi) the laws of one price

hold; (vii) the world goods and financial markets clear; and (viii) the resource constraints and the national government budget constraints are satisfied. In Supplemental Appendix A.2 we present the Periphery decision problems and solutions. In Appendices A.3-A.4 and C, we present in detail the *Stationary Equilibrium*, the perfect foresight *Decentralized Equilibrium* and the computational algorithm.

3 Calibration and *Status Quo* stationary equilibrium

The section presents the calibration of the *Status Quo* economy in Section 3.1 and the numerical solution of the *Status Quo* stationary equilibrium in Section 3.2.

3.1 Calibration of the *Status Quo* economy

The time unit is one year. The model is calibrated for the EA, which consists of the Core and the Periphery. All variables of the Core are constructed as the GDP-weighted average of the respective variables of Austria, Germany and Netherlands. Similarly, all variables of the Periphery are constructed as the GDP-weighted average of the respective variables of Greece, Spain, Italy and Portugal.[11] We focus on sample averages over the period 2000-2019, however, in some cases the time span differs due to limited data availability.

First, we set the values of a subset of the structural parameters equal to their respective values in the data and/or following the related literature. Table 2 lists these parameters and the associated source. Second, the remaining fifteen parameters are jointly calibrated to meet fifteen targets, fourteen of which are selected key macroeconomic ratios and distributional statistics and one is normalization. To do this, we choose the vector of the fifteen structural parameters so as to minimize the distance between the model-generated variables and their corresponding targets. Table 3 lists these parameters and the associated data moment that we aim to target.

Households' preferences and income processes. The preference parameters are set to be equal across countries. Thus, we exclude any cross-country ex ante heterogeneity in preferences. This assumption will allow cross-country welfare comparisons across policy experiments. Specifically, the inverse of the elasticity of intertemporal substitution, $\sigma = \sigma^*$, is set equal to 1 (as in e.g., de Ferra *et al.*, 2020). The inverse of the Frisch labor elasticity, $\eta = \eta^*$, is set equal to 2 (as in e.g., Chetty *et al.*, 2011; and McKay *et al.*, 2016). We assume that households of the currency union have symmetric consumption

[11] The distinction between Core and Periphery is based on fiscal and external imbalances. Countries included in the Core have lower public debt-to-GDP ratios and net external debts, while those included in the Periphery have higher averages for both indicators. France and Belgium, however, do not clearly meet the criteria to be included in either group, with public debt-to-GDP ratios of 82% and 102%, and net external debt-to-GDP ratios of 34% and -52%, respectively. Given this ambiguity, we exclude them from both groups.

preferences. We also allow for home bias in their consumption towards the goods produced within the union, i.e., we set $\chi_H = \chi_H^*$=$\chi_F = \chi_F^* = 0.4$**.** The elasticity of substitution among the three traded goods, $\theta = \theta^*$, is set equal to 1.5 as in e.g., Feenstra *et al.* (2018). The relative weight of labor disutility, $\varphi = \varphi^*$, is calibrated so that Periphery's steady state output is normalized to unity. We also assume that the discount factors, β and β^*, and the wedges faced by borrowers, Δ and Δ^*, are equal between the Core and Periphery, and are internally calibrated (see below). While the fraction of per capita output, λ and λ^*, which determines the borrowing limit in each country is also internally calibrated (see Table 3).

Table 2: Exogenously Calibrated Parameters

	Description	Core	Periphery	Targets/Source
σ, σ^*	Intertemp. elast.	1	1	de Ferra *et al.* (2020)
η, η^*	Frisch elast.	2	2	Chetty *et al.* (2011)
χ_H, χ_F^*	Consumption shares	0.4	0.4	symmetric preferences
χ_F, χ_H^*	Consumption shares	0.4	0.4	symmetric preferences
θ, θ^*	Elast. of subst.	1.5	1.5	Feenstra *et al.* (2018)
ρ, ρ^*	Persistence labor income	0.871	0.871	McKay *et al.* (2016)
$\sigma_\varepsilon, \sigma_\varepsilon^*$	Standard dev. labor income	0.561	0.561	Vacas-Soriano (2018)
Z, Z^*	Aggregate labor prod.	1.41	1	GDP per hour worked
μ, μ^*	Price markup	1.1	1.1	10% Price markup
μ_w, μ_w^*	Wage markup	1.1	1.1	10% Price markup
κ, κ^*	Rotemberg Price adj.cost	0.1	0.1	Auclert *et al.* (2021a)
κ_w, κ_w^*	Rotemberg wage adj.cost	0.1	0.1	Auclert *et al.* (2021a)
$\bar{\pi}$	inflation target	0.02	0.02	ECB inflation target
$\tau^p, \tau^{p,*}$	Labor tax prog.	0.224	0.167	Holter *et al.* (2019)
$\tau^a, \tau^{a,*}$	Capital tax rate	0.25	0.33	Effective capital tax rate
$\frac{PB}{P_H Y_H}, \frac{P^* B^*}{P_F^* Y_F^*}$	Gov. debt ratio	0.67	1.45	Debt to GDP
ϖ, ϖ^*	Fiscal externality	0	0	No direct externality
$\tilde{\imath}, \tilde{\imath}^*$	Time-invariant comp. of RoW interest rate	0.0307	0.0307	Core-Periphery spread
ζ, ζ^*	Sovereign Risk elast.	0.0125	0.0125	Core-Periphery spread
$\tilde{\theta}_H, \tilde{\theta}_F^*$	Price elasticity of RoW demand	3	3	de Ferra et al (2020)

Regarding the income processes, we assume that the idiosyncratic productivities of the Core and the Periphery, ε_t and ε_t^*, respectively, follow an augmented Markov Chain. This Markov chain consists of an ordinary Markov chain following a discretized AR(1) process and is augmented by two additional states (see Section 2.1.2). We set the auto-

correlation coefficient of the AR(1) equal to $\rho = \rho^* = 0.871$; this value is consistent with the annualized persistence of McKay *et al.* (2016). We then calibrate the unconditional variance, σ_ε and σ^*_ε, to target wage inequality (the Gini coefficient) in 2015, as shown in Vacas-Soriano (2018, Table 1). The resulting weighted average of wage inequality for the Core and Periphery is symmetric and equal to 0.30. To discretise the AR(1) processes into seven-state, $m = 7$, Markov chains we use the Rouwenhorst (1995) method. To calibrate the eight transition probabilities, $p_{pp'}$, $p_{rr'}$, p_p, p_r and $p^*_{pp'}$, $p^*_{rr'}$, p^*_p, p^*_r in the transition matrices of each member state (e.g., for the Core see (2))[12] as well as the four parameters, λ and λ^*, $\beta = \beta^*$ and $\Delta = \Delta^*$, we match twelve targets in the data. Namely, we match distributional statistics in Core and Periphery such as bottom 40% wealth and income share, Gini income, top 10% and 1% wealth shares and macroeconomic ratios such as the net external debt to output ratios (see Table 3).

Firms production, markups and nominal rigidities. To calibrate the scale parameters Z and Z^*, which denote aggregate labor productivity in the Core and the Periphery, respectively, we use real GDP per hour worked for the two countries. These are constructed by dividing the Core and Periphery's real GDP by their respective total hours worked. We then divide the Core's real GDP per hour worked by the corresponding ratio of the Periphery. The average of this ratio is 1.41 over 2000-2019 period. Therefore, we set $Z = 1.41$ and normalize Z^* to unity. Additionally, we set the steady-state price markups, $\mu = \mu^*$, and wage markups, $\mu_w = \mu^*_w$, symmetrically in the Core and the Periphery equal to 1.1 as in Bayer *et al.* (2023). Parameters that govern price rigidity, $\kappa = \kappa^*$, and wage rigidity, $\kappa_w = \kappa^*_w$, are set equal to 0.1 as in Auclert *et al.* (2021a).

The degree of fiscal externality, sovereign premium and RoW parameters. Initially, we solve the model with the mechanism of the direct fiscal externality switched off, i.e., $\varpi = \varpi^* = 0$. Moreover, we assume that the value of parameters, ζ and ζ^*, that govern the elasticity of the sovereign risk premium with respect to the net foreign debt in each country and the time invariant components of the international interest rate, $\tilde{\imath}$ and $\tilde{\imath}^*$, are equal across member states. The latter assumption implies that cross-country disparity in borrowing costs from the RoW does not depend on inherent structural differences, but rather on their net external debt to output ratios. In addition, we assume that $\overline{nfd} = \overline{nfd}^* = 0$. To calibrate ζ, ζ^*, $\tilde{\imath}$, $\tilde{\imath}^*$ we use equations (12) and (13) and data on nominal interest rates and net foreign asset position over the period 2000-2019. For nominal interest rates, we employ the 10-year government bond yields (annualized), which are then scaled by the CPI to obtain real interest rates. Thus, conditional on $\bar{\pi} = 2\%$ and $\varpi = \varpi^* = 0$, we use the sample average real interest rates and net foreign debt to output ratios in the Core and Periphery to solve (12) and (13) for $\zeta = \zeta^*$ and $\tilde{\imath} = \tilde{\imath}^*$.

[12] This means that after the calibration (ex-post) the block matrices that differ across countries are, $\Gamma_{\varepsilon z}$, $\Gamma_{z\varepsilon'}$, and $\Gamma_{zz'}$.

In addition, the price elasticities of world demand, $\widetilde{\theta}_H$=$\widetilde{\theta}_F$, for union produced goods are symmetrically set across countries and equal to 3 as in de Ferra *et al.* (2020).[13]

Table 3: Endogenously Calibrated Parameters

	Description	Core	Periphery	Targets
β, β^*	Discount factor	0.948	0.948	Core's NFA to output ratio
Δ, Δ^*	Wedge	0.113	0.113	Periphery's NFA to output ratio
φ, φ^*	Disutility weight of labor	0.973	0.973	Normalization
λ, λ^*	Borrowing limit	0.308	0.263	Bottom 40% wealth share
$p_{pp'}, p^*_{pp'}$	Prob. staying in p	0.380	0.363	Bottom 40% income share
$p_{rr'}, p^*_{rr'}$	Prob. staying in r	0.757	0.982	Top 1% wealth share
p_p, p^*_p	Trans. prob. from m to p	0.076	0.131	Gini income
p_r, p^*_r	Trans.prob. from m to r	0.0014	0.0001	Top10% wealth share
$\overline{\tau}^l, \overline{\tau}^{l,*}$	Net labor tax rate level	0.216	0.225	$\frac{\text{Net labor income tax revenue}}{\text{total labor income}}$

Note: The first three parameters are set equal in both countries. For the calibration algorithm see Supplemental Appendix C.3.

Policy variables. Regarding the union-wide inflation target, we assume that the union monetary authority sets an annual inflation target, $\bar{\pi}$, equal to 2%. Regarding fiscal policy variables, capital tax rates are set equal to 2000-2019 data averages. Specifically, we proxy capital tax rate in each country with the effective tax rate on capital income computed as in Mendoza *et al.* (1994). The public debt to output ratios, b and b^*, are set equal to 67% for the Core and 145% for the Periphery. Given that public debt is a stock variable which reflects the history of past fiscal policies, we choose the values from 2020 as the starting point for our policy experiment. In addition, we calibrate the parameters that govern the tax and transfer schedule of households as follows. The parameters τ^p and $\tau^{p,*}$ that govern tax progressivity in the Core and Periphery, respectively, are set equal to 0.224 and 0.167, which implies a relatively higher level of tax progressivity in the Core compared to the Periphery. These values are computed as weighted averages using the country specific values reported in Holter *et al.* (2019). Given these tax progressivity parameters, the parameters, $\overline{\tau}^l$, and , $\overline{\tau}^{l,*}$, that govern the average level of taxation are internally calibrated. The data target that we aim to match is the 2000-2019 average of labor income tax revenues net of government transfers as a fraction of total labor income. The resulting model-based average net tax rates functions across the labor income

[13] As a robustness check, we have recalibrated alternative parameter values that govern home bias, the price elasticity of world demand, and nominal wage and price rigidity to examine the welfare implications of these changes. These results, presented in Supplemental Appendix E.1, show that our findings from the benchmark calibration are robust.

distribution are relatively higher in the Core with respect to the Periphery as in the data. Our calibration is also consistent with Huber *et al.* (2023), who estimate tax functions for individual Core (Germany) and Periphery (Italy and Spain) countries, while the transfers are also less progressive in the Periphery vis-à-vis the Core as in Bayer *et al.* (2024) (see Figure D1 in Supplemental Appendix D.1 which plots the model-based average net taxes). Finally, the steady-state ratios of government consumption to output, g_H and g_F^*, are adjusted residually to satisfy the national government budget constraint in the Core and Periphery (which yields 0.28 and 0.24, respectively).

3.2 *Status Quo* stationary equilibrium

Table 4: Macro and International Macro variables

Description	Variable	Model	Data
Panel A: Targeted variables			
Real rate in the Core	$\frac{1+i_H}{1+\pi}-1$	1.14%	1.14%
Real rate in the Per.	$\frac{1+i_F}{1+\pi}-1$	2.29%	2.29%
Sovereign spreads in the Per. (real)	$\frac{1+i_{RoW}}{1+\widetilde{\pi}}-\frac{1+i^*_{RoW}}{1+\widetilde{\pi}}$	1.15%	1.15%
Net foreign debt in the Core/GDP	nfd	0.07	0.07
Net foreign debt in the Per./GDP	nfd^*	0.70	0.70
Panel B: Non-Targeted			
Trade balance w.r.t RoW Core	$\frac{P_H\widetilde{C}_H-P_{RoW}C_{RoW}}{P_HY_H}$	0.021	0.02
Trade balance w.r.t RoW Per.	$\frac{P^*_F\widetilde{C}_F-P_{RoW}C^*_{RoW}}{P^*_FY^*_F}$	-0.004	-0.02
Core's total trade balance	$\frac{(P_HC^*_H-P_FC_F)+(P_H\widetilde{C}_H-P_{RoW}C_{RoW})}{P_HY_H}$	0.003	0.06
Periphery's total trade balance	$\frac{(P^*_FC_F-P^*_HC^*_H)+(P^*_F\widetilde{C}_F-P_{RoW}C^*_{RoW})}{P^*_FY^*_F}$	0.017	-0.01
Relative output ratio	$\frac{P_HY_H}{P_FY_F}$	1.20	1.25

Notes: Exports and imports from the World Bank's World Integrated Trade Solution are used to compute the trade balances of Core and Periphery w.r.t. the RoW. These trade balaces are calculated by subtracting the Core and Periphery's trade within the EA from their total trade. The data are converted from US dollars to Euros using annual spot exchange rates from FRED.

This section presents the numerical solution of the *Status Quo* stationary equilibrium. The results indicate that our model captures both qualitatively and quantitatively salient features of the macroeconomic narrative of EA, as shown in Table 4, as well as within country distributional statistics, as shown in Table 5. Our calibration targets the variables listed in Panels A of both tables. However, our model also performs relatively well beyond the variables targeted as illustrated in Panels B. In what follows, the *Status Quo* stationary equilibrium will serve as the point of departure in our policy experiments.

Regarding cross-country heterogeneity, Table 4 illustrates that the higher the public debt in a country, the higher the external debt to the RoW. This is coupled with the

Core trade surplus as opposed to the Periphery trade deficits with respect to the RoW. However, when comparing model-generated total trade balances with the corresponding data averages, a notable discrepancy emerges. Specifically, the model suggests that the highly indebted Periphery should run a relatively high total trade surplus compared to the Core in order for the balance of payments to be satisfied at the stationary equilibrium. Due to these fiscal and international macroeconomic imbalances that mimic the EA 2000-2019 period, the Periphery borrows at the international financial markets with a sovereign premium compared to the Core.

Table 5: Within country distributional variables

	Core		Periphery	
Description	Model	Data	Model	Data
Panel A: Targeted				
Wealth share of top 1%	23	23^c	15	15^c
Wealth share of top 10%	59	59^c	46	46^c
Wealth share of bottom 40%	0	0^c	5	5^c
Net income share of bottom 40%	22	22^b	19	19^b
Gini of net income	0.29	0.29^b	0.33	0.33^b
Panel B: Non-targeted				
Net income share of top 10%	22	23^b	24	25^b
% of IOUs borrowers	19	18^d	12	8^d
Gini wealth	0.78	0.74^a	0.64	0.60^a

Note: In this table we compare the model predictions with their data counterparts. Net income is defined as $y^n \equiv (\frac{R\left(a_{-1}, i^a_{-1}, \tau^a\right)}{1+\pi} - 1)a_{-1} + y^{nl}$ where $y^{nl} \equiv (1-\tau^l)\left(w\varepsilon l + \varepsilon d\right)^{1-\tau^p_t}$ is net labor income. Sources: [a]Cowell and Van Kerm (2015); [b]World Income Inequality Database (2010-2020); [c]OECD Stat (2009-2019); [d]Bayer *et al.* (2024), see their Table 1.

Regarding within-country heterogeneity, Table 5 illustrates that the model accurately matches most key wealth and income distribution statistics in both countries, meaning that the Core has higher wealth and lower income inequality than the Periphery. Supplemental Appendix A.5 discusses the long run relationship between public debt and wealth inequality in our model.

Since we study fiscal reforms, such as fiscal consolidation, a particular emphasis will be put on the lower end of the wealth distribution. The fit of our model with cross-sectional data implies that it is well-suited for examining the distributional implications of reforming the EA debt targets (see Table 5).

4 Policy experiment

This section outlines our policy experiment, i.e., fiscal reforms in the EA debt-output targets. The EA economy starts from the *Status Quo (SQ)* stationary equilibrium and travels towards alternative reformed economies. Below, we specify these reformed economies.

EA debt-output targets. The three reformed economies differ in the level of public debt-to-output targets that each EA country member should meet in the new reformed economy, denoted as $\overline{b}$ and $\overline{b}^*$ in the national fiscal rules for the Core and Periphery, respectively. Specifically, the three scenarios that we consider are as follows. First, we consider a fiscal scenario that mimics the Maastricht Treaty (MT). Thus, both countries should meet their formal debt targets, i.e., both countries should set $\overline{b} = \overline{b}^* = 60\%$. This scenario is referred to as *Fiscal Formality* (*FF*). Second, we study a fiscal reform in which EA public debt-to-output targets would be relaxed for highly indebted country to better reflect their current fiscal stance. Specifically, the Periphery sets $\overline{b}^* = 100\%$, while the Core sets $\overline{b} = 67\%$, meaning that the Periphery consolidates from 145% to 100%; while the Core just adopts a debt stabilization policy around its *SQ* public debt-to-output ratio. We refer to this scenario as *Fiscal Realism* (*FR*). Third, both countries set a common debt target of $\overline{b} = \overline{b}^* = 100\%$, which implies that the Core expands while the Periphery consolidates. We refer to this scenario as *Fiscal Accommodation* (*FA*). Steady state solutions for the three reformed economies are presented in Section 5.1.

We also explore optimized public debt targets. By 'optimized', we mean that a hypothetical supranational EA fiscal policymaker maximizes a joint welfare criterion for the Core and Periphery in order to set the EA-wide public debt target. We operationalize this process by searching over a grid of public debt-to-output ratios subject to specific restrictions. This policy experiment is detailed in Section 5.4.

Fiscal and monetary policy rules. Policy is implemented via simple rules. Along the transition from the *SQ* economy to each of the reformed economies, the union-wide monetary policy follows the Taylor rule given by (11), while the national fiscal policymakers set their fiscal instruments according to fiscal rules, e.g., see equation (9) for the Core. The EA monetary policymaker sets the relative weight, ς, given to Core's vis-à-vis Periphery inflation equal to 0.5, the feedback policy coefficient on inflation over its target, ϕ_π, equal to 1.5 and the inflation target equal to 2% across all fiscal scenarios. Since the Periphery's government consolidates to meet all three fiscal scenarios, we calibrate the fiscal policy feedback coefficient, γ_l^*, to match a specific half-life of 15 years, which is in line with the reform of the SGP in 2011. The Core's government consolidates only under the *FF*, thus we only calibrate, γ_l, to match a half-life of 15 years under the *FF*, then we keep this calibrated value for the remaining experiments, i.e. *FR* and the *FA*, where the Core's government either stabilizes its public debt or expands, respectively. Unless other-

wise stated, national fiscal policy employs labor taxes to react to public debt deviations from their target, while government consumption to output ratio and taxes on capital are held constant and equal to their SQ value.

We compute the transition path from the SQ to each of the reformed economies implementing the first-order perturbation method in the sequence space developed by Auclert *et al.* (2021a) (see Supplemental Appendix C for details).

5 Results

This section presents the results of our policy experiment. We start by presenting the numerical solutions of each stationary reformed economy in Section 5.1. Then, in Section 5.2, we present transitional dynamics from the SQ economy towards the reformed economies. Section 5.3 examines the role of the cross-country fiscal externality, while Section 5.4 explores EA 'optimized' debt targets.

5.1 Reformed stationary economies

This section presents the steady state solutions of the reformed economies defined in Section 4. Specifically, columns [2]-[4] of Table 6 present reformed economies *FF*, *FR*, and *FA*, respectively, while the SQ economy is presented in column [1] for comparison. We report a measure of welfare and a selection of key macroeconomic endogenous variables in Panel A and indicators of within-country wealth inequality in Panel B.

As a measure of welfare, we compute the average consumption equivalent variation (CEV) for each country. The average means that each household is given an equal weight. The CEV measures the percentage change in SQ consumption that should be given to the average household so as to be indifferent between the SQ and each of the reformed steady state economies. Thus, a positive (negative) CEV indicates welfare gains (losses) for each country (see Supplemental Appendix B for details). A reform such as fiscal consolidation enhances the average welfare in both countries (see Panel A) and simultaneously increases wealth inequality (see Panel B). To see this, compare the *FF* reformed economy in column [2] with the SQ in column [1].

In the long run, fiscal consolidation policy implies a policy trade-off. On the one hand, it reduces net external debt, which subsequently lowers sovereign premia and interest rates. Thus, lower public debt, coupled with lower borrowing costs, leads to lower labor taxes, resulting in higher consumption and, eventually, welfare (level effect). On the other hand, public debt provides an additional tool for consumption smoothing (as in Aiyagari and McGrattan, 1998) and, hence, in reformed economies with lower debt households are more exposed to risk, which is welfare deteriorating. Similar to Röhrs and Winter (2017),

in the long run, the level effect dominates, and the average CEV increases. However, the analysis here ignores the transition toward each reformed economy (we postpone this discussion until section 5.2.3).

Table 6: Macroeconomic aggregates in the reformed stationary equilibrium economies

	[1] *Status Quo*	[2] *Fiscal Formality*	[3] *Fiscal Realism*	[4] *Fiscal Accomodation*
Panel A: Macroeconomic variables				
$\overline{\tau}^l$	0.216	0.215	0.216	0.224
$\overline{\tau}^{l,*}$	0.225	0.200	0.208	0.209
nfd	0.07	0.008	0.070	0.353
nfd^*	0.70	-0.024	0.328	0.328
$\frac{1+i^*_{RoW}}{1+\widetilde{\pi}} - \frac{1+i_{RoW}}{1+\widetilde{\pi}}$	1.15%	-0.04%	0.39%	-0.04%
$\frac{PC}{P_H Y_H}$	0.72	0.72	0.72	0.71
$\frac{P^*C^*}{P_F Y_F}$	0.74	0.76	0.75	0.75
average CEV Core (%)	0	0.31	0.15	-0.42
average CEV Peri. (%)	0	1.96	1.35	1.24
Panel B: Distributional variables				
% of IOUs borrowers Core	18.9	19.2	18.9	17.4
% of IOUs borrowers Per.	12.1	14.7	13.6	13.6
Bottom 40% Core	0	-0.1	0	0.6
Bottom 40% Per.	5	3.4	4.1	4.1
Gini wealth Core	0.775	0.778	0.775	0.761
Gini wealth Per.	0.643	0.662	0.654	0.654

Notes: The average CEV measures the percentage change in *Status Quo* consumption that should be given to the average household so as to be indifferent between the Status Quo and each of the reformed steady state economies. A positive (negative) average CEV indicates welfare gains (losses) for each country (see Supplemental Appendix B for details).

The long run rise in wealth inequality works via the *interest rate channel* and asset accumulation. Fiscal consolidation leads to a lower interest rate which induces households to save less.[14] Additionally, the decrease in the interest rate shrinks the non-risky part

[14]While public debt is costly due to the associated sovereign premium, it also serves as an insurance instrument against idiosyncratic shocks (see e.g., Aiyagari and McGrattan (1998)). Our model does not incorporate a portfolio choice between risky and safe assets as in e.g., Angeletos (2007), nor sovereign "default risk", as in e.g., Roldán (2024). The latter incorporates sovereign default risk in a small open economy model with heterogeneous households and provides theoretical and some empirical evidence that when sovereign default becomes more likely, households increase their precautionary savings. In our model, we capture this in a reduced form way by modeling sovereign premia like Schmitt-Grohè and Uribe (2003). Incorporating such features may potentially alter the relationship between households' saving and the interest rate. This is further discussed in the conclusions.

relative to the risky part of total resources. Both of these changes contribute to an increase in the variability of total resources (i.e., the households are more exposed to risk) and, consequently, the variability of the choice for the next period's assets.[15] Thus, in our model, we expect wealth inequality to increase when the interest rate decreases. Similar results have been found concerning interest rates and wealth inequality in a Bewley-Huggett-Aiyagari framework see e.g., Viegas and Ribeiro (2016), Angelopoulos *et al.* (2020), Greenwald *et al.* (2021), and Bayer *et al.* (2023).

Reforming EA debt targets, say from the *FF* to *FR,* would reduce the long run welfare benefit in CEV terms but at the same time would also mitigate the rise in wealth inequality (compare column [3] with column [2]). Going beyond *FR*, by adopting *FA*, would result in welfare losses for the Core and lower wealth inequality. Such a reform would reduce average welfare in the Periphery while leaving wealth inequality unaffected.

5.2 Transitional dynamics

In what follows, we study transitional dynamics where the economy starts from the *SQ* stationary equilibrium computed in Section 3.2 and travels towards one of the reformed economies of Section 5.1. Policy targets and feedback policy coefficients in the transition are those that have been specified in Section 4. In each section, we start by analysing the main mechanisms at work of the *FF* scenario because this scenario mimics the current EA institutions. We then examine the cross-country and within-country implications of reforming EA debt targets.

5.2.1 Macroeconomic aggregates

We begin by analyzing the dynamic path of the key endogenous macroeconomic variables under each fiscal reform developed in Section 4. Figure 2 presents relative prices and interest rates, while Figure 3 depicts key macroeconomic and international macroeconomic aggregates for the Core (Panel A) and Periphery (Panel B). The three fiscal scenarios, *FF*, *FR*, and *FA*, are illustrated by grey solid, blue dashed, and red dotted lines, respectively.

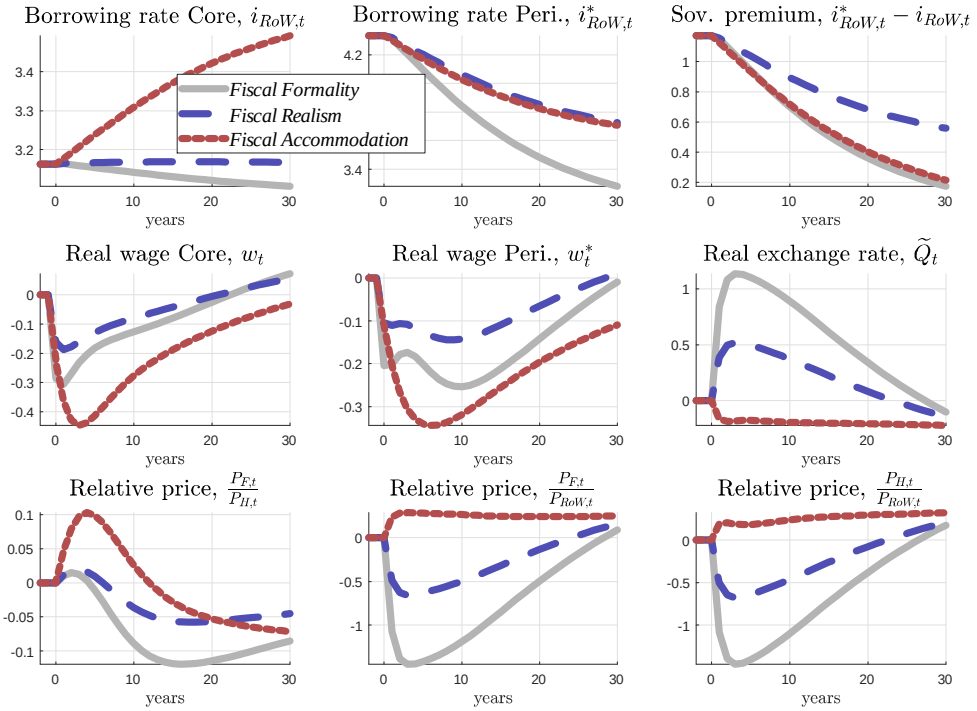
There are two main channels through which the respective fiscal reforms would affect our world economy during the transition. The *fiscal policy channel* which works through the labor tax and its impact on domestic demand in each member state and the *expenditure-switching channel* which works via international relative prices.[16]

[15] In Supplemental Appendix A.5 we provide the intuition of this result and in general we show the role of debt asymmetry in explaining cross and within-country wealth inequality.

[16] There are also other channels, such as the interest rate channel and its impact on intertemporal substitution which play an important role in the dynamics of wealth distribution (see next section). At the household level, there is the precautionary motive channel which works through income risk (e.g., the insurance effect of higher tax) and the borrowing limit (e.g., tighter borrowing limits would increase the motive to save). However, these seem less important quantitatively for the dynamic path

Under the *FF* scenario, the *fiscal policy channel*, i.e., higher taxes, dominates in the short to medium run. Higher labor taxes induce a reduction in net labor income and a subsequent downturn in domestic demand in each country. The fiscal policy channel is more pronounced in the Periphery compared to the Core. As illustrated in Panel B of Figure 3, the Periphery undertakes a sizeable fiscal consolidation to bring public debt, b_t^*, down to 60%. To achieve this, the Periphery's fiscal policymaker should sharply increase labor tax, $\tau_t^{l,*}$. As a result, the net external debt of the Periphery, nfd_t^*, shrinks, which eventually leads to a reduction in the sovereign premium and, hence, in the international nominal rate at which the Periphery borrows from the RoW, $i_{RoW,t}^*$ (see Figure 2).

Figure 2: Interest rates and relative prices



Notes: Evolution of interest rates and relative prices under each fiscal reform developed in Section 4. 1st row is in levels, while 2nd-3rd rows are in log-deviations from *Status Quo* steady state.

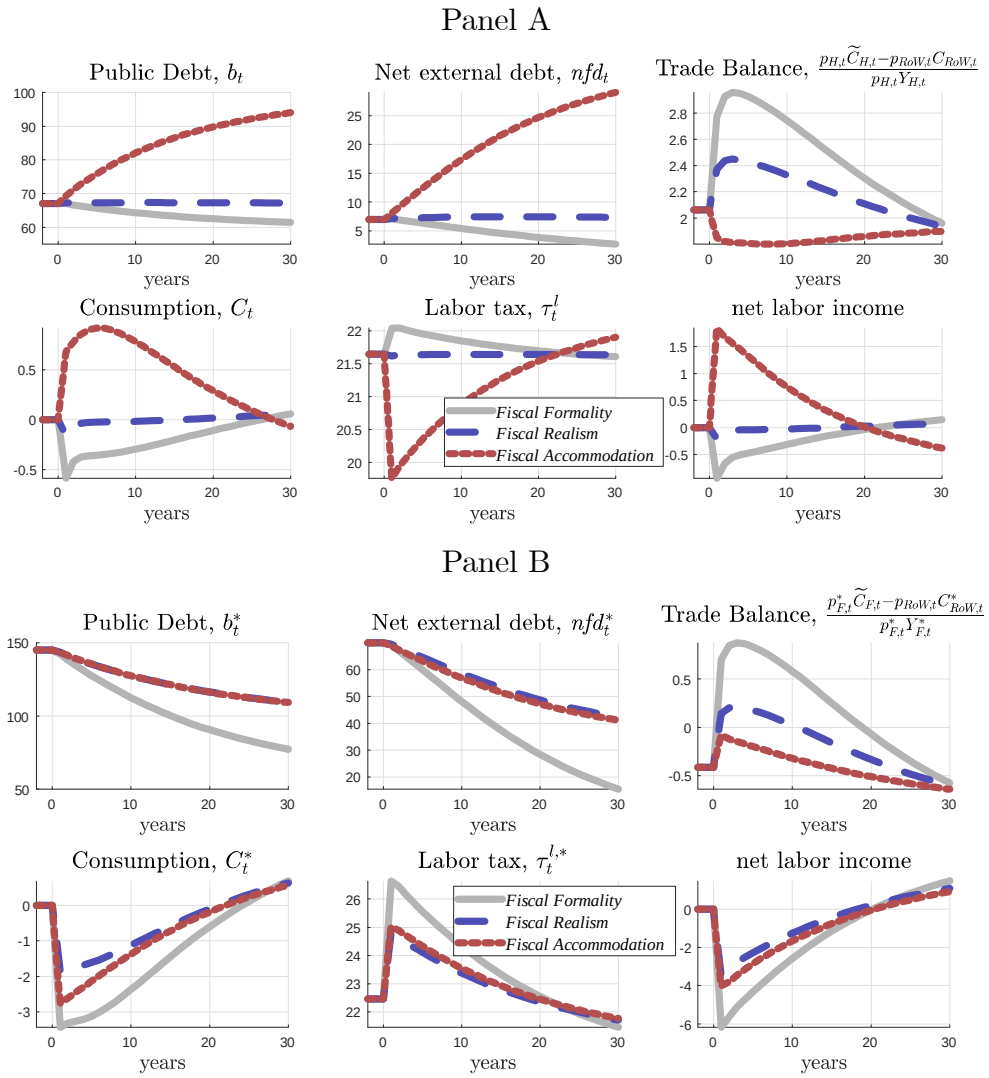
On the other hand, the reduction in interest rates, $i_{RoW,t}$ and $i_{RoW,t}^*$, leads to real (and nominal) depreciation of the union currency vis-à-vis the RoW, i.e., a rise in the real exchange rate, $\widetilde{Q}_t$ (from the optimality condition of the mutual fund, see equation (6)). This depreciation enhances the union's international competitiveness and helps mitigate the negative impact of fiscal consolidation policy, as trade balances are improving relative to the RoW. Additionally, this channel is further reinforced by the decline in domestic demand, which causes a reduction in real wages, i.e., the marginal cost of production, in both the Core and the Periphery. Consequently, union goods become less expensive com-

of macroeconomic aggregates in our experiments. For the role of intertemporal substitution effects in HANK, see Kaplan (2018).

pared to RoW goods, i.e., $\frac{P_{H,t}}{P_{RoW,t}}$ and $\frac{P_{F,t}}{P_{RoW,t}}$ decrease. These movements in international relative prices trigger an *expenditure-switching* towards the relatively less expensive union goods.

Reforming EA debt targets, say from *FF* (grey solid) to *FR* (blue dashed), softens the negative impact of the *fiscal policy* channel but comes at the cost of mitigating the positive effects of the *expenditure-switching* channel. Such a reform implies that the Periphery needs to undertake a smaller fiscal adjustment, resulting in a smaller increase in labor tax (see Figure 3, Panel B). The smaller public debt reduction leads to a smaller reduction in net external debt, nominal interest rate, and sovereign premium. Thus, the decline in consumption and aggregate net labor income would be less severe, and the recovery would be swifter.

Figure 3: Macroeconomic Aggregates



Notes: Evolution of aggregate quantities under each fiscal reform developed in Section 4 for the Core (Panel A) and Periphery (Panel B).

On the other hand, the smaller reduction in the international interest rate causes a relatively milder real depreciation (and a decline in the relative prices), which makes the *expenditure-switching* towards the union's goods smaller than the *FF* scenario. However, the latter is quantitatively smaller than the improvement due to the softening of the fiscal policy channel, which makes the resulting macroeconomic outcomes under the *FR* scenario relatively better compared to *FF* (especially for the Periphery).

Going beyond the *FR* (blue dashed) scenario by allowing the Core to expand while the Periphery consolidates, i.e., implementing *FA* (red dotted), improves the Core's macroeconomic outcomes but worsens those of the Periphery (compare the red dotted with the blue dashed lines). Core's fiscal expansion occurs via labor tax cuts, resulting in a short to medium run increase in aggregate net labor income. This increase benefits Core's households by boosting their consumption. The rise in Core's consumption tends to drive up the Periphery's output, *ceteris paribus*, as a portion of the increased net labor income is spent on imported goods from the Periphery.

However, in equilibrium, the reversal of the *expenditure-switching* effect dominates.[17] This reversal arises from the combination of Core's labor tax cut and the respective labor tax hike in the Periphery. These combined fiscal policy changes reduce the marginal cost of production of Core goods relative to Periphery goods (as reflected in the relative price, $\frac{P_{F,t}}{P_{H,t}}$). Additionally, the increase in Core's interest rate leads to a real appreciation (see $\widetilde{Q}_t$), which further erodes Periphery's international competitiveness while making union goods relatively more expensive compared to the RoW. Thus, any positive effects on the Periphery from Core's expansion are counteracted by the fall in Periphery's international competitiveness.[18]

5.2.2 Wealth distribution

These macroeconomic outcomes have significant implications for within-country wealth distribution. Figure 4 presents the evolution of selected wealth distribution statistics under each fiscal scenario. We begin with a statistic that captures changes in the overall wealth distribution, namely, the Gini coefficient on wealth. However, the Gini coefficient cannot fully capture shifts in the lower end of the wealth distribution, which might be

[17] In Supplemental Appendix D.2, we use the goods market clearing condition to show that an increase in relative prices tends to reduce Periphery's output, *ceteris paribus*. Furthermore, the main difference between the *FA* scenario and *FR*/*FF* is that the expenditure-switching effect operates in the opposite direction. Specifically, the rise in Periphery's relative prices, driven by the combined fiscal policy changes, leads to a decline in the Periphery's output, see Figure D3.

[18] In the robustness check in Supplemental Appendix E.1, we reduced the price elasticity parameters of world demand, $\widetilde{\theta}_F$ and $\widetilde{\theta}_H$, to 1.5, which implies a smaller expenditure switch compared to the benchmark calibration in Section 3. This adjustment reduces the negative spillover from Core expansion under *FA* and diminishes the positive welfare implications induced by consolidation under *FF*.

particularly relevant to the fiscal reforms under consideration.[19] To address this, we also focus on the lower end of the wealth distribution by plotting the wealth share of the poorest 20% of the population (labeled as the Bottom 20%) and the population share of borrowers. Panels A and B correspond to Core and Periphery, respectively.

The Gini coefficient on wealth clearly shows that fiscal consolidation induces an overall increase in wealth inequality in the short to medium run. Moreover, the larger the fiscal adjustment, the more pronounced the rise in wealth inequality over time. Indicatively, the most significant increase in wealth inequality occurs for the Periphery under the *FF* scenario (see first row, Panel B, grey solid line). As the Core undertakes a much smaller fiscal adjustment under the *FF*, it experiences a relatively smaller increase in wealth inequality (see first row, Panel A, grey solid line).

Moreover, fiscal consolidation thickens the lower tail of the wealth distribution by increasing the population share of the poorest households and/or decreasing their net wealth. This effect is captured by the two metrics presented in the second and third columns of Figure 4. Firstly, the wealth share of the bottom 20%, primarily consisting of borrowers (thus reflecting a negative share), is declining. This decline shows an increase in the indebtedness of the bottom 20% in IOUs. Secondly, the population share of the poorest households in terms of wealth rises. In our model, these households are the net borrowers (i.e., households with negative net wealth, a_t, $a_t^* < 0$). The most severe shift takes place in the Periphery under the *FF*, where the increase in the population share of borrowers is as high as 2% after the first 10 years of the *FF* implementation.[20]

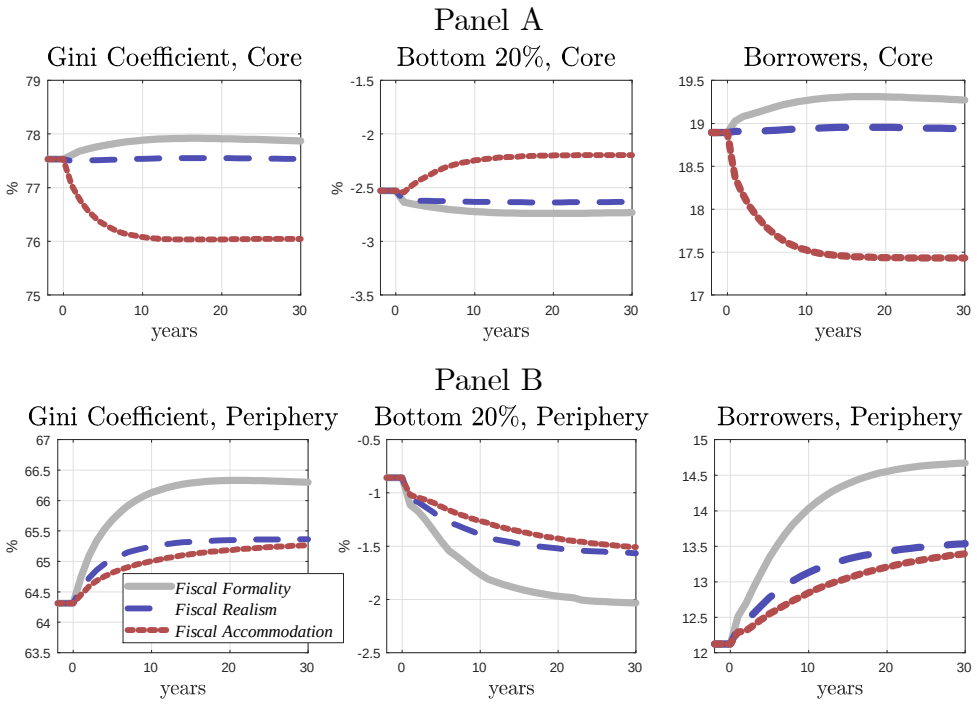
The impact of the debt target reforms on wealth distribution dynamics depends directly on how they affect the households' total resources. Wealth-poor households rely more heavily on labor income than asset income compared to relatively wealth-rich households. To give a sense of the magnitudes, households in the bottom 20% of the *SQ* equilibrium rely exclusively on labor income while holding negative net wealth, meaning they are in debt through IOUs. Specifically, on average, they owe 3.4% and 8.2% of their total resources in IOUs in the Periphery and Core, respectively. Therefore, relatively wealth-poor households are severely affected by the *fiscal policy* and *interest rate* channels in the short to medium run. Under the *FF* scenario, the significant rise in the labor tax (see Figure 3) leads to a substantial reduction in net labor income, indicating either an increase in the labor tax and/or a decrease in transfers. This reduction in net labor income diminishes their ability to accumulate wealth and pushes more households toward the bottom of

[19] Moreover, the Gini coefficient on wealth is more sensitive to changes at the top of the distribution, which, in our case, is less affected by our policy experiment. This is due to the incorporation of a high-productive state, where behavior is primarily driven by the exogenous income process.

[20] To understand the magnitude of the increase in the population share of net borrowers, a 2p.p. rise in Italy, Spain, Greece, and Portugal corresponds to approximately 1.2 million, 0.9 million, 0.2 million, and 0.2 million people, respectively.

the wealth distribution. The latter is also compounded by the decrease in interest rates resulting from fiscal consolidation and the subsequent reduction in sovereign premiums, reinforcing the deaccumulation of wealth from wealth-poor households (see discussion in Section 5.1).[21]

Figure 4: Wealth inequality measures along the transition path



Notes: Evolution of wealth inequality measures under each fiscal reform developed in Section 4 for the Core (Panel A) and Periphery (Panel B).

A reform of EA debt targets, say from *FF* to *FR*, would mitigate both *fiscal* policy and *interest rate* channels. This reform would enable wealth-poor households to maintain a higher level of labor income under *FR* due to a smaller tax hike compared to the level under *FF*. Additionally, the *FR* reform implies a smaller reduction in interest rates than *FF*. These effects would allow wealth-poor households to sustain a relatively higher level of wealth and thus mitigate the rise in wealth inequality, especially for the Periphery.

However, going beyond the *FR* to allow the Core to expand via labor tax cuts, as in the *FA* scenario, does not clearly decrease wealth inequality in the Periphery (compare red dotted with blue dashed lines in Panel B). This is primarily due to the deterioration in the international competitiveness of the Periphery relative to the Core, which dampens the Periphery's domestic demand and eventually reduces aggregate net labor income compared to *FR* (as explained in Section 5.2.1). Nevertheless, the *FA* scenario significantly

[21] For households that start as borrowers in the *Status Quo* stationary equilibrium, the interest rate decline would positively impact their total resources as they would pay lower interest payments. However, this change is small compared to the rise in labor tax, which eventually dominates.

decreases all inequality indicators for the Core (compare red dotted with blue dashed lines in Panel A).

5.2.3 Welfare

In this section, we use welfare to rank the alternative EA public debt targets of Section 4. Our model, which features cross- and within-country heterogeneity, enables us to evaluate such reforms across and within countries. To evaluate welfare, we use the consumption equivalent variation (CEV) conditional on the relative position of each household in the initial wealth distribution, i.e., the wealth distribution in the *SQ* stationary equilibrium. Following, e.g., Domeij and Heathcote (2004) and Kitao (2008), the CEV for each household is defined as the percentage change in consumption required to be given to a household, such that the household is indifferent between remaining in the *SQ* economy as opposed to the economy that follows the dynamic transition under each fiscal consolidation reform (for a formal definition see Supplemental Appendix B.3). Thus, the difference with Section 5.1 is that we take into account the transition towards reformed economies, as well as the dispersion of welfare gains and losses across the wealth distribution.

Figure 5 plots the CEV in percentage points (y-axis) of a household conditional on its asset holdings in the *SQ* equilibrium (x-axis). The grey, blue, and red solid lines correspond to the CEV functions under the *FF*, *FR,* and *FA* scenarios, respectively, for the Core (left panel) and the Periphery (right panel) households. Finally, to understand each country's *SQ* wealth distribution, we introduce the blue dashed and dotted vertical lines, which mark the 10th, 50th, and 90th percentiles, respectively.[22]

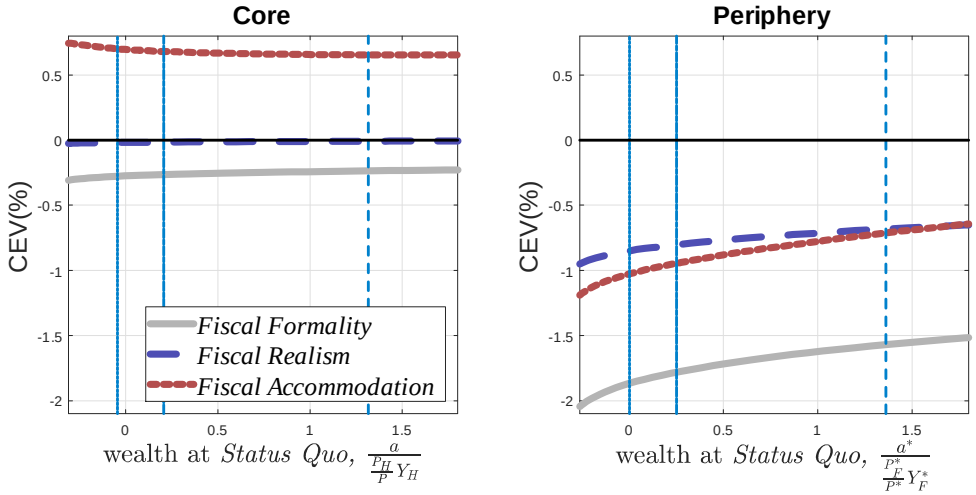
Figure 5 yields several interesting results. First, fiscal consolidation policy that targets debt-output ratios implied by the *FF* scenario is quite costly in terms of welfare across and within countries. Second, all three fiscal scenarios are less harmful (or beneficial) in the Core than the Periphery for any level of wealth a household holds at the *SQ* equilibrium. Third, a revision of EA debt targets, say from *FF* to *FR* and/or *FA*, can mitigate welfare losses at any level of wealth in both countries. In other words, revising EA debt targets closer to their recent historical levels can make fiscal consolidation more affordable across and within countries. Since the *FF* scenario mimics the actual public debt-output targets that national fiscal policymakers should meet to comply with the current EA treaties, the findings of Figure 5 provide a rationale for reforming EA debt targets.

Regarding the welfare ranking of EA debt targets in Section 4, Figure 5 implies a clear-cut welfare ranking for the Core. *FA* ranks higher than *FR* in terms of welfare at any level of wealth, while the *FF* scenario is the worst, i.e., it generates higher welfare losses for any level of wealth. In the Periphery, although both *FR* and *FA* scenarios are

[22] These percentiles are based on the *Status Quo* wealth distributions plotted in Figure D7 in Supplemental Appendix D.3.

strictly better (or less harmful) than the *FF* scenario, the welfare ranking of *FR* and *FA* for a particular household depends on its initial wealth. For most households, i.e., those holding assets below the 93.7% wealth percentile in the *SQ* equilibrium, the *FR* scenario outperforms the *FA*, while only for the remaining 6.3% wealth percentile *FA* is preferable to *FR*.

Figure 5: Conditional CEVs



Notes: The CEV is defined as the percentage change in consumption required to be given to a household with an initial level of wealth, $\frac{a}{\frac{P_H}{P}Y_H}$ or $\frac{a^*}{\frac{P_F^*}{P^*}Y_F^*}$, such that it is indifferent between remaining in the *Status Quo* economy as opposed to the economy that follows the dynamic transition under each fiscal consolidation reforms (see Supplemental Appendix B for details). A positive (negative) CEV indicates welfare gains (losses) for each country. The blue dashed and dotted vertical lines mark the 10th, 50th, and 90th percentiles of the respective wealth distributions.

This result aligns with the findings in Section 5.2.1, which show that going beyond the *FR* does not necessarily benefit the households in the Periphery. Moreover, going beyond the *FR* by allowing the Core to expand while the Periphery consolidates will generate a conflict of interest between all households in the Core, the wealth-rich in the Periphery, and the majority of households in the Periphery. The macroeconomic narrative developed in Section 5.2.1 suggests that this effect comes primarily from the deterioration of the Periphery's vis-à-vis the Core's international competitiveness, which worsens the macroeconomic outcomes of the Periphery (see, e.g., net aggregate labor income).[23]

5.3 The role of fiscal externality in the monetary union

So far we have presented results for the case of a currency union without the direct fiscal externality of Section 2.7.2, i.e., $\varpi = \varpi^* = 0$. In this section, we relax this assumption

[23] In Supplemental Appendix D.4, we also analyze the CEV against initial wealth across various percentiles of the income distribution. These findings are consistent with those presented in Figure 5.

and we examine how the presence of a fiscal externality might alter our main results. To do this, we switch on the degree of fiscal externality, $\varpi = \varpi^* > 0$ and we only present results for the symmetric case, i.e., $\varpi = \varpi^*$; thus, for notational convenience we drop ϖ^*. To keep our results comparable with the above analysis, the rest of the calibration remains as in Section 3.1. For each economy, we only recalibrate the parameters, $\zeta = \zeta^*$, and $\tilde{\imath} = \tilde{\imath}^*$, to be consistent with data on interest rates using equations (12) and (13). This calibration choice makes the *SQ* equilibria observationally equivalent across different values of ϖ.

Even though *SQ* stationary equilibria are identical, when $\varpi > 0$, the mechanism that generates the country-specific sovereign spread differs. The sovereign spreads are now increasing functions of the weighted average of the net external debt of the entire monetary union. In particular, the higher the ϖ, the larger the feedback of net external debt from the other member state, meaning that Periphery's fiscal consolidation would directly reduce the international borrowing cost of the Core.

We repeat the same policy experiments presented in Section 4 by setting $\varpi = \{0.1, 0.2\}$.[24] We find that our key results of Section 5.2.3 do not change; to save space, we include the analogous figures to Figure 5 in Supplemental Appendix E.1. Here, we focus on how a national fiscal policy reform, such as fiscal consolidation in the Periphery, would have different cross- and within-country impact depending on the degree of fiscal externality, ϖ.

5.3.1 Fiscal Realism under various degrees of fiscal externality

We focus on the *FR,* one of the fiscal scenarios of Section 4. The *FR* is particularly well-suited to isolate the effect of the direct fiscal externality in a monetary union with cross-country heterogeneity. Recall that under *FR,* the Periphery's national government consolidates its public debt, while Core's national government stabilizes its public debt around its *SQ* level. Figure 6 plots the households' CEV in percentage points (y-axis) conditional on their wealth in the *SQ* equilibrium (x-axis). Each blue line corresponds to the resulting CEV function under different values of ϖ. The blue dashed, circled, and crossed lines correspond to ϖ equal to 0, 0.1, and 0.2, respectively.

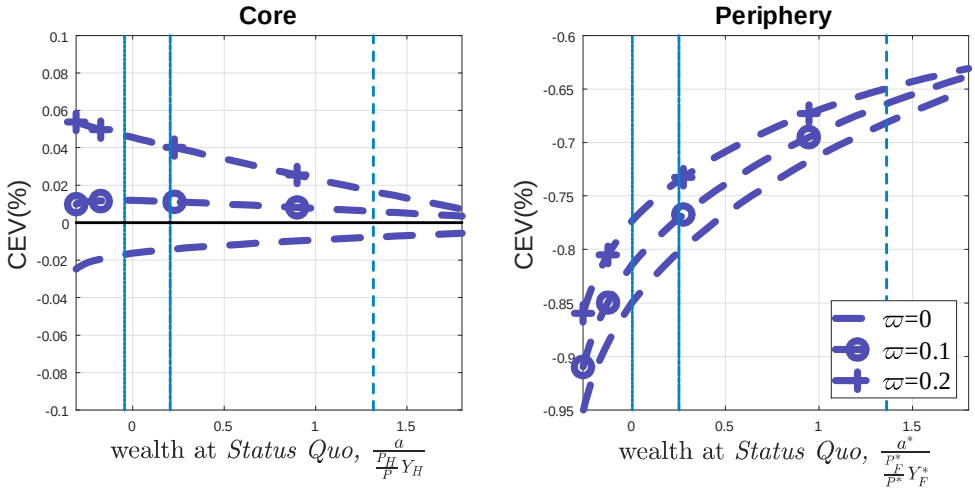
A comparison of the *FR* scenario across monetary unions with different ϖ yields some interesting findings. Firstly, in monetary unions with fiscal externalities ($\varpi > 0$), households in low-indebted countries (Core) would benefit more from a fiscal consolidation reform in high-indebted countries (Periphery), compared to monetary unions where a direct fiscal externality does not exist ($\varpi = 0$). Households in high-indebted countries would also benefit due to lower borrowing costs. Secondly, as the degree of fiscal exter-

[24] Indicatively, a value of $\varpi \in (0, 0.2)$ would imply that Core's sovereign spreads could increase from 0 to 42 basis points when Periphery's net external debt rises by 1%, *ceteris paribus.*

nality increases, these benefits would be distributed proportionally more to wealth-poor households. These can be observed by the CEV functions of Figure 6.[25]

For the Core (left panel), the CEV function for $\varpi > 0$ turns to positive for almost any level of net wealth compared to the associated CEV function for $\varpi = 0$, which is negative. Moreover, the fiscal externality changes the slope of Core's CEV function. Specifically, when $\varpi > 0$, the CEV is downward sloping with respect to net wealth as opposed to the case of $\varpi = 0$, where it is upward sloping. A downward sloping CEV implies that fiscal consolidation in the Periphery benefits (or harms) relatively more (or less) the poor-wealth households compared to the rich-wealth in the Core. The stronger the externality, i.e., the larger the value of ϖ, the more pronounced the difference in CEV terms between poor- and rich-wealth households in the Core. The slope of the Core's CEV becomes steeper for higher values of ϖ (compare the circled with the crossed lines).

Figure 6: *Fiscal Realism* under various degrees of fiscal externality



Notes: See notes of Figure 5.

The above effect works mainly through the interest rate channel. When $\varpi > 0$, fiscal consolidation in the Periphery directly induces a reduction in the interest rate of the Core. This decreases the borrowing costs for Core households with negative net wealth, allowing the relatively poor-wealth households to increase their consumption levels. At the same time, lower interest rates would imply a lower labor tax to sustain the same level of public debt. Both effects would benefit the relatively poor-wealth households. In turn, this increase in consumption seems to generate an amplifying effect on Core's domestic demand. These effects push upwards the CEV function for any level of net wealth.

Turning to the Periphery on the right panel of Figure 6, we find that the degree of the externality also has significant quantitative effects. The upward shift in the CEV functions suggests that the fiscal externality alleviates the burden of fiscal consolidation for the

[25] Discussions on the *FF* and *FA* scenarios are provided in Supplemental Appendix D.5.

Periphery households. The improvement in terms of CEV is larger as we move towards the lower end of the wealth distribution (on the left of the x-axis). This improvement can be attributed both to the interest rate channel and cross-country spillovers from Core's increased domestic demand. The findings of Figure 6 may explain why national fiscal policymakers in the Core advocate for fiscal consolidation in the Periphery. Moreover, the perceived degree of fiscal externality by each national fiscal authority seems to increase the desirability of fiscal consolidation.

5.4 'Optimized' EA debt targets

So far, we have focused on EA reforms of debt targets motivated by proposals that have been widely discussed within EA public discourse (for a recent overview of EU fiscal rules, see Francová *et al.*, 2021). However, our model enables us to compute 'optimized' debt targets, i.e., public debt targets that maximize a welfare criterion. Below, we specify the welfare criterion and the problem faced by a hypothetical EA fiscal policymaker.

5.4.1 EA welfare criterion

We assume a hypothetical EA fiscal policymaker whose aim is to maximize a weighted average of country-specific welfare criteria given by,

$$V_0^{EA} = \varsigma V_0 + (1-\varsigma)\, V_0^* \tag{17}$$

where V_0 and V_0^* are the utilitarian social welfare functions of the Core and Periphery, respectively. These functions denote the cross-sectional averages of lifetime utility for an economy that starts at the SQ and transits towards a reformed economy (see more details in SupplementalAppendix B). We set $\varsigma = 0.5$.

In our experiment, the optimized debt target means essentially that we search for the EA debt target that maximizes V_0^{EA}, when policy is assumed to follow simple feedback rules. Specifically, the EA monetary policymaker sets monetary policy feedback coefficient and inflation target, i.e., ϕ_π and $\overline{\pi}$, respectively. While EA fiscal policymakers set fiscal policy coefficients, γ_l and γ_l^*, and public debt targets, $\overline{b}$ and $\overline{b}^*$.

However, searching for the optimized value of V_0^{EA} across all possible sets of policy parameters and targets will be computationally cumbersome. To reduce the dimensionality of this optimization problem, we assume that the hypothetical EA fiscal policymaker chooses only a common public debt target for both countries, denoted as $\overline{b}^{EA} = \overline{b} = \overline{b}^*$, conditional on the remaining policy parameters and targets. For comparability with the other fiscal scenarios, we work as in Section 4. That is, for each value of $\overline{b}^{EA}$, we calibrate γ_l^* so that the half-life of consolidation in the Periphery is equal to 15 years. Moreover,

we set the values of ϕ_π, $\overline{\pi}$ and γ_l as in Section 4. This simplifies the recalibration of γ_l^* and makes our results comparable with those of Section 5.2.3. This implies that we search for the value of $\overline{b}^{EA}$ which maximizes V_0^{EA} conditional on the EA common monetary policy and national fiscal policy reaction to public debt deviations from the common optimized debt target.[26] We restrict the search of $\overline{b}^{EA}$ within the range of 60% to 145%. Since the EA economy starts from the *SQ*, where the initial public debt-to-output ratios are 67% for the Core and 145% for the Periphery, the Periphery implements a fiscal consolidation policy for any common target, $\overline{b}^{EA}$, that we consider in this section. At the same time, the Core mostly undertakes fiscal expansion.

5.4.2 Welfare over a common EA public debt target

Figure 7 depicts the welfare criterion for each entity (y-axis), namely EA, V_0^{EA}, Core, V_0, and Periphery, V_0^*, against a union-wide debt target, $\overline{b}^{EA}$ (x-axis). To see where the other EA debt target reforms of Section 4 stand compared to the 'optimized' we introduce them as dots in each graph. The grey, blue and red dots correspond to *FF*, *FR* and *FA* scenarios, respectively.

The hump shape of the welfare functions suggests that the hypothetical EA fiscal policymaker faces a trade-off when setting an optimized debt target. On the one hand, a relatively looser EA public debt target boosts Core's domestic demand, while simultaneously mitigates the costly transitional phase of fiscal consolidation in the Periphery (via softening the *fiscal policy* channel). Moreover, the presence of inequality and the role of public debt as an instrument of self-insurance, also contribute to the ascending segment of the welfare curves in Figure 7.[27] On the other hand, the relatively higher interest rates would harm the international competitiveness of the union (via the expenditure-switching channel). Additionally, a higher public debt target reduces the long run welfare benefit of fiscal consolidation, as higher labor taxes are required to finance the increased borrowing costs.[28]

Additionally, the common EA debt target is between the current debt-to-output ratios of the two member states, i.e. $\arg\max_{\overline{b}^{EA}} V_0^{EA} \in [0.67, 1.45]$. This implies that the Periphery should consolidate, albeit towards a looser public debt target than the one dictated by

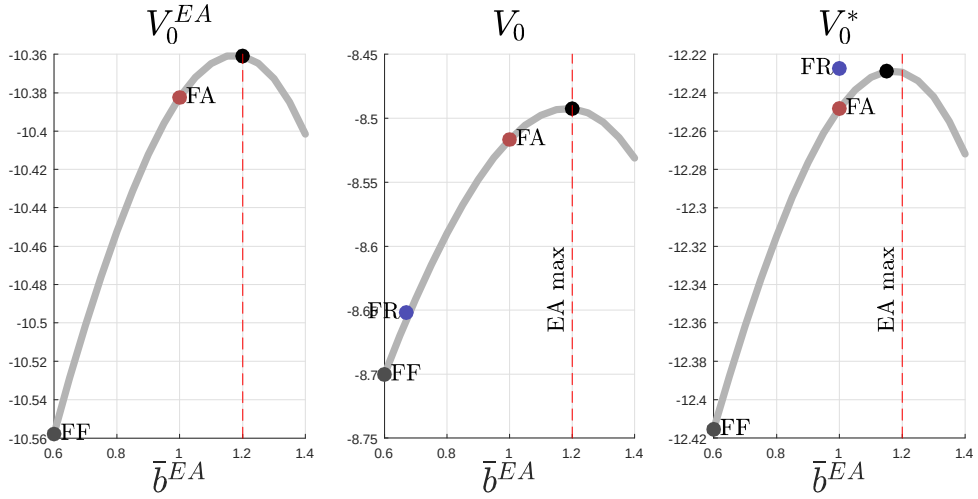
[26] We acknowledge that our approach does not constitute a fully-fledged optimal policy problem. The latter is beyond the scope of this paper. Instead, our aim is to provide a methodological approach and its quantitative implementation to compute debt targets that maximize an objective function under the specific restrictions imposed here.

[27] To illustrate the quantitative importance of the presence of inequality for the common EA debt target, Supplemental Appendix D.6 decomposes the total welfare change into two components: the level and the dispersion component. The level component reflects the welfare change experienced by the average household, while the dispersion component represents the welfare change attributed to inequality.

[28] Supplemental Appendix D.7 presents the discounted cumulative effect on key endogenous variables over the first 30-period horizon as a function of the $\overline{b}^{EA}$ to visualise these trade-offs.

the current EA treaties, while the Core should expand. Our parameterization implies an 'optimized' EA debt-output target equal to 120%.

Figure 7: Optimal welfare as a function of a common debt target, $\overline{b}^{EA}$



Notes: ϕ_π= 1.5, γ_l= 0.08. We calibrate γ_l^* such that the half life fiscal consolidation for Periphery is 15 years for each different $\overline{b}^{EA}$ (in line with the 1/20 rule proposed in SGP reform in 2011). The vertical red dashed lines indicate the optimal common debt target. The grey, blue and red dots correspond to the welfare of the *FF*, *FR* and *FA* scenarios, respectively.

Comparing the average welfare across EA debt targets, we reconfirm that *FF* is the worst and *FA* is better. However, the *FR* warrants more analysis. The *FR* does not restrict a common debt target across member states in the union, and thus, there is no equivalent dot for *FR* in the EA panel (see V_0^{EA}). Under *FR*, the Periphery would be strictly better off for any common target, while the Core would be far from its peak of the average welfare function.[29]

6 Robustness

We conduct a sensitivity analysis by varying key structural parameters and modelling assumptions individually. Specifically, we vary parameters related to consumption preferences, world demand elasticities, nominal price and wage rigidities, and fiscal externalities. For modelling assumptions, we consider union-wide MIT shocks (e.g., TFP, government spending, and markup shocks), introduce household heterogeneity (workers and entrepreneurs, as in *Bayer et al.*, 2024), and adopt alternative fiscal rules—namely, a government spending rule and a primary surplus rule, following Alves *et al.* (2020)—to implement the debt reforms in Section 4. A detailed account of these robustness checks is provided in Supplemental Appendix E. The main findings reported in Section 5 remain robust.

[29] A sensitivity analysis of the optimized debt target is provided in Supplemental Appendix D8.

To aid interpretation and facilitate comparison, we summarize the average welfare losses for all households and the bottom 40% under both the baseline and the robustness scenarios discussed above in Tables E4 and E5 in Supplemental Appendix E. The main findings reported in Section 5 remain robust.

7 Conclusions

This paper develops a world economy HANK model for the EA Core and Periphery, which captures key features of the cross- and within-country heterogeneity in the EA in order to study reforms to EA debt targets. We show that fiscal consolidation under the current EA institutions, namely the Maastricht Treaty and the Stability Growth Pact, is quite costly across and within countries. Households residing in the Periphery are particularly vulnerable to the adverse effects of these policies. Our key finding is that reforming EA debt targets to more realistic values can significantly mitigate these welfare losses and make fiscal consolidation more affordable for a large proportion of households in the Periphery. However, a fiscal scenario where the Core expands while the Periphery consolidates would generate a conflict of interest between households of the Core and the majority of households in the Periphery.

We close with modelling caveats and possible extensions. First, we model sovereign premia following the popular modeling approach of Schmitt-Grohé and Uribe (2003), which is not only empirically relevant in the context of EA but also allows us to study the impact of public debt reforms during non-crisis years. This implies that our paper does not address other issues like the possibility of and/or actual sovereign default as in e.g., Corsetti *et al.* (2013) or Roldán (2024). Including sovereign default and/or a portfolio choice between risky and safe assets may affect some of our results. For instance, higher interest rates due to sovereign premia might prompt households to reallocate their portfolios from riskier (Periphery's) to safer (Core's) assets. Moreover, sovereign default would further increase the output losses associated with high public debt and, consequently, lead to larger welfare gains from fiscal consolidation to lower debt targets. Second, our model abstracts from physical capital accumulation. In our setup, it would be more realistic to introduce physical capital as an illiquid asset and an imperfect substitute for foreign assets and public debt, as in Bayer *et al.* (2023).

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