CES ifo Working Papers

10961
2026

Original Version: February 2024
This Version: March 2026

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CES ifo

Imprint:

CESifo Working Papers

ISSN 2364-1428 (digital)

Publisher and distributor: Munich Society for the Promotion
of Economic Research - CESifo GmbH

Poschingerstr. 5, 81679 Munich, Germany
Telephone +49 (0)89 2180-2740

Email office@cesifo.de
https://www.cesifo.org

Editor: Clemens Fuest

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Political Economy of Climate Change Adaptation*

Yasmine van der Straten[†], Enrico Perotti[‡], Frederick van der Ploeg[§]

Updated: March 2026,
First Version: February 2024

Abstract

We examine how political support for climate adaptation evolves as climate risk and inequality rise. With heterogeneous beliefs and incomes, households vote on publicly funded adaptation. As extreme events accumulate, beliefs about climate risk converge, and the value of protection grows. These forces generate a political tipping point: young sceptics—facing rising housing scarcity and future damages—shift toward stronger adaptation, realigning with old realists and triggering a discrete increase in public intervention. Yet even after this political shift, adaptation remains below the social optimum due to a "tragedy of the horizon" effect. Rising inequality can induce a second tipping point, but its effect is ambiguous, as gradual inequality depresses adaptation through political backlash, while rapidly widening inequality pushes voters toward greater protection.

Keywords: Climate adaptation, inequality, tragedy of the horizon, political tipping.

JEL codes: D83, H23, Q54, Q58.

*We thank Tim Besley, Beatrice Weder di Mauro, Benoit Crutzen, Helios Herrera, Paolo Fulghieri and Hans Peter Grüner as well as participants of the EJPE-CEPR-Bocconi Political Economy Conference 2024, the CEPR Paris Symposium 2023, the SURED Conference on Sustainable Resource Use and Economic Dynamics 2024 and seminar participants at the University of Amsterdam. This work was funded by Fundação para a Ciência e a Tecnologia (UID/00124/2025, UID/ PRR/124/2025, Nova School of Business and Economics DOI: https://doi.org/10.54499/ UID/00124/2025) and LISBOA2030 (DataLab2030 - LISBOA2030-FEDER-01314200).

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I. Introduction

Climate change can destabilise the weather system with extreme events, such as severe storms, rising sea levels and desertification, damaging the housing stock, degrading habitable land and worsening living conditions. While beliefs about the reality of climate change are slowly converging, there is little agreement on the desired intensity of climate adaptation policy. After a brief phase of rising intervention, sharper political differences have emerged, stalling climate risk containment and mitigation efforts. This political impasse is concerning as global warming is expected to persist over the coming decades. As climate shocks intensify, cumulative damages to housing and land are likely to increase (Burzyński et al., 2019). Individuals and corporations will adapt to a changing climate, either through self-protective measures (e.g., Fried, 2022; Van der Straten, 2023) or by reallocating capital (Kahn et al., 2024), or via migration or relocation of trade (e.g., Conte et al., 2022; Desmet and Rossi-Hansberg, 2024).

Yet much climate damage is best contained by large-scale investments in *public* adaptation. Such a collective effort is costly, so it requires firm political support. We study how political support for public climate adaptation evolves against a backdrop of rising inequality, a key driver of increasingly polarised views (Voorheis et al., 2015), especially with regards to climate policy (e.g., Douenne and Fabre, 2022). We study how gradual climate damages and inequality can trigger discrete shifts in political majorities.

Climate shocks damage the housing stock and degrade habitable land, through rising sea levels, desertification or ecological degradation as, for example, in (Van der Straten, 2023). The economic impact is considerable: housing accounts for two-thirds of global wealth, and a tenth of the housing stock is already under climate threat.[1] Physical damage from extreme climate events may be contained by protective infrastructure, while underinvestment leads to more loss of housing and habitat.

Our aim is to characterise political tipping points in climate adaptation policy. We thus let which households differ by age, income, and beliefs – three key predictors of voter support for climate policies (Dechezleprêtre et al., 2025).[2] These differences

[1] See "Homeowners face a $25 trillion bill from climate change", The Economist, April 11 2024.

[2] Dechezleprêtre et al. (2025) show that support for an active climate policy is influenced by its perceived effectiveness in reducing emissions, redistributive effects and direct impact on households.

shape households' views on the desirability of public intervention, generating political disagreement. We allow for heterogeneity in age and beliefs about the severity of climate risk. Differences in priors initially generate disagreement, but repeated exposure to climate damage leads beliefs about climate risk to converge over time. We thus examine how evolving climate damages and belief convergence affect majority support for adaptation and whether they can induce political tipping points. In an extension, we incorporate income heterogeneity to study how rising inequality reshapes political coalitions and long-run adaptation outcomes.

We deliberately use a relatively simple partial-equilibrium, overlapping-generations economy in which climate risk and inequality rise gradually over time to highlight the politics of climate adaptation.[3] Households derive utility from consumption and housing. They also partially internalise habitat conditions for their children in the near future.[4] This specification captures a collective action problem, because each household undervalues the long-term benefits of adaptation beyond the next generation. This incomplete internalisation gives rise to a "tragedy of the horizon" effect (Carney, 2015), where myopic preferences and the public good nature of adaptation lead to underinvestment in protective measures even under politically favourable coalitions.

In each period, households vote for the coalition favouring the adaptation rate closest to their preference. Households vote before they know their income (thus under a Rawlsian veil of ignorance), although they anticipate rising inequality. In an extension, the old cohort observes its income when voting. We consider diverging beliefs, which reflect different priors on actual climate risk (e.g., Murfin and Spiegel, 2020; Baldauf et al., 2020; Bakkensen and Barrage, 2021). As extreme events accumulate, beliefs about climate risk converge, reducing disagreement over time. We show that even sceptic-dominated coalitions gradually support higher adaptation as climate damages rise.[5]

We assume that the old cohort is politically dominant and that climate sceptics form a majority within each age and income group, which seems realistic in the light of the current debate. We show that the evolution of adaptation policy depends on how climate

[3]We use the redistributive growth model of Döttling and Perotti (2017) to capture long-term trends.

[4]This implies caring for 'the world we leave for our children', as opposed to caring for long-term living conditions on our planet.

[5]We refer here to sceptic and realist voters, as, unfortunately, the second group proved more accurate in predicting the severity of the challenge.

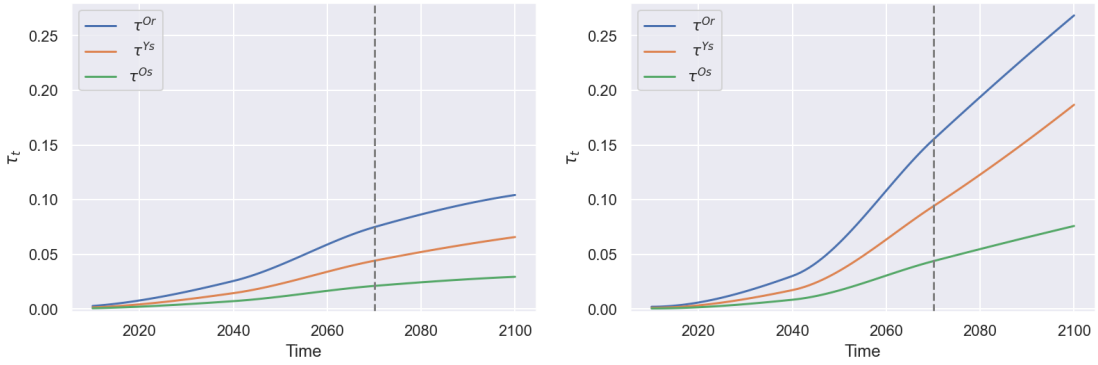


FIGURE 1: **Climate change and evolution of the political equilibrium**

Key: The time paths of the adaptation rate (τ_t) preferred by the old realists (Or, blue line), the young sceptics (Ys, orange line) and the old sceptics (Os, green line) for different SSP scenarios. The dashed, vertical line indicates the majority shift from a climate-sceptic coalition towards a coalition of young climate sceptics and old climate realists. The left panel shows results for the SSP1-2.6 scenario, in line with the aggregate Nationally Determined Contribution emission levels by 2030; the right panel shows results for the SSP3-7.0 scenario, a medium to high climate change scenario.

risk differentially affects voter groups over time. Initially, as climate risk is limited, the majority coalition consists of sceptic households of all ages, who favour modest public intervention. This results in a faster loss of habitat and rising housing scarcity. Our first general result is that even political coalitions dominated by sceptics gradually support more climate adaptation as climate threats rise.[6] A distinctive feature is that if political beliefs are polarised, age differences matter less. We show that the young climate sceptics emerge as the pivotal group. As climate risk rises, their policy preferences shift faster than for their initial allies, because young households benefit more from containing habitat loss by adaptation. As their preferred rate of public intervention gradually moves closer to the rate preferred by old realists (as shown in Figure 1), the winning coalition shifts once climate damages and habitat loss become sufficiently large, provided polarisation is not too extreme. The shift in the political equilibrium resulting from young climate sceptics changing and becoming relatively more in favour of climate adaptation policy leads to a discrete upward jump in public adaptation.

Still, this more active adaptation policy falls short of the socially optimal value. We refer to this difference as the *adaptation gap*. The gap reflects the "tragedy of the horizon" effect, as households care about the present and near future habitat, and do not fully

[6]Cain et al. (2020) and Demski et al. (2017) show how floods reduce polarisation on climate priorities and increase support for adaptation; see also Rasmussen et al. (2021); MacInnis and Krosnick (2020).

internalise benefits for future generations.

Finally, we consider an extension with a different timing of events to investigate how economic status affects voting when households know their income level over time, sharpening their differences. A steady rise in inequality may lead to more support for climate adaptation even among low-income old voters, as they benefit relatively more from public adaptation. As a result, a second political tipping point may emerge, where low-income voters join the majority coalition. However, the effect on public adaptation is ambiguous. If inequality rises gradually, the shift is towards less public adaptation. This is due to the inclusion of low-income, climate-sceptic households in the majority coalition, which produces political backlash. Thus, increasing vulnerability may be met with reduced collective action. If inequality rises rapidly, the income effect dominates, and the policy impact reverses. The second political tipping point then leads to a coalition favouring more public adaptation. These results highlight that the evolution of economic inequality is critical for the feasible intensity of future climate policy.

Section II discusses the related literature. Section III presents the model, and Section IV derives equilibrium conditions. Section V introduces the political economy framework and derives the majority voting equilibrium. Section VI provides a quantitative assessment of the evolution of the equilibrium over time. We derive the intergenerationally optimal policy and discuss the public adaptation gap in Section VII. Section VIII considers an extension, where rising inequality affects the political equilibrium. Section IX concludes.

II. Related Literature

The normative literature on climate policy studies mitigation policies such as optimal carbon pricing (e.g., Nordhaus, 2008; Golosov et al., 2014; Dietz and Stern, 2015). Our paper relates to adaptation to climate change (e.g., Lasage et al., 2014; Muis et al., 2015; Fried, 2022; Van der Straten, 2023), predominantly focused on private incentives to adapt to weather shocks. Fried (2022) studies investments in seawalls, stilts and other choices to cope with severe storms in the US and the welfare cost of climate change. Van der Straten (2023) studies how financial incentives shape private efforts to contain climate damages, and highlights that credit-constrained households have limited incentives to fully adapt, increasing the rate of habitat loss. Our approach also recognises how climate

change affects habitat, adding to the literature on long-term housing trends with fixed land supply (Hansen and Prescott, 2002). Ricardo (1817) shows how economic growth benefits landlords disproportionately due to the fixed nature of land. Nichols (1970) includes land as a fixed production factor in a Solow growth model. Grossmann et al. (2025) consider a context where land development becomes inactive in the long run. Combined with differences in the intensity with which land is used in different sectors, the fixed nature of land explains the rise in real house prices in the long run as observed in the data. Saiz (2010) shows empirically that the fraction of land that cannot be developed is higher in areas where there are regulatory or geographical constraints.

Our framework is related to Hong et al. (2023), who analyze how the private and public sectors should adapt to manage disaster risks when they learn about the adverse effects of global warming. Voter beliefs are central in any political economy analysis. As in Hong et al. (2023), where adaptation is more valuable under learning, in our framework, political support for public adaptation rises as climate shocks become more intense because of both rising risks and convergent beliefs on the severity of climate change.

Empirical evidence also suggests that climate change beliefs influence the extent to which climate risk is priced in housing markets, sorting patterns, and the adaptive response to extreme climate events[7], e.g., Murfin and Spiegel (2020), Baldauf et al. (2020) and Bakkensen and Barrage (2021). Bakkensen et al. (2025) show that households who are pessimistic about climate risks take up higher and longer-term mortgages, as a higher risk of weather damage leads households to value the option to default more. Different beliefs about climate risk contribute to partisan sorting in housing markets. Bernstein et al. (2019) show that households "vote with their feet", with climate change deniers being more likely to sort into neighbourhoods that are more exposed to climate risks.

Our work relates to work on the political economy of climate policies. Besley and Persson (2023) study a dynamic complementarity of technology and values that may either promote a green transition or create a vicious circle, leading to a so called "climate trap". Delfgaauw and Swank (2024) also develop a political economy model of a climate trap. Bez et al. (2023) show that globalisation, through the distributional consequences of import competition, reduces electoral support for green parties across the US and Western

[7]Zappalà (2024) shows that climate technology adoption levels are lower when farmers underestimate climate change.

Europe. This suggests that environmental concerns are stronger at the time of economic distress. Our analysis focuses on the direct effect of rising inequality through skill-biased technological change (see e.g., Acemoglu and Autor, 2011) on support for climate policy.

To study simultaneous trends in inequality and climate risk requires distinguishing the (perceived) impact of climate change across polarised cohorts. Intuitively, more extreme climate events or sea-level rise raise support for climate adaptation, but may increase polarisation across age and income cohorts. Ultimately, we highlight how the tension between inequality and beliefs significantly affects the political feasibility of climate policy, and endogenises the rate of habitat loss as the driver of competing views and interests. Finally, as our approach is to solve for the political majority equilibrium by considering all possible coalitions of subgroups (old versus young, high and low income, optimists versus pessimists or sceptics), our work is closely related to the early political economy literature on migration and pensions. Razin et al. (2002) adopt an overlapping-generations framework to study political shifts in response to long term-trends, thus adding to their focus on climate risk that worsens income inequality.

III. Baseline Model

Time is discrete and is denoted by $t \in \{0, 1, ..., \infty\}$. The economy is exposed to climate risk, which rises over time.[8] The economy has two overlapping generations, where the old generation is larger and thus dominates the young cohort in terms of active voters.[9] Households earn income in both periods and demand housing (or habitat), which is in fixed supply, and a numeraire good in abundant supply. At the start of each period, a flood hits a fraction of households and damages housing as well as the land on which housing is built, thus reducing habitat. Preventive investment (adaptation) can reduce the impact of climate shocks. Households differ in their initial perceptions about the severity of climate risks, and learn over time from flooding events. The government reduces climate risk exposure by investing in public adaptation (e.g., seawalls, dikes or stilts; storing sandbags and pumps; funding fire departments), financed by a flat tax on labour income.

[8]We use flood risk or climate risk interchangeably as a shorthand for climate-related risks. Sometimes, flood or climate risk can be attributed to extreme weather events.

[9]This assumption may reflect voting behaviour, life expectancy, or demographic features.

A. *Households*

Households live for two periods and derive utility from housing and a non-durable consumption good, and from the environment (habitat) in the near future.[10] The young purchase housing capital from the old at a price p. Once old, they use the return earned on their savings and proceeds from selling the house for the purchase of a numeraire good. The initial generation at $t = 0$ is endowed with the initial supply of houses $\bar{L}_0$.

Preferences Households have preferences which are concave over housing and linear in consumption. Their preferences also reflect intergenerational altruism in the spirit of Barro (1974), rather than personal bequest (dynastic) motives. We assume that households care about the collective quality of the habitat left behind, rather than individual wealth transfers, so their utility increases in the *aggregate* housing stock available in the next period, $\bar{L}_{t+1}$. Expected lifetime utility is given by:

$$U\left(L_{i,t}, c_{i,t+1}\right) = v\left(L_{i,t}\right) + c_{i,t+1} + f\left(\bar{L}_{t+1}\right)$$

where $v\left(L_{j,t}\right)$ is the utility derived from housing consumption $L_{i,t}$ by individual i in period t, with $v'(\cdot) > 0$ and $v''(\cdot) < 0$, $f\left(L_{i,t+1}\right)$ captures the utility of leaving behind habitable land to the next generation, with $f'(\cdot) > 0$ and $f'(\cdot) < 0$, and $c_{i,t+1}$ denotes consumption of the numeraire good by individual i at time $t + 1$.

Income A fraction $\phi < 0.5$ of households is of the high-income type, denoted by h; the remaining fraction $1 - \phi$ is of the low-income type, denoted by l. High-income households earn $y_{h,t} = q$, and low-income households earn $y_{l,t} = w$, where $q > w > 0$.

B. *Climate Change*

The probability of a flood event affecting any household in period t, γ_t, increases deterministically over time (cf. Van der Straten, 2023), so γ_t is the fraction of households whose house suffers damages in period t (from the law of large numbers). Damages, denoted by $\xi_{i,t}$, are i.i.d. shocks distributed according to $F\left(\xi_{i,t}\right)$. We denote by μ the

[10] Thus, the young care about the world when they are old, and the old care about the state of the world inherited by the next generation.

common fraction of losses to housing capital caused by a flooding event, so from Bayes' law expected damages are

$$\mathbb{E}_t\left(\xi_{i,t+1}\right) = \underbrace{\mathbb{E}_t\left(\xi_{i,t+1}\middle|\text{Hit by Flooding event}\right)}_{\mu} \times \underbrace{\mathbb{P}\left(\text{Hit by Flooding event}\right)}_{\gamma_{t+1}}.$$

The housing capital of household i after a flood event is $L_{i,t+1} = (1-\xi_{t+1})\, L_{j,t}$. Flood events damage part of the housing stock and permanently degrade its land.[11] Denote the supply of livable land, or habitat (cf. Burzyński et al. (2019)), by $\bar{L}_t$, where we assume that total land supply is fixed in the long run. The supply of *habitable* land evolves in response to flood according to $\bar{L}_{t+1} = \int_0^1 (1-\xi_{i,t+1})\, di L_t \overset{\text{LLN}}{=} (1-\mu\gamma_{t+1})\, \bar{L}_t$.

Beliefs about Flood Shocks We assume that households differ in their initial priors on the likelihood of floods. These beliefs do not depend on income or age. A fraction $\omega > 0$ of households consists of sceptics (s), who underestimate flood risk; the remaining households are realists (r), who correctly perceive the probability of flood disasters. Initially, sceptics are the majority. Let $\theta_{j,t}$ denote the belief of a household of type $j \in \{s, r\}$ at time t about the probability that a flood event occurs. Realists assign the correct probability, $\theta_{r,t} = \bar{\theta} = 1$, in every period. Climate sceptics have probability $\theta_{s,t} = \underline{\theta} < 1$, and act as if a flood event occurs with probability $\underline{\theta}\gamma < \gamma$, where γ is the objective probability of the event. Sceptics' expectation about the damages suffered due to floods affect their preferences for adaptation.[12] These expectations evolve with time. Following simple learning models (cf. Hong et al., 2023), we assume that belief revision occurs gradually in response to observed, economy-wide climate damages.

Each period t in which there are floods, a skeptic household updates its belief with

$$\theta_{s,t+1} = \min\left\{\theta_{s,t} + \delta,\ 1\right\} \tag{1}$$

where $\delta > 0$ captures the speed of learning. The beliefs of realists remain $\theta_r = 1,\ \forall t$. Due

[11] Land degradation occurs over a quarter of the Earth's ice-free land area and climate change accelerates its rate and scale (IPCC, 2019).

[12] From the perspective of a sceptic household, the expected housing capital affected by flood events is $E_{s,t}\left(L_{s,t+1}\right) = (1-\underline{\theta}\mu\gamma_{t+1})\, L_{s,t}$.

to learning, there is a gradual convergence in perceptions of flood risk.[13]

C. Public Policy Intervention

We focus on public adaptation measures, which directly offer protection to households (such as dikes, dams, or fire preventive measures).[14] (In Section V.D. we consider the case that such measures are not seen by all as cost-effective, with some voters being sceptical about the ability of the government to build an adequate infrastructure.) As large-scale adaptation investments take substantial time to realise, we assume their pay-offs are realised in the next period. Define $X_t \in [0, 1)$ as the fraction by which households' idiosyncratic losses from flood shocks are prevented by public adaptation in period $t+1$. Public adaptation shifts the distribution of household losses $F(\xi_{i,t+1})$ to the left, so that $\mathbb{E}_t(\xi_{i,t+1}) = (1 - X_t)\,\mu\gamma_{t+1}$.[15] The expected housing capital that remains preserved after the flood event is then $L_{i,t+1} = [1 - (1 - X_t)\,\mu\gamma_{t+1}]\,L_{j,t}$. Adaptation reduces the speed at which its supply of habitable land shrinks. Using the above expression for expected damages, the supply of houses thus evolves as

$$\bar{L}_{t+1} = \left(\int_0^1 (1 - \xi_{i,t+1})\,di\right)\bar{L}_t \overset{\text{LLN}}{=} (1 - (1 - X_t)\,\mu\gamma_{t+1})\,\bar{L}_t. \tag{2}$$

Finance of Public Adaptation Public adaptation come at a cost $\psi(X_t) = \frac{1}{2}\bar{L}_t X_t^2$. These costs are proportional to the aggregate housing stock, $\bar{L}$, since larger areas require more extensive and resource-intensive infrastructure.[16] Investment costs are convex in the adaptation rate, since even the most ambitious investments cannot entirely prevent climate-related damages (Van der Straten, 2023).

[13] Hong et al. (2023) show that learning improves the adaptive response of the economy; other studies highlight how belief updating can be ideologically polarised. Djourelova et al. (2023) find that exposure to disasters increases climate concern among liberals but reduces it among conservatives, thus widening the ideological divide.

[14] Another form of corrective action is the restoration of habitat. This may be more difficult than preventing its loss ex ante, so we assume it is prohibitively costly. Compensation for damages caused by large climate shocks would not be preventive and may even reduce private adaptation (Fried, 2022; Van der Straten, 2023).

[15] Here, adaptation does not increase the utility of housing in the current period. Rather, it benefits future households by raising the stock of undamaged housing capital available in the next period.

[16] E.g., protecting a larger area requires longer and potentially taller dikes, which increases the quantity of materials needed. This raises costs in proportion to the protected land area. Also, expanding the coverage of a dike system involves addressing more varied geographical features, such as rivers, coastal regions, and floodplains. These costs scale with the size of the protected region.

Public adaptation is financed with a flat labour income tax, τ_t, which we refer to as the adaptation rate. The tax burden is shared among young and old, because taxes cannot be targeted at a particular social group. As neither spending nor taxes can be targeted to specific voter groups, and politicians cannot appropriate tax revenues, policy preferences are monotonic with respect to income. As taxes are proportional to income, rich households prefer a smaller government, while poor households favour a larger government (cf. Persson and Tabellini, 2002). After-tax income is used to rent habitable land and to save, $S_{i,t}$, so the household budget constraint is $(1-\tau_t)\, y \leq p_t L_{i,t} + S_{i,t}$.

D. Housing Market Dynamics

The housing market opens after flood events take place. Since destroyed housing capital has zero liquidation value, households with a mortgage risk default and pay the endogenous risky rate of return, $r_t^R \geq r$, where the interest rate r is exogenous. Net savings of a household i in period t is $S_{i,t} \equiv y_{i,t} - p_t L_{j,t}$, where $S_{i,t} \geq 0$ indicates that household i is a net lender and $S_{i,t} < 0$ a net borrower. Default occurs once losses become sufficiently large, i.e., $p_{t+1} L_{i,t+1} \leq (1 + r_{t+1}^R)(-S_{i,t})$. This condition implicitly defines the threshold of losses above which a homeowner defaults by $\hat{\xi}_{i,t+1} \equiv 1 - LTV_{i,t+1}$, where the loan-to-value ratio is $LTV_{i,t+1} \equiv \frac{(1+r_{t+1}^R)(-S_{i,t})}{p_{t+1} L_{j,t}}$. Then, the probability of default is $\chi_{i,t} = \left(1 - F\left(\hat{\xi}_{i,t+1}\right)\right)$. Mortgage creditors price default risk. Specifically, no arbitrage requires that the expected repayments, including recovery in the default state, equal the risk-free return. Since all risk is idiosyncratic and lenders are risk-neutral, household debt is priced at the risk-free rate r, not r_t^R, in expectation.

E. Timing of Events

The timeline of each household is illustrated in Figure 2, where the household is young in period $t = 0$, and old in period $t = 1$.

IV. Equilibrium in the baseline model

Households maximise expected utility subject to their budget constraints, credit constraint and a limited liability constraint,

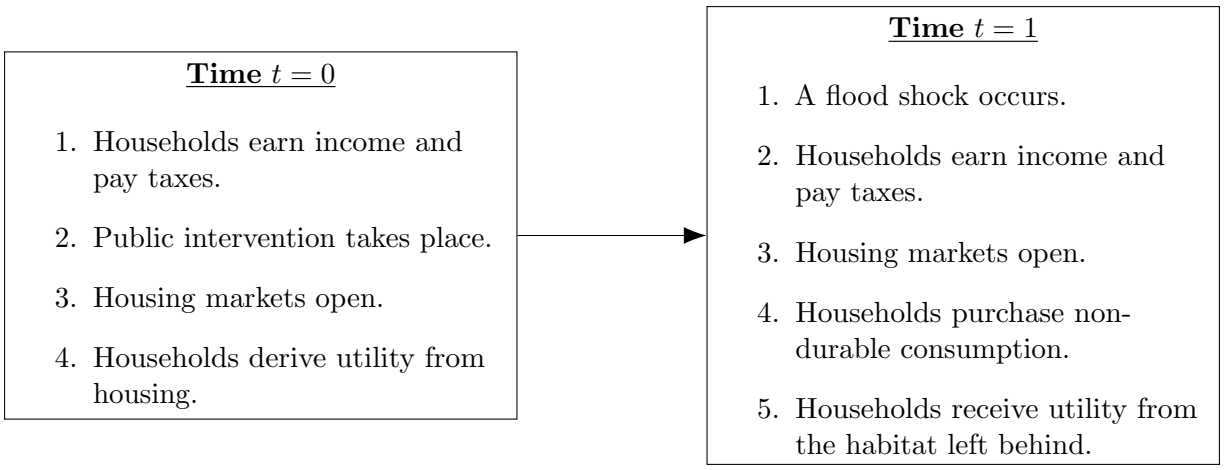


FIGURE 2: TIMING OF EVENTS

$$\max_{L_{i,j,t},S_{i,j,t},c_{i,j,t+1}} \mathbb{E}\left(U\left(L_{i,j,t}, c_{i,j,t+1}, X_t\right)\right) = v\left(L_{i,j,t}\right) + \mathbb{E}_{i,j,t}\left(c_{i,j,t+1}\right) + \mathbb{E}_{i,j,t}\left(f\left(\bar{L}_{t+1}\right)\right)$$

$$\text{s.t. } \left(1-\tau_t\right) y_{i,t} \leq p_t L_{i,j,t} + S_{i,j,t},$$

$$c_{i,j,t+1} \leq \left(1-\tau_{t+1}\right) y_i + \max\left\{p_{t+1}\left(1-\xi_{i,t+1}\right) L_{i,j,t} + \left(1+r^R_{t+1}\right) S_{i,j,t}, 0\right\},$$

and $L_{i,j,t} \geq 0$, where $c_{i,j,t+1}$ is consumption of household i with belief j in period $t+1$.

A. Demand for Housing Capital

Due to quasi-linear preferences, housing demand is independent of income. The perception of the severity of climate risk does affect housing demand. Since sceptics expect a larger fraction of their housing capital to remain undamaged after the impact of a flood event - and thus to have a positive liquidation value - they have a higher demand for housing. Given housing demand $L^*_{j,t}$, the price of housing capital follows from the arbitrage equation

$$p_t = \frac{\left[1-\mu\left(1-X_t\right)\theta_{j,t}\gamma_{t+1}\right] p_{t+1} + v'(L^*_{j,t})}{1+r}.$$

The price reflects the discounted value of the total benefits from owning housing, namely the utility household a household of belief type j derives from consuming housing in the current period, $v'\left(L_{j,t}\right)$, and the expected revenue from selling (or renting) undamaged housing capital next period p_{t+1}. The damage discount depends on the beliefs of the marginal buyer θ_j, the objective risk exposure γ_{t+1}, and public adaptation X_t.

B. Demand for Household Debt

Households with net savings lend to other households; households with negative savings take out a mortgage. Household debt thus follows residually.

C. Equilibrium and Market Clearing

A competitive equilibrium is an allocation $\{c_{i,j,t+1}, L_{j,t}, S_{i,j,t}\}_{t=0}^{T}$ and prices $\{p_t, \tau_t\}_{t=0}^{T}$, so each period, t, given prices, households maximise lifetime utility and all markets clear. In equilibrium, the housing price must be consistent with household optimality and market clearing. Aggregating the housing demand across households implies that expected housing returns are weighted by housing holdings given belief types, i.e.,

$$p_t = \frac{\left(1 - \mu\left(1 - X_t\right)\int_0^1 \tilde{\theta}_{j,t} dj \gamma_{t+1}\right) p_{t+1} + v'(\bar{L}_t)}{1 + r}, \tag{3}$$

where total housing demand equals total housing supply (i.e., $\int_0^{\omega} L^*_{s,t} ds + \int_{\omega}^1 L^*_{r,t} dr = \bar{L}_t$), and the belief-weighted housing-share is $\tilde{\theta}_{j,t} \equiv \frac{\theta_{j,t} L^*_{j,t}}{\bar{L}_t}$.

Over time, two dynamics shape the evolution of house prices in the presence of climate risk. First, flood damages reduce the supply of habitat. Since households are risk-averse with respect to housing consumption, the reduction in supply increases the marginal utility of housing and thus the willingness to pay for housing. This raises the price of housing (cf. Van der Straten (2023)). Belief heterogeneity also feeds into prices through aggregation. As households revise their beliefs about flood events, they internalise the impact of flood damages on the resale value of housing. The imperfect internalisation of climate risk puts upward pressure on prices by weakening the effect of the exposure of housing to future damages. Crucially, the larger the dispersion in climate risk perceptions, the more muted the risk-exposure effect (i.e., the sea-level rise discount effect; see e.g., Baldauf et al. (2020); Bernstein et al. (2019); Bakkensen and Barrage (2021)) becomes. This hinders the capitalisation of climate risk and can lead to rising house prices under weaker conditions than in the rational agent case.[17]

[17]We derive the equilibrium condition under which the supply effect dominates in Appendix A1. Compared to Van der Straten (2023), this condition is less restrictive because of the belief heterogeneity. As some households underestimate their true exposure to climate risk, the downward pressure on prices from perceived exposure is weakened, while the upward pressure from the supply reduction remains

Government budget balance Government tax revenues from the old and the young must finance the convex costs of public adaptation,

$$2\tau_t \left(\phi q + (1-\phi)\, w\right) = \frac{1}{2} X_t^2 \bar{L}_t, \tag{4}$$

D. Solution of the Model

We solve for a competitive equilibrium in which households optimise, markets clear, and expectations are rational, given heterogeneous climate change beliefs. The key equilibrium object is the joint evolution of housing quantities, prices, and public adaptation. We note that our model has the following exogenous variables: $\{\delta, \mu, \phi, q, w, r\}$. Furthermore, γ_t is also exogenous and follows a deterministic trajectory (based on IPCC projections).

For a given tax rate, the evolution of housing supply (habitat, $\bar{L}_t$) follows from (2), where the adaptation rate $X_t = \sqrt{4\tau_t(\phi q + (1-\phi)w)/\bar{L}_t}$ follows from the government budget constraint (4). The tax rate (τ_t) and thus the adaptation rate (X_t) and house prices (3) depend on the political economy. In particular, they depend on the relative number of young and old households and on the evolving beliefs regarding climate change (1) (i.e., the updating rule for sceptics, θ_s, t). Section V shows in detail how the tax and adaptation rates are determined politically (see Lemmas 1, 2 and 3, and Proposition 1).

Given a path for adaptation $\{X_t\}$ and beliefs $\{\theta_{j,t}\}$, equilibrium prices $\{p_t\}$ and housing demand $\{L^*_{j,t}\}$ are jointly determined by (i) the household first-order conditions, (ii) and the housing market clearing condition, which pins down equilibrium house prices.[18]

V. Political Economy: Baseline Results

Public adaptation is determined by majority voting among a finite set of voter types. In each period, households vote over the level of adaptation, which reduces expected flood damages in the following period. Politicians compete in a majoritarian election by proposing specific adaptation rates, and households cast their votes for the politician

unchanged due to market clearing. As a result, house prices may rise with climate risk for values of relative risk aversion below one.

[18]Aggregate after-tax income of young households must equal aggregate investment in housing. Hence, $(1-\tau_t)\int_0^1 y^Y_{i,t} di = p_t\left(\theta_j, X_t\right)\bar{L}_t$, where aggregate gross labour income of the young equals $\int_0^1 y^Y_{i,t} di = \phi q + (1-\phi)\, w$.

closest to their preferences. A policy is implemented if it receives majority support. We characterise the political equilibrium using a majority-stability concept. A policy is majority-stable if (i) it is supported by a majority of voters, and (ii) there exists no alternative policy that another majority strictly prefers. Deviations occur only through voting. There are no side payments or cooperative transfers across groups.

Voting preferences differ across age and beliefs. Because voter types are discrete, multiple majority-feasible groupings may exist. We refer to a "coalition" as a set of voter types that together form a majority. Conditional on forming a majority, a coalition chooses the adaptation rate that maximises the joint utility of its members, taking prices and the budget constraint as given. A coalition is feasible only if it is internally stable (no member prefers to leave for another majority) and externally stable (no outside group can form a blocking majority offering a policy preferred by all its members).

A. Preferred Adaptation Rates

If households vote under a Rawlsian veil of ignorance, they are not yet aware of their income type. This creates four distinct groups in society, with preferences for adaptation shaped by both age and climate change beliefs. Households prefer an adaptation rate that maximises their expected lifetime utility.

Lemma 1. *The preferred adaptation rate of a young household i with beliefs θ_j is*

$$\tau_t^{Yij*} = \frac{\bar{L}_t}{[\phi q + (1-\phi)\, w]} \left(\frac{\tilde{\theta}_{j,t}\,(p_{t+1} + \pi_{j,t})}{(1+r)} \right)^2,$$

and the preferred adaptation rate of an old household i with beliefs θ_j is

$$\tau_t^{Oij*} = \frac{\bar{L}_t}{[\phi q + (1-\phi)\, w]} \left(\tilde{\theta}_{j,t} \pi_{j,t} \right)^2,$$

where we define $\pi_{j,t} \equiv \partial f(\mathbb{E}_{j,t}(\bar{L}_{t+1}))/\partial\, \mathbb{E}_{j,t}(\bar{L}_{t+1})$. Note that $y_{i,t} = \phi q + (1-\phi)\, w$, since households vote under a Rawlsian veil of ignorance with respect to their income type.

Proof: See Appendix A2.B.

The preferred adaptation rate of households in both age groups increases as climate risk (γ_{t+1}) intensifies, and the supply of habitable land ($\bar{L}_t$) diminishes (note that the

belief-weighted housing share depends on total land supply). These factors increase the need for protective measures and, consequently, raise the support for public adaptation. Additionally, households with a higher perceived exposure to climate events ($\tilde{\theta}_{j,t}$) favor higher adaptation rates, as they view public adaptation as more critical in addressing rising climate risks, indicating that $\tau^{Yir*} > \tau^{Yis*}$ and $\tau^{Oir*} > \tau^{Ois*}$. Similarly, the preferred adaptation rate rises with the marginal utility of leaving behind habitat ($\pi_{j,t}$), because households place greater value on the benefits of public adaptation for the welfare of the future generation. Conversely, the preferred adaptation rate decreases with individual income levels, due to the proportionality of the tax burden to income. However, it increases with higher aggregate labour income ($\phi q + (1-\phi)\, w$), reflecting society's greater capacity to shoulder the public investment. Finally, and distinctively, the young's preferred adaptation rate increases with the house prices (p_{t+1}), which reflects the value of housing which is potentially lost upon a climate impact. Because of the intertemporal nature of the investment, adaptation reduces only the risk exposure of young households, who become the owners of the housing stock. This indicates that the old have relatively less to gain from public adaptation. Hence, the adaptation preferred by the old is less than that of the young, i.e., $\tau^{Yij*} > \tau^{Oij*}$.

B. Feasible Coalitions

To win an election, politicians must secure a majority of votes. Lemma 2 shows that households' preferred adaptation rate varies based on their age and their beliefs about climate change. Since no single group is large enough to constitute a majority, voters must form coalitions to ensure the implementation of their preferred policy. We focus on the following potential coalitions: (i) young sceptics and old realists, (ii) young and old sceptics, and (iii) all old households.[19]

We focus on majority coalitions that are both internally and externally stable. That is, no member prefers to leave and form an alternative coalition, and no party outside the coalition can join and improve outcomes for all members. We assume that coalitions choose an adaptation rate that maximises their joint utility subject to their budget constraints.

[19]We do not consider a coalition consisting of only young households or a coalition of young and old realists, since we assume that they are too small to form a majority. We also rule out a coalition of all old households, since Lemma 2 implies that this coalition is too ideologically dispersed.

Lemma 2. *If there are fewer young than old households and sceptics constitute a majority ($\omega > 0.5$), the set of feasible coalitions is either (i) a coalition of young sceptics and old realists with preferred adaptation rate,*

$$\tau_t^{Ys,Or*} = A\left(\frac{\omega\tilde{\theta}_{s,t}p_{t+1} + \left(\omega\tilde{\theta}_{s,t} + (1-\omega)\tilde{\theta}_{r,t}\right)\pi_{s,r,t}}{1+\omega r}\right)^2,$$

or (ii) a coalition of young and old sceptics with the preferred adaptation rate,

$$\tau_t^{Ys,Os*} = A\left(\frac{\tilde{\theta}_{s,t}\left(\frac{1}{2}p_{t+1} + \pi_{s,t}\right)}{1+\frac{1}{2}r}\right)^2,$$

or (iii) a coalition of the old with the preferred adaptation rate,

$$\tau_t^{Or,Os*} = A\left(\left(\omega\tilde{\theta}_{s,t} + (1-\omega)\tilde{\theta}_{r,t}\right)\pi_{r,s,t}\right)^2,$$

where the common terms are defined by $A \equiv A\left(\bar{L}_t, \gamma_{t+1}\right) = \frac{(\mu\gamma_{t+1})^2\bar{L}_t}{[\phi q + (1-\phi)w]}$.

Proof: See Appendix A2.B.

The adaptation rate proposed by each coalition increases with intensifying climate risk (γ_{t+1}), diminishing habitable land supply ($\bar{L}_t$), rising aggregate labour income ($\phi q + (1-\phi)w$), higher future house prices (p_{t+1}), and in the marginal utility of leaving behind livable land ($\pi_{j,t}$). These factors collectively reflect the increasing need to adapt as climate risks rise. The proposed adaptation rates also rise in the perceived climate exposure ($\tilde{\theta}_{j,t}$), highlighting the role of beliefs in shaping political outcomes. Moreover, the adaptation rates proposed by a coalition of old realists and young sceptics, as well as by a coalition of old realists and sceptics, increase with the share of realists, $1-\omega$.

The political equilibrium hinges on two factors: whether young sceptics choose to form a coalition with old sceptics or old realists, and whether old sceptics prefer to align with young sceptics or old realists. Define by $\tilde{\Theta} \equiv \tilde{\theta}_{r,t}/\tilde{\theta}_{s,t}$ the dispersion in beliefs between sceptics and realists. We now assume that the dispersion of beliefs is large enough.

Assumption 1. $\tilde{\Theta} > \frac{p_{t+1}+\pi_{s,t}}{\pi_{r,t}(1+r)}$.

This assumption rules out an equilibrium in which the old cohort becomes the dominant political group, by ensuring that the differences in their beliefs, and therefore the voting

preferences of the sceptic and realistic old, remain sufficiently large. However, if the sceptics revise their beliefs very fast in the face of climate events (i.e., δ is large), Assumption 1 may no longer hold over time. In particular, sufficiently fast belief updating reduces within-cohort disagreement, allowing the old to emerge as the dominant political coalition.

Lemma 3. *If Assumption 1 holds, then the preferred adaptation rates satisfy*

$$\tau_t^{Yr*} > \tau_t^{Or*} > \tau_t^{Or,Ys*} > \tau_t^{Ys*} > \tau_t^{Or,Os*} > \tau_t^{Ys,Os*} > \tau_t^{Os*}.$$

Old realists prefer to form a coalition with young sceptics rather than old sceptics. Conversely, if Assumption 1 does not hold, old households form the majority coalition, and the equilibrium adaptation rate is

$$\tau_t^{Or,Os*} = A\left(\left(\omega\tilde{\theta}_{s,t} + (1-\omega)\tilde{\theta}_{r,t}\right)\pi_{r,s,t}\right)^2.$$

The ordering of preferred adaptation rates in Lemma 3 reflects the interplay of age and climate change beliefs in shaping political dynamics. Young climate realists propose the highest adaptation rate, because they face the longest horizon to experience the benefits of reduced climate risks, and also have an accurate perception of climate risks. Old climate sceptics, in contrast, propose the lowest adaptation rate, because their short remaining time horizon reduces the perceived benefits of adaptation and they underestimate the risks the economy is exposed to.

For old climate realists to prefer a higher adaptation rate than young climate sceptics ($\tau^{Or*} > \tau^{Ys*}$), belief dispersion must be sufficiently large. On the one hand, young sceptics gain directly from public adaptation through reduced damages to the housing they own, making them inclined to support a more involved public adaptation policy. However, they underestimate climate risks. Old climate realists, in contrast, have an accurate perception of climate risks. Yet, only if the dispersion in beliefs is big enough, this effect dominates. Assumption 1 provides a sufficient condition for this to hold, as under this assumption the adaptation rates satisfy $\tau_t^{Or*} > \tau_t^{Or,Ys*} > \tau_t^{Or,Os*}$. Given that the utility of old realists is concave in the adaptation rate and rises for $\tau_t \leq \tau_t^{Or*}$, forming a coalition with young sceptics provides higher utility to old realists than forming a coalition with old sceptics. The strict ranking of preferences ensures that this equilibrium is unique, and

both internally and externally stable. As climate risk intensifies over time, Assumption 1 becomes increasingly harder to satisfy. Rising climate risk leads to habitat loss, which in turn drives up house prices. This raises the economic stakes for young sceptics, who benefit from both lower house prices and lower damages due to public adaptation.

C. Political Tipping

We now characterise how political coalitions evolve as climate risk and housing scarcity increase. Under Assumption 1, sceptics initially form a majority and intra-cohort belief differences among the old remain sufficiently large. As a result, the initial political equilibrium is determined by a coalition of young and old sceptics. Since both groups share similar beliefs about the limited severity of climate risk, they support relatively modest public adaptation. As climate risk rises over time, however, habitat loss increases housing scarcity. This raises the economic value of public adaptation, particularly for young households, who benefit more strongly from preserving future habitat. Consequently, the preferred adaptation rate of young sceptics increases more rapidly than that of old sceptics. Because young sceptics are pivotal under Assumption 1, the key political question becomes whether they continue to align with old sceptics or instead form a coalition with old realists. Political tipping occurs when the preferred policy of young sceptics becomes sufficiently close to that of old realists. Intuitively, this realignment is driven by rising house prices, which increase the economic stakes of adaptation for the young. We now formalise this coalition switch.

Proposition 1. *Let there be fewer young people than old, the sceptics then represent a majority ($\omega > 0.5$), Assumption 1 is satisfied and $v(L_{j,t}) = \ln(L_{j,t})$. Then, if*

$$\tilde{\Theta} < \left(\frac{1}{\pi_{r,s,t}} \left(\frac{1+\omega r}{(1-\omega)} \sqrt{\left(\frac{B}{\tilde{\theta}_{s,t}^2} + \frac{1}{\left(1+\frac{1}{2}r\right)^2} \left(\frac{1}{2} p_{t+1} + \pi \right)^2 \right)} - p_{t+1} \right) - 1 \right), \tag{5}$$

the political economy equilibrium is characterised by a coalition of young sceptics and old realists. The adaptation rate proposed by this coalition equals

$$\tau_t^{Ys,Or*} = A \left(\frac{\omega \tilde{\theta}_{s,t} p_{t+1} + \pi_{r,s,t} \left(\omega \tilde{\theta}_{s,t} + (1-\omega) \tilde{\theta}_{r,t} \right)}{1+\omega r} \right)^2. \tag{6}$$

If condition (5) on the dispersion of beliefs is not satisfied, the political economy equilibrium is characterised by a coalition of young and old sceptics with the adaptation rate

$$\tau_t^{Ys,Os*} = A\left(\frac{\tilde{\theta}_{s,t}\left(\frac{1}{2}p_{t+1} + \pi_{s,t}\right)}{1+\frac{1}{2}r}\right)^2. \tag{7}$$

Proof: See Appendix A1.B.

Proposition 1 highlights that at low levels of climate risk, young sceptics prefer to form a coalition with old climate sceptics. This is driven by their ideological alignment, even as economic incentives between young and old differ. However, as climate risk intensifies, the economic incentives of young climate sceptics increasingly diverge from those of old sceptics. Habitat loss resulting from climate change increases house prices, raising the marginal value of public adaptation for the young. While all households prefer higher adaptation as climate risk rises, the preferred rate of young sceptics increases more rapidly because they internalise future housing scarcity more strongly. Hence, public adaptation becomes more significant for young sceptics over time.

If beliefs are not too dispersed – that is, if the condition in equation (5) holds –, the political equilibrium eventually shifts. Specifically, the increasing alignment between the young sceptics and old realists in response to rising climate risk may bring forward "political tipping". The coalition of young sceptics and old realists, which arises as the politically dominant coalition, supports a higher adaptation rate, therefore bringing forward a discrete jump in the intensity of public adaptation policies. This reflects young sceptics' growing interest in addressing their rising economic stakes from climate change.

However, if beliefs are *too* polarised, the ideological gap between sceptics and realists outweighs the increased economic value of adaptation for the young sceptics. In that case, the young sceptics continue to prefer a coalition with the old sceptics, and adaptation increases only gradually. Thus, political tipping requires an intermediate degree of belief dispersion: large enough for young sceptics to be pivotal (Assumption 1), but not so large that ideological divisions dominate economic incentives (see equation (5)).

Faster belief updating (higher δ) accelerates the convergence of climate-risk perceptions between the young climate sceptics and old realists, reducing belief dispersion and bringing the tipping point forward in time. However, if beliefs update too rapidly, dispersion

diminishes very fast and Assumption 1 may cease to hold. If this occurs, the disagreement among the old becomes small and the pivotal role of young climate sceptics disappears. In this case, the old emerge as the dominant political group.

Corollary 1. *If belief updating is sufficiently fast (high enough δ), Assumption 1 may no longer hold over time. Then the political equilibrium is determined by a coalition of the old cohort.*

Because the old internalise a smaller share of future habitat preservation benefits, the resulting adaptation rate is generally lower than the tipping equilibrium described in Proposition 1. Rapid belief updating thus has an ambiguous political effect: while it reduces ideological polarisation, it may simultaneously reduce public adaptation investments by shifting political dominance toward the old. Depending on the speed of belief updating, the transition to an old-dominated coalition may occur either before or after political tipping would otherwise have taken place. In the former case, tipping is pre-empted; in the latter, the shift towards a coalition of young sceptics and old realists is only temporary.

VI. Quantitative Assessment

To illustrate the effects of rising climate risk on the political equilibrium, we provide a parameterisation based on the Dutch economy. The Netherlands is extremely prone to flooding. Specifically, 59% of land area prone to flooding and 48% of the houses are at risk of direct inundation (Klimaateffectatlas, n.d.). This area is densely populated, with about 70% of population residing here. The Netherlands also has a long history in flood risk management. Since flood risk is the main climatic impact in the Netherlands, the country offers an ideal closed-economy context for this study.

We run our model for the period 2010-2100, with each time period equal to 30 years. We conduct counterfactual analysis to demonstrate the effects of different scenarios of sea level rise, based on a low greenhouse gas emission-scenario (SSP1-1.9, SSP1-2.6), an intermediate greenhouse gas emission-scenario (SSP2-4.5) and a high greenhouse gas emission-scenario (SSP3-7.0) based on IPCC (2023).[20] We use the illustrative parameter

[20]The SSP$x-y$ scenarios describe different climate futures depending on socio-economic trends underlying scenario (x) and the approximate level of radiative forcing (in watts per square meter) resulting from the scenario in the year 2100 (y). Under SSP1-1.9 (SSP1-2.6), global warming remains

Parameter	Description	Value	Source
μ	Conditional expectation of land losses	1	Sea-level rise
$\bar{L}$	Housing stock	1	Normalization
ϕ	Fraction of high skilled labour	0.20	Statistics Netherlands
ω	Fraction of pessimists	0.51	Initial majority
q	Wage of high-income households	0.167	Van der Straten (2023)
r	Rate of interest	0.718	Van der Straten (2023)
w	Wage of low-income households	0.089	Van der Straten (2023)

TABLE 1: **Parameter Values.**

values stated in Table 1 (cf. Van der Straten, 2023).[21] [22]

For the purpose of illustrating the effects of the model, we let γ_t represent the fraction of the currently flood-safe houses that a future rise in sea levels would be at risk of flooding) (cf. Van der Straten, 2023). We rely on Bosker et al. (2019), who provide estimates of the number of currently flood-safe houses that a future rise in sea levels would put at risk of flooding of at least 50 centimetres for various levels of sea level rise.[23] To approximate the evolution of γ_t under different scenarios of sea level rise, we use the NASA Sea Level Projection Tool (Garner et al., 2021; Fox-Kemper et al., 2021; Garner et al., in prep.). This tool visualises the median projections of global and regional sea level rise, relative to a 1995-2014 baseline. These projections are based on IPCC (2023). We source the projections for the region IJmuiden, a port city in the Dutch province of North Holland.[24] By the end of the century, this region is expected to experience a sea level rise of 0.59 meters under an intermediate greenhouse gas emission scenario (SSP2-4.5). The evolution of climate risk under the different SSP trajectories is depicted in Figure A7 in Appendix A3. It indicates that more severe global warming scenarios put more houses at risk of

approximately below 1.5 (2.0) degrees Celsius above 1850-1900 in the year 2100, which is the target of the Paris Agreement. This scenario requires net zero CO2 emissions by 2050 (in the second half of the century). SSP2-4.5 is in line with the aggregate Nationally Determined Contribution emission levels by 2030. Under this scenario, global warming reaches approximately 2.7 degrees Celsius above 1850-1900 by the end of the century. SSP3-7.0 is a medium to high climate change scenario. Under this scenario, global warming reaches approximately 3.6 degrees Celsius above 1850-1900 by the end of the century.

[21] These are for the Netherlands 2010, or based on the terminal values in Van der Straten (2023).

[22] Since agents are risk neutral, we need the risk-free rate of interest, r. Since this is reported for a period of 30 years, the corresponding annual rate is $(1 + 0.718)^{1/30} - 1 = 1.18\%$.

[23] Bosker et al. (2019) provides estimates of the number of currently flood-safe houses that a future rise in sea levels would put at risk of flooding in a best-, medium-, and worst-case scenario with sea levels rising by 24, 100 or 150 cm, respectively, based on Dutch elevation data.

[24] While regional projections are provided for various Dutch regions, there is relatively little variability in their projection. Projections are provided for the regions Vlissingen, Roompot Buiten, Hoek van Holland, Maassluis, IJmuiden, Den Helder, West-Terschelling, Harlingen, Delfzijl and Borkum.

flooding: under the SSP1-2.6 scenario the fraction of houses at risk of flooding rises to 10 percent by the end of the century, while under the SSP 3-7.0 scenario this fraction rises to about 17 percent. Finally, we use the functional forms $v(L) = \ln(L)$ and $f\left(\bar{L}\right) = \ln\left(\bar{L}\right)$.

We provide the results under an initial stage without public adaptation, $X_t = 0$, and conduct counterfactual analysis under various climate change scenarios. Since the projected socioeconomic global changes are available up to the year 2100, we assume that a steady state is reached at that point and solve the model backwards from then on.

A. Evolution of the Housing Stock and House Prices

The supply of inhabitable houses falls exogenously in the model with climate risk, leading to a reduction in the housing stock by approximately 25 per cent at the end of the century in the SSP3-7.0 trajectory (see left panel of Figure A8). In accordance with Van der Straten (2023), the rising scarcity of habitable land translates into a sharp rise of house prices over time (right panel, Figure A8).

B. Evolution of the Political Equilibrium

The political equilibrium depends on the level of disagreement between climate realists and sceptics. A coalition between young sceptics and old realists only forms when their beliefs are sufficiently dispersed, but not too dispersed. Figure 3 illustrates the time paths of the upper and lower limits on belief dispersion (denoted as Θ) for which a coalition of young sceptics and old realists is stable, under different SSP scenarios. Assumption 1 sets the lower bound on Θ, representing the minimum level of belief dispersion at which old realists prefer to join forces with young rather than old sceptics. The blue-shaded area shows where Assumption 1 is *not* met, meaning that the belief gap is not wide enough to make the old realists' adaptation rate higher than that preferred by young sceptics. In this case, the old realists would rather form a coalition with the old sceptics. Hence, the political equilibrium that emerges is a coalition of the old.

In contrast, the pink- and yellow-shaded areas highlight regions where Assumption 1 is satisfied. Here, the belief dispersion is sufficient for old realists to prefer a coalition with young sceptics, as their adaptation rate is higher than the one preferred by the old sceptics. Old realists are then strictly better off if they form a coalition with young

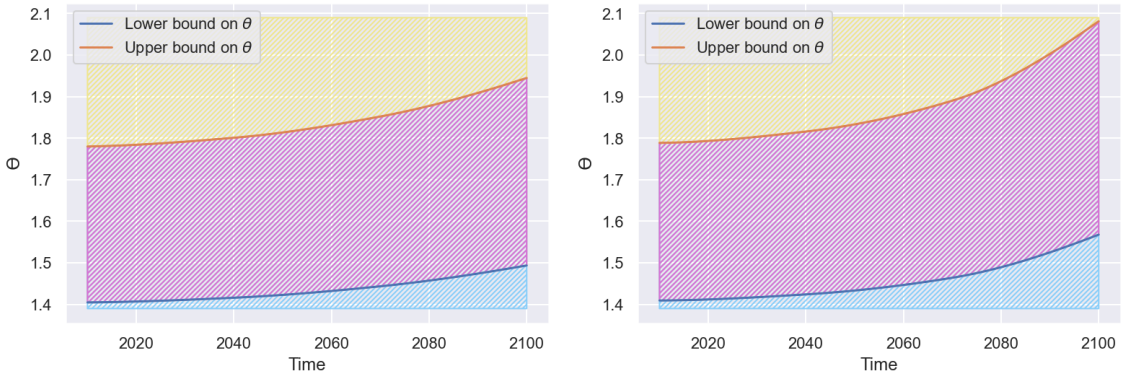


FIGURE 3: **Characterisation of the winning coalition over time**

KEY: JOINT EVOLUTION OF THE UPPER (PROPOSITION 2) AND LOWER (ASSUMPTION 3) BOUNDS ON DISPERSION IN BELIEFS FOR WHICH A COALITION OF YOUNG SCEPTICS AND OLD REALISTS PREVAILS (PINK-SHADED AREA). THE LEFT PANEL SHOWS THE EVOLUTION OF THE BOUNDS UNDER THE SSP1-2.6 AND THE RIGHT PANEL UNDER THE SSP3-7.0 SCENARIO.

sceptics. Proposition 1 provides the upper limit for Θ, defining the maximum level of belief dispersion at which young sceptics still prefer allying with old realists over old sceptics.[25] The yellow-shaded area shows where the condition in Proposition 1 is *not* met, meaning young sceptics would prefer to form a coalition with old sceptics. The pink-shaded areas, on the other hand, show where the condition is met, and where Assumption 1 holds. In this region, young sceptics gain more utility by forming a coalition with old realists.

As house prices rise, the preferred adaptation rate of young sceptics increases, making them more likely to favour a coalition with old realists rather than old sceptics. This weakens the condition in Proposition 1, causing the upper bound on belief dispersion to rise. In other words, this coalition remains internally stable for larger levels of belief dispersion over time. As a result, the region where a coalition of young sceptics and old realists dominates expands, especially as climate risk becomes more urgent and for more adverse climate change scenarios.

C. Political Tipping in Adaptation Rates

Based on the insights from Figure 3, we consider values for the dispersion in beliefs, Θ, such that the political equilibrium tips. The proposed adaptation rates rise as climate

[25] If utility of young sceptics, $\mathbb{E}_t(U^{Ys})$ is symmetric around the optimal adaptation rate, τ_t^{Ys*}, the bound in Proposition 2 can be approximated by $\tau_t^{Ys,Or} - \tau_t^{Ys*} \leq \tau_t^{Ys*} - \tau_t^{Ys,Os}$. We use this approximation to determine the upper bound in Figure 3.

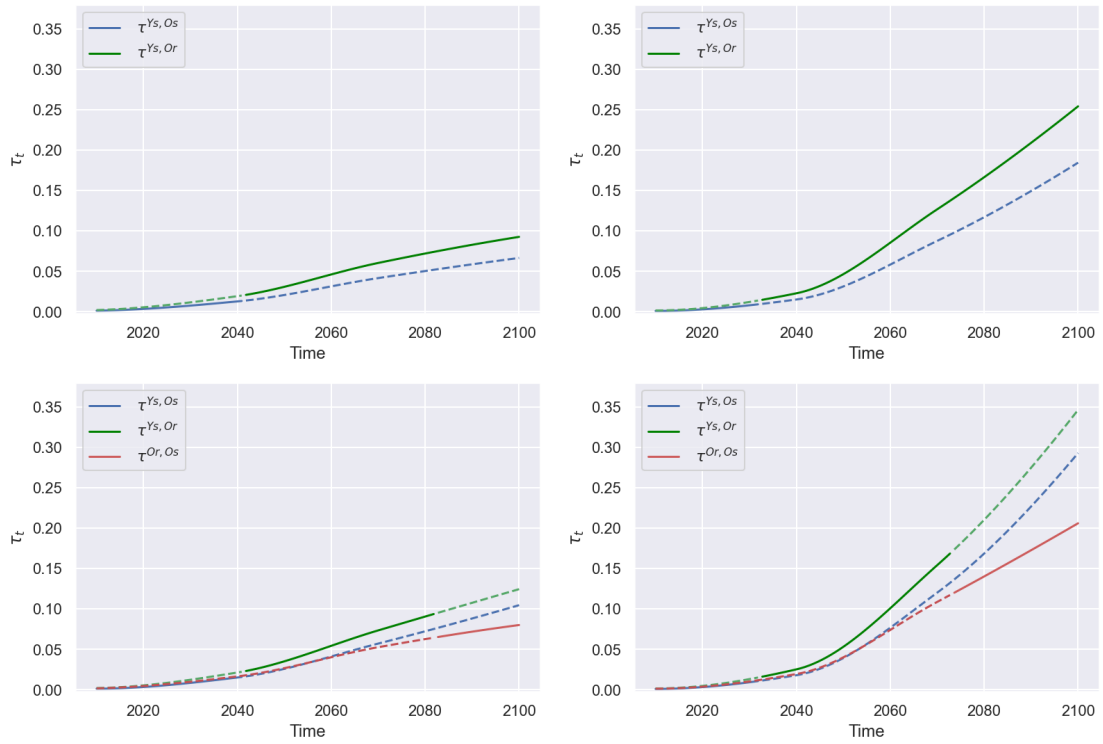


FIGURE 4: **Faster political tipping with faster learning about climate change**

KEY: ADAPTATION RATE WHEN THE POLITICAL EQUILIBRIUM TIPS AROUND 2040 UNDER THE SSP1-2.6 (LEFT PANEL) AND AROUND 2030 UNDER THE SSP3-7.0 (RIGHT PANEL) SCENARIOS UNDER A LOW SPEED OF LEARNING (UPPER GRAPHS) AND A HIGH SPEED OF LEARNING (LOWER GRAPHS).

risk increases over time. However, the outcome of the political process crucially matters for the level of public adaptation, as the adaptation rate proposed by a coalition of young sceptics and old realists is consistently higher than proposed by a coalition of sceptics. If learning is gradual, the political equilibrium shifts from a coalition of only sceptics to one of young sceptics and old realists around 2040 under the less severe climate change scenario. This tipping point marks a pivotal change in the proposed adaptation rate. As shown in Figure 4, the quantitative impact of this political shift moves forward in time under more severe climate change trajectories. It significantly shapes the overall adaptation strategy, precisely when the need for adaptation is greatest. The speed of learning matters crucially for the evolution of the political equilibrium. If there is no learning (see Figure A9 in Appendix A3), the tipping point occurs decades later. Conversely, if beliefs update rapidly, climate risk perceptions converge, and disagreement vanishes. As a consequence, the old emerge as the dominant political group, and the adaptation rate shifts down as the old internalise a smaller share of the benefits from future habitat preservation.

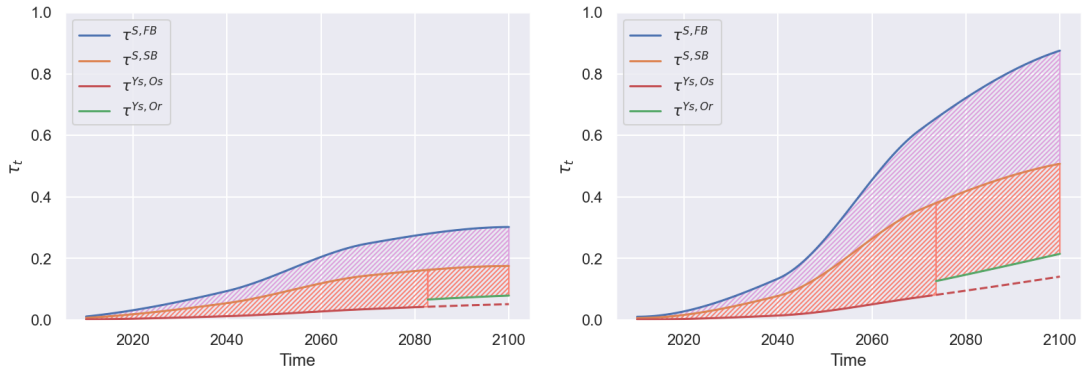


FIGURE 5: **Public adaptation gap and the tragedy of the horizon**

KEY: THE ADAPTATION GAP IF HETEROGENEOUS CLIMATE BELIEFS ARE IGNORED (ORANGE- AND PURPLE-SHADED AREAS) AND IF THEY ARE TAKEN INTO ACCOUNT (ORANGE-SHADED AREA), FOR THE SSP1–2.6 SCENARIOS (LEFT PANEL) AND THE SSP3–7.0 SCENARIO (RIGHT PANEL). THE ORANGE SHADED AREA CAPTURES THE COMPONENT OF THE GAP ATTRIBUTABLE TO THE "TRAGEDY OF THE HORIZON" EFFECT, WHILE THE PURPLE SHADED AREA REFLECTS THE ADDITIONAL GAP DRIVEN BY HETEROGENEITY IN CLIMATE CHANGE BELIEFS.

VII. Public Adaptation Gap

To compare the political economy equilibrium to the social optimum, we determine the optimal policy X_t that maximises utilitarian social welfare. We first consider the case where the social optimum is determined with realistic perceptions on the severity of climate risk only, $\theta_j = 1, \forall j$. The optimization problem of the social planner is then

$$\max_{X_t} \sum_{t=0}^{\infty} \left(\frac{1}{1+r}\right)^t \left((1+r)\left(\int_0^1 y_{i,t}^Y di + \int_0^1 y_{i,t}^O di - \frac{1}{2} X_t^{2*} \bar{L}_t\right) + v(\bar{L}_t) + f(\bar{L}_{t+1})\right)$$

$$s.t. \qquad \bar{L}_j = \bar{L}_t \prod_{\iota=t}^{j-1} \left(1 - (1 - X_\iota)\, \mu \gamma_{\iota+1}\right).$$

Proposition 2. *With realistic perceptions on the severity of climate risk, the socially optimal level of public adaptation equals*

$$X_t^* = \frac{\mu_L \gamma_{t+1}}{(1+r)} \sum_{j=t+1}^{\infty} \left(\frac{1}{1+r}\right)^{j-t} \left[-\frac{1}{2}(1+r) X_j^2 + v'(\bar{L}_j)\right] \prod_{\iota=t+1}^{j-1} \left(1 - (1 - X_\iota)\, \mu_L \gamma_{\iota+1}\right)$$
$$+ \left(f'\left(\bar{L}_{t+1}\right) + \sum_{j=t+1}^{\infty} \left(\frac{1}{1+r}\right)^{j-t} \left(f'(\bar{L}_{j+1})\right) \prod_{\iota=t+1}^{j} \left(1 - (1 - X_\iota)\, \mu_L \gamma_{\iota+1}\right)\right). \tag{8}$$

Proof: See Appendix A1.C.

A comparison between the socially optimal adaptation rate with the preferred adaptation rate of the young and old reveals that the socially optimal adaptation rate is higher. Households thus do not fully internalise the benefits of public adaptation. Since the old do not own housing capital, they do not respond to price incentives and thus do not take into consideration that public adaptation reduces the speed at which habitat shrinks. While the young partially internalise the impact of public adaptation on the evolution of the housing stock – through its capitalisation into house prices (Van der Straten, 2023) – the horizon they internalise remains limited. Specifically, they fail to account for the fact that preserving housing benefits *all* future generations, not just their offspring. In contrast, under the social optimum, the benefits associated with public adaptation are fully internalised across *each* subsequent generation. Hence, the private choice of adaptation does not equal the social optimum – even if all households were to have realistic perceptions on the severity of climate risk ($\theta_j = 1, \forall j$).

To quantify the public adaptation gap, we compare the socially optimal adaptation rate with the adaptation rates proposed by the prevailing coalitions over time. Figure 5 illustrates the evolution of this gap, with each panel corresponding to a distinct SSP$x-y$ trajectory. The blue line represents the socially optimal adaptation rate, determined under realistic perceptions of the efficacy of public policy. The green line depicts the adaptation rate set by a coalition of sceptics, while the red line shows the adaptation rate chosen after the political equilibrium shifts to a coalition of young sceptics and old realists. The public adaptation gap is visualised by the purple and orange shaded areas between these lines at any given time. A significant part of the adaptation gap arises from scepticism about the efficacy of public policy (purple-shaded area). However, even if all households shared realistic perceptions of, a residual adaptation gap would persist. This is because households primarily value the present and near-term supply of habitable land, failing to internalise the long-term benefits of public adaptation for future generations.
To decompose the adaptation gap, we also compute a belief-constrained (second-best) benchmark computed under the same feasibility set and timing as the political equilibrium (see Appendix A.1.C), which is represented by the orange line in Figure 5. The orange-shaded area corresponds to the "tragedy of the horizon" effect, highlighting the gap caused by the short-term focus of individual households. While sceptical political beliefs explain

a significant share of the adaptation gap, the tragedy of the horizon effect remains a substantial contributor. Over time, the adaptation gap widens further at an accelerating rate as the supply of habitable land diminishes. While this increases the urgency for public adaptation to preserve land for all future generations, the prevailing coalitions fall short of full internalisation, and thus do not fully address this increasing need.

VIII. Extension: The Role of Rising Income Inequality

We now allow for a different timing of events, so that income heterogeneity affects the preferences for public intervention. In this extension, old households observe their realised income before voting and adjust their preferred level of adaptation according to both their income position and their beliefs. Since the net benefits of public adaptation investments depend on households' income type, rising inequality affects policy preferences and the political equilibrium that prevails.

A. Old Households' Choice of Adaptation Rate

An old household, with beliefs $j \in \{r, s\}$ and income $y \in \{q, w\}$ maximises

$$\max_{\tau_t} \mathbb{E}_{j,t}\left(U\left(c_{i,t}, \bar{L}_{t+1}\right)\right) = \mathbb{E}_{j,t}\left(c_{i,t}\right) + f\left(\mathbb{E}_{j,t}\left(\bar{L}_{t+1}\right)\right)$$

$$\text{s.t.} \quad c_{i,t} \leq \left(1-\tau_t\right) y_i + \max\left\{p_t\left(1-\xi_{i,t}\right) L_{i,t-1} + \left(1+r^R_{t+1}\right) S_{i,t-1}, 0\right\}.$$

Lemma 4. *If the wage gap is smaller than the dispersion in beliefs (scaled by the marginal utilities of the future housing stock), i.e.,* $\frac{q}{w} < \frac{\theta_{r,t}}{\theta_{s,t}} \frac{\pi_{r,t}}{\pi_{s,t}}$*, then*

$$\tau^{O,r,l*} > \tau^{O,r,h*} > \tau^{O,s,l*} > \tau^{O,s,h*}.$$

Otherwise, $\tau^{O,r,l*} > \tau^{O,s,l*} > \tau^{O,r,h*} > \tau^{O,s,h*}$.

Since the investment in adaptation does not benefit the old households directly, the difference in the preferred adaptation rates of high- respectively low-income households is fully explained by differences in wages. As low-income, old households bear a smaller fraction of the investment costs associated with public adaptation, due to the proportionality of taxes, they favour a higher adaptation rate than high-income households.

B. Feasible Coalitions

The voting preferences of old now also depend on their income type, and coalitions must include (at least) three groups of households to form a majority. We summarise the set of feasible coalitions, and the adaptation rates that maximise the joint utility of each coalition, in Lemma A1 in Appendix A2.F. The wage gap, which determines the relative ordering of the adaptation rates preferred by the various groups of old households (see Lemma 5), also affects the set of feasible coalitions. In particular, a rise in economic inequality, as reflected by an increase in the wage gap, q/w, increases the adaptation rate preferred by the low-income, old sceptics relative to the rate preferred by the high-income, old realists.[26] This is because the relative reduction in their income lowers the fraction of the investment costs which are borne by the low-income households. Consequently, if the wage gap is sufficiently large, the preferences of pivotal voters align more closely with those of the low-income, old sceptics than with their previous coalition partners – the high-income, old realists. As a result, old sceptics become relevant in the formation of majority coalitions. This highlights how rising economic inequality reshapes the political equilibrium.

C. Evolution of the Political Equilibrium and Equilibrium Tipping

The political equilibrium that emerges depends again on the preferences of young sceptics. We evaluate the viability of the most ambitious coalition, determining the conditions under which young sceptics prefer to form a coalition that favours the highest attainable adaptation rate within our environment. If beliefs are not too dispersed, an equilibrium exists in which the economy tips to a political equilibrium characterised by this "high-ambition" coalition (see Proof of Proposition A2, in Appendix A1.C).

To study the evolution of the political equilibrium, we use a comparable parameterisation as before. We start from a case in which the wages of high- and low-income workers are equal, and reduce the wage of low-income workers disproportionately over time to reflect rising inequality. We let inequality increase gradually over time, picking up speed

[26] If economic inequality declines, this does not lead to a change in the relative ordering of the preferred adaptation rates of the old, unless economic inequality is very large at the onset. If the latter is the case, the political equilibrium tips between the same coalitions as outlined below, although in reverse order.

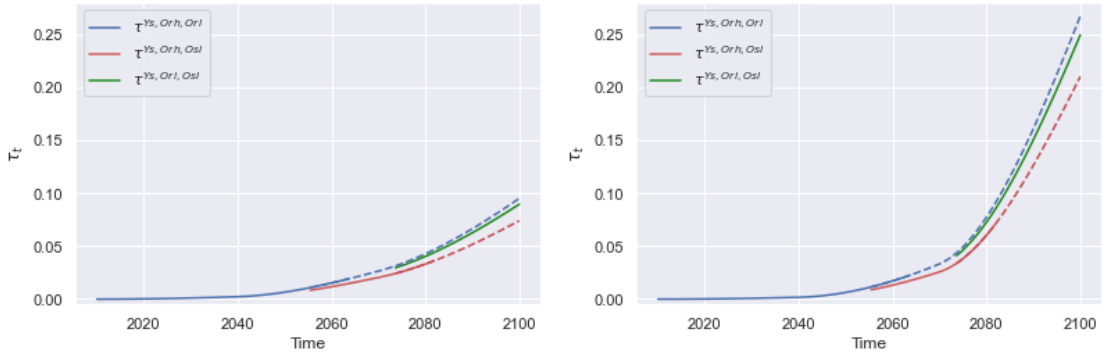


FIGURE 6: **Two political tipping points for the adaptation rate**

KEY: TIME PATHS FOR THE ADAPTATION RATE WHEN THE POLITICAL EQUILIBRIUM TIPS AROUND 2050, AND 2080, UNDER THE SSP1-2.6 4.5 (LEFT PANEL) AND THE SSP3-7.0 (RIGHT PANEL) SCENARIOS.

temporarily during the mid of the century. We also show the results for when the rise in the inequality accelerates in Appendix A3.B.

Political tipping again affects the prevailing adaptation rate, as shown in Figure 6. The panels reveal that the coalition of young sceptics and old realists prevails until 2060, after which the political equilibrium shifts to a less ambitious coalition. Once inequality is sufficiently high (see Lemma 5), the political equilibrium tips around 2080 to the high-ambition coalition, which includes the young sceptics and the low-income old. While the prevailing adaptation rate is higher after the second tipping point than in the case in which the political equilibrium does not tip, the prevailing adaptation rate is lower compared to the case in which inequality remains constant over time. The political backlash occurs due to tension between beliefs and income. Specifically, the low-income, old sceptics enter the new majority coalition, replacing the high-income, old realists. If inequality rises gradually, the difference in income between the groups of old households is not sufficient to offset the inclusion of a larger number of sceptics in the majority coalition. Hence, political tipping leads to *less* spending on public intervention in this case.

Escalating inequality Figure A10 in Appendix A3.B shows that, if the wage gap, q/w, rises at an accelerating rate, the effect of income on the adaptation rate dominates the effect due to sceptic beliefs. Then, the second tipping point leads to *more* public intervention. Thus, economic inequality plays a critical role in shaping the political feasibility of climate policy.

D. *Rising Inequality and the Young*

In our extension, old households know their income level and adjust their preferences accordingly, while the young remain under the Rawlsian veil of ignorance. However, as inequality rises, the young may view it more likely that they will be of the low-income type. While this does not change the composition of the political equilibrium that emerges, it does affect the speed at which the political equilibrium tips. As young households view it more likely that they are of the low-income type, their preferred adaptation rate rises.[27] Consequently, the preferences for adaptation of the young sceptics converge to those of the old realists, and diverge from those the old sceptics. Then, for relatively lower levels of climate risk, the young sceptics prefer to form a coalition with the old realists.

The timing of the second tipping point depends entirely on the evolution of the wage gap and how its size compares to the dispersion in beliefs. Hence, this timing remains unaffected by a change in the perceived probability of being of the low-income type.

Corollary 2. *If young households view it more likely that they are of the low-income type, the first political tipping point occurs sooner. Also, the likelihood that the second political tipping point occurs increases, but its timing is unaffected.*

IX. Conclusion

Climate change steadily raises the stakes of inaction by eroding habitat, inflating housing scarcity, and amplifying the economic damages faced by households. Our framework shows that these rising physical risks do not simply increase the level of desired adaptation – they reshape the political coalitions capable of delivering it. Even sceptical voters, faced with cumulating losses, gradually shift toward greater support for public intervention. Yet, this increased support is uneven: age, beliefs, and income interact in subtle ways, making political transitions slow, fragile, and subject to political tipping points.

[27] Suppose the young's perceived probability of being of the low-income type is $(1-\phi+\epsilon)$ with $\epsilon \in (0, \phi)$. Then, the preferred adaptation rate of a young household with beliefs θ_j becomes

$$\tau_t^{Ys*} = A \frac{[\phi q + (1-\phi)\, w]^2}{[(\phi-\epsilon)q + (1-\phi+\epsilon)\, w]^2} \left(\frac{\tilde{\theta}_{j,t}\left(p_{t+1} + \pi_{s,t}\right)}{(1+r)} \right)^2$$

The key driver of political tipping is the economic exposure of young sceptics. As climate damages shrink habitable land and push up house prices, the young bear a growing risk to their future housing consumption. Their preferences for adaptation thus rise faster than those of the old sceptics with whom they initially align. When beliefs are not too polarised, this shift pulls young sceptics into coalition with old realists, triggering a discrete jump toward more ambitious public adaptation. Crucially, this transition emerges endogenously from rising economic stakes – not from changes in values or ideology.

However, even this higher level of adaptation falls short of the social optimum, as households internalise only the benefits of adaptation to present and near-future generations. This "tragedy of the horizon" effect leads to a persistent adaptation gap even under the most favourable coalitions. Rising climate risk thus strengthens support for adaptation, but political incentives remain too myopic to align private preferences with long-run social welfare.

Rising inequality adds another layer of political complexity. As the income gap widens, the low-income, old voters – who bear a smaller share of tax costs yet face large climate exposures – become more willing to support adaptation. Inequality can thus create a second political tipping point. But its effect is ambiguous: gradual inequality produces political backlash by empowering low-income, climate sceptics who favour lower intervention, while rapidly escalating inequality pushes the same voters to demand greater public intervention. Inequality thus shapes not only support for adaptation but also the political feasibility of sustaining ambitious climate policy.

Finally, our analysis highlights that polarisation over climate policy may endure even as climate impacts intensify. In our framework, households gradually converge in their beliefs about climate risk, but modern political conflict increasingly centres on beliefs about the effectiveness and credibility of public intervention itself. Even with shared recognition of climate change, persistent ideological divisions over whether governments can deliver meaningful protection can block collective action. This shift from debating the reality of climate change to debating the value of public adaptation suggests that future political backlash may arise from institutional distrust rather than climate scepticism.

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A1. PROOF OF PROPOSITIONS

A. Proof of Proposition A1

Proposition A1. *Suppose climate risk rises in all future periods by a factor $\zeta > 1$, so that $\{\zeta\gamma_{t+1}, ..., \zeta\gamma_\infty\}$. Then, house prices rise in this factor ζ if*

$$-\frac{\frac{\partial v'(\bar{L}_j)}{\partial \bar{L}_j}\mathbb{E}\left(\bar{L}_j\right)}{v'\left(\bar{L}_j\right)}\frac{\sum_{\iota=t}^{j-1} X_\iota^*\gamma_{\iota+1}\prod_{\iota'=t,\iota'\neq\iota}^{j-1}\left(1-\left(1-X_{\iota'}^*\right)\mu\zeta\gamma_{\iota'+1}\right)}{\sum_{\iota=t}^{j-1}\int_0^1 X_\iota^*\tilde{\theta}_{j,\iota}dj\gamma_{\iota+1}\prod_{\iota'=t,\iota'\neq\iota}^{j-1}\left(1-\left(1-X_{\iota'}^*\right)\mu\zeta\int_0^1\tilde{\theta}_{j,\iota}dj\gamma_{\iota'+1}\right)} \geq 1. \tag{A1}$$

This condition becomes more stringent in $\int_0^1\tilde{\theta}_{j,\iota}dj$. For $\int_0^1\tilde{\theta}_{j,\iota}dj = 1$, this condition is as in Van der Straten (2023).

The price of housing capital in a given period t is

$$p_t^* = \frac{\left(1-\left(1-X_t^*\right)\mu\int_0^1\tilde{\theta}_{j,t}dj\gamma_{t+1}\right)p_{t+1} + v'(\bar{L}_t)}{(1+r)}. \tag{A2}$$

Forward substitution gives

$$p_t^* = \sum_{j=t}^{\infty}\left(\frac{1}{1+r}\right)^{j-t+1}\left[v'\left(\bar{L}_j\right)\right]\prod_{\iota=t}^{j-1}\left(1-\left(1-X_t^*\right)\mu\int_0^1\tilde{\theta}_{j,t}dj\gamma_{\iota+1}\right), \tag{A3}$$

where

$$\bar{L}_j = \bar{L}_t\prod_{\iota=t}^{j-1}\left(1-\left(1-X_t^*\right)\mu\gamma_{\iota+1}\right). \tag{A4}$$

Suppose climate risk increases in all future periods, i.e. $\{\gamma_{t+1}, ..., \gamma_\infty\}$ by some factor $\zeta > 0$, i.e. $\{\zeta\gamma_t, ..., \zeta\gamma_\infty\}$.

Then, the first-order optimality for p_t with respect to ζ is

$$\begin{aligned}\frac{\partial p_t}{\partial\zeta} = &\sum_{j=t}^{\infty}\left(\frac{1}{1+r}\right)^{j-t+1}\frac{\partial v'(\bar{L}_j)}{\partial\bar{L}_j}\frac{\partial\bar{L}_j}{\partial\zeta}\prod_{\iota=t}^{j-1}\left(1-\left(1-X_\iota^*\right)\mu\zeta\int_0^1\tilde{\theta}_{j,\iota}dj\gamma_{\iota+1}\right) \\ &+ v'\left(\bar{L}_j\right)\frac{\partial}{\partial\zeta}\left(\prod_{\iota'=t}^{j-1}\left(1-\left(1-X_{\iota'}^*\right)\mu\zeta\int_0^1\tilde{\theta}_{j,\iota}dj\gamma_{\iota'+1}\right)\right),\end{aligned} \tag{A5}$$

where

$$\frac{\partial \bar{L}_j}{\partial \zeta} = -\mu \bar{L}_t \sum_{\iota=t}^{j-1} (1 - X_\iota^*) \gamma_{\iota+1} \prod_{\iota'=t, \iota' \neq \iota}^{j-1} \left(1 - (1 - X_{\iota'}^*) \mu \zeta \gamma_{\iota'+1}\right) \tag{A6}$$

and

$$\begin{aligned} &\frac{\partial}{\partial \zeta} \left(\prod_{\iota'=t}^{j-1} \left(1 - (1 - X_{\iota'}^*) \mu \zeta \int_0^1 \tilde{\theta}_{j,\iota} dj \gamma_{\iota'+1} \right) \right) \\ &= -\mu \int_0^1 \tilde{\theta}_{j,\iota} dj \sum_{\iota=t}^{j-1} (1 - X_\iota^*) \gamma_{\iota+1} \prod_{\iota'=t, \iota' \neq \iota}^{j-1} \left(1 - (1 - X_{\iota'}^*) \mu \zeta \int_0^1 \tilde{\theta}_{j,\iota} dj \gamma_{\iota'+1} \right). \end{aligned} \tag{A7}$$

Define

$$\mathbb{E}\left(\bar{L}_j\right) = \bar{L}_t \prod_{\iota=t}^{j-1} \left(1 - (1 - X_\iota^*) \mu \int_0^1 \tilde{\theta}_{j,\iota} dj \gamma_{\iota+1} \right). \tag{A8}$$

Then, this becomes

$$\begin{aligned} \frac{\partial p_t}{\partial \zeta} = &-\mu \sum_{j=t}^{\infty} \left(\frac{1}{1+r} \right)^{j-t+1} \frac{\partial v'(\bar{L}_j)}{\partial \bar{L}_j} \mathbb{E}\left(\bar{L}_j\right) \sum_{\iota=t}^{j-1} (1 - X_\iota^*) \gamma_{\iota+1} \prod_{\iota'=t, \iota' \neq \iota}^{j-1} \left(1 - (1 - X_{\iota'}^*) \mu \zeta \gamma_{\iota'+1}\right) \\ &+ v'\left(\bar{L}_j\right) \int_0^1 \tilde{\theta}_{j,\iota} dj \sum_{\iota=t}^{j-1} (1 - X_\iota^*) \gamma_{\iota+1} \prod_{\iota'=t, \iota' \neq \iota}^{j-1} \left(1 - (1 - X_{\iota'}^*) \mu \zeta \int_0^1 \tilde{\theta}_{j,\iota} dj \gamma_{\iota'+1} \right). \end{aligned} \tag{A9}$$

This expression is positive if

$$-\frac{\frac{\partial v'(\bar{L}_j)}{\partial \bar{L}_j} \mathbb{E}\left(\bar{L}_j\right)}{v'\left(\bar{L}_j\right)} \frac{\sum_{\iota=t}^{j-1} (1 - X_\iota^*) \gamma_{\iota+1} \prod_{\iota'=t, \iota' \neq \iota}^{j-1} \left(1 - (1 - X_{\iota'}^*) \mu \zeta \gamma_{\iota'+1}\right)}{\sum_{\iota=t}^{j-1} \int_0^1 \tilde{\theta}_{j,\iota} dj \left(1 - X_\iota^*\right) \gamma_{\iota+1} \prod_{\iota'=t, \iota' \neq \iota}^{j-1} \left(1 - (1 - X_{\iota'}^*) \mu \zeta \int_0^1 \tilde{\theta}_{j,\iota} dj \gamma_{\iota'+1} \right)} \geq 1. \tag{A10}$$

The derived condition is less stringent than the one in Van der Straten (2023), i.e., $-\frac{\frac{\partial v'(\bar{L}_j)}{\partial \bar{L}_j} \bar{L}_j}{v'(\bar{L}_j)} \geq 1$, if

$$\frac{\bar{L}_j}{\mathbb{E}\left(\bar{L}_j\right)} \leq \frac{\sum_{\iota=t}^{j-1} (1 - X_\iota^*) \gamma_{\iota+1} \prod_{\iota'=t, \iota' \neq \iota}^{j-1} \left(1 - (1 - X_{\iota'}^*) \mu \zeta \gamma_{\iota'+1}\right)}{\sum_{\iota=t}^{j-1} \int_0^1 \tilde{\theta}_{j,\iota} dj \left(1 - X_\iota^*\right) \gamma_{\iota+1}) \prod_{\iota'=t, \iota' \neq \iota}^{j-1} \left(1 - (1 - X_{\iota'}^*) \mu \zeta \int_0^1 \tilde{\theta}_{j,\iota} dj \gamma_{\iota'+1} \right)}. \tag{A11}$$

This becomes

$$\sum_{\iota=t}^{j-1} \left(\frac{\int_0^1 \tilde{\theta}_{j,\iota} dj \left(1 - X_\iota^*\right) \gamma_{\iota+1}}{\left(1 - (1 - X_\iota^*) \mu \zeta \int_0^1 \tilde{\theta}_{j,\iota} dj \gamma_{\iota+1} \right)} \right) \leq \sum_{\iota=t}^{j-1} \left(\frac{(1 - X_\iota^*) \gamma_{\iota+1}}{(1 - (1 - X_\iota^*) \mu \zeta \gamma_{\iota+1})} \right), \tag{A12}$$

which is always satisfied as $\int_0^1 \tilde{\theta}_{j,\iota} dj \leq 1$.

B. *Proof of Proposition 1*

Young sceptics prefer to form a coalition with the old realists rather than with the old sceptics if

$$\mathbb{E}_t\left(U_{Ys}\left(\tau^{Ys,Or*}\right)\right) > \mathbb{E}_t\left(U_{Ys}\left(\tau^{Ys,Os*}\right)\right). \tag{A13}$$

Using that

$$v'\left(L_{Ys,t}\right) = (1+r)p_t - \left(1-\left(1-X_t\right)\mu\theta_{Ys,t}\gamma_{t+1}\right)p_{t+1}$$

and assuming $v\left(L_{i,t}\right) = \ln\left(L_{it}\right)$, the relevant condition becomes

$$\begin{aligned} &\underbrace{v\left(L_{Ys,t}\left(\tau^{Ys,Or*}\right)\right) - v\left(L_{Ys,t}\left(\tau^{Ys,Os*}\right)\right)}_{(i)>0} \\ &+ \underbrace{f\left(\mathbb{E}_{s,t}\left(\bar{L}_{t+1}\left(\tau^{Ys,Or*}\right)\right)\right) - f\left(\mathbb{E}_{s,t}\left(\bar{L}_{t+1}\left(\tau^{Ys,Os*}\right)\right)\right)}_{(ii)>0} \\ &> (1+r)\underbrace{\left(\tau^{Ys,Or*} - \tau^{Ys,Os*}\right)}_{(iii)>0} y_{Ys,t}. \end{aligned} \tag{A14}$$

Substituting the expressions for $\tau^{Ys,Or*}, \tau^{Ys,Os*}$ and rewriting gives

$$\begin{aligned} &\left(\frac{\left(\omega\tilde{\theta}_{s,t}p_{t+1} + \pi_{r,s,t}\left(\omega\tilde{\theta}_{s,t} + (1-\omega)\tilde{\theta}_{r,t}\right)\right)}{(1+\omega r)}\right)^2 - \left(\frac{\tilde{\theta}_{s,t}\left(\frac{1}{2}p_{t+1} + \pi_{s,t}\right)}{\left(1+\frac{1}{2}r\right)}\right)^2 \\ &< \frac{1}{\bar{L}_t\left(\mu\gamma_{t+1}\right)^2}\frac{\Delta_\tau v\left(L_{Ys,t}\right) + \Delta_\tau f\left(\mathbb{E}_{s,t}\left(\bar{L}_{t+1}\right)\right)}{(1+r)}, \end{aligned} \tag{A15}$$

where

$$\Delta_\tau v\left(L_{Ys,t}\right) = v\left(L_{Ys,t}\left(\tau^{Ys,Or*}\right)\right) - v\left(L_{Ys,t}\left(\tau^{Ys,Os*}\right)\right)$$

and

$$\Delta_\tau f\left(\mathbb{E}_{s,t}\left(\bar{L}_{t+1}\right)\right) = f\left(\mathbb{E}_{s,t}\left(\bar{L}_{t+1}\left(\tau^{Ys,Or*}\right)\right)\right) - f\left(\mathbb{E}_{s,t}\left(\bar{L}_{t+1}\left(\tau^{Ys,Os*}\right)\right)\right).$$

Denote by

$$B \equiv B\left(\bar{L}_t, \gamma_{t+1}, \Delta_\tau v\left(L_{Ys,t}\right), \Delta_\tau f\left(\mathbb{E}_{s,t}\left(\bar{L}_{t+1}\right)\right)\right) = \frac{1}{\bar{L}_t\left(\mu\gamma_{t+1}\right)^2}\frac{\Delta_\tau v\left(L_{Ys,t}\right) + \Delta_\tau f\left(\mathbb{E}_{s,t}\left(\bar{L}_{t+1}\right)\right)}{(1+r)}.$$

This allows us to rewrite the condition as

$$\frac{\omega^2}{(1+\omega r)^2}\left(p_{t+1}+\pi_{r,s,t}\left(1+\frac{(1-\omega)}{\omega}\frac{\tilde{\theta}_{r,t}}{\tilde{\theta}_{s,t}}\right)\right)^2 < \frac{B}{\tilde{\theta}_{s,t}^2}+\frac{1}{\left(1+\frac{1}{2}r\right)^2}\left(\frac{1}{2}p_{t+1}+\pi_{s,t}\right)^2, \tag{A16}$$

which can be simplified to obtain

$$p_{t+1}+\pi_{r,s,t}\left(1+\frac{(1-\omega)}{\omega}\frac{\tilde{\theta}_{r,t}}{\tilde{\theta}_{s,t}}\right) < \frac{1+\omega r}{\omega}\sqrt{\left(\frac{B}{\tilde{\theta}_{s,t}^2}+\frac{1}{\left(1+\frac{1}{2}r\right)^2}\left(\frac{1}{2}p_{t+1}+\pi_{s,t}\right)^2\right)}. \tag{A17}$$

Then, the young sceptics prefer to form a coalition with the old realists if

$$\tilde{\Theta} < \left(\frac{1}{\pi_{r,s,t}}\left(\frac{1+\omega r}{(1-\omega)}\sqrt{\left(\frac{B}{\tilde{\theta}_{s,t}^2}+\frac{1}{\left(1+\frac{1}{2}r\right)^2}\left(\frac{1}{2}p_{t+1}+\pi\right)^2\right)}-p_{t+1}\right)-1\right). \tag{A18}$$

Otherwise, we have that

$$\mathbb{E}_t\left(U_{Ys}\left(\tau^{Ys,Or*}\right)\right) < \mathbb{E}_t\left(U_{Ys}\left(\tau^{Ys,Os*}\right)\right) \tag{A19}$$

and a coalition of young sceptics and old sceptics prevails.

C. Proof of Proposition 2

In the social optimum, the severity of climate risk is fully internalised, i.e. $\theta_j = 1, \forall j$. Then, the optimal choice of public adaptation is determined by maximising a utilitarian social welfare function, i.e.,

$$\max_{X_t}\sum_{t=0}^{\infty}\left(\frac{1}{1+r}\right)^t\left((1+r)\left(\int_0^1 y_{i,t}^Y di+\int_0^1 y_{i,t}^O di-\frac{1}{2}X_t^{2*}\bar{L}_t\right)+v(\bar{L}_t)+f\left(\bar{L}_{t+1}\right)\right) \tag{A20}$$

$$\text{s.t.} \qquad \bar{L}_j = \bar{L}_t\prod_{\iota=t}^{j-1}\left(1-(1-X_\iota)\,\mu\gamma_{\iota+1}\right).$$

The first order optimality condition for X_t is

$$\begin{aligned}(1+r)X_t^*\bar{L}_t = {} & \mu\gamma_{t+1}\bar{L}_t f'\left(\bar{L}_{t+1}\right) \\ & +\sum_{j=t+1}^{\infty}\left(\frac{1}{1+r}\right)^{j-t}\left(\left[-\frac{1}{2}(1+r)X_j^2+v'(\bar{L}_j)\right]\frac{\partial\bar{L}_j}{\partial X_t}+f'\left(\bar{L}_{j+1}\right)\frac{\partial\bar{L}_{j+1}}{\partial X_t}\right).\end{aligned} \tag{A21}$$

Using that

$$\frac{\partial \bar{L}_j}{\partial X_t} = \mu_L \gamma_{t+1} \bar{L}_t \prod_{\iota=t+1}^{j-1} \left(1 - (1 - X_\iota)\, \mu_L \gamma_{\iota+1}\right), \tag{A22}$$

the socially optimal public choice of adaptation becomes

$$X_t^*|_{\theta_j=1 \forall j} = \underbrace{\frac{\mu_L \gamma_{t+1}}{(1+r)} \sum_{j=t+1}^{\infty} \left(\frac{1}{1+r}\right)^{j-t} \left[-\frac{1}{2}(1+r)X_j^2 + v'(\bar{L}_j)\right] \prod_{\iota=t+1}^{j-1} \left(1 - (1 - X_\iota)\, \mu_L \gamma_{\iota+1}\right)}_{p_{t+1}|\theta_j=1, \forall j} \tag{A23}$$

$$+ \left(f'\left(\bar{L}_{j+1}\right) + \sum_{j=t+1}^{\infty} \left(\frac{1}{1+r}\right)^{j-t} f'\left(\bar{L}_{j+1}\right) \prod_{\iota=t+1}^{j} \left(1 - (1 - X_\iota)\, \mu_L \gamma_{\iota+1}\right) \right).$$

Decomposing the Adaptation Gap We solve for the optimum in the case in which the heterogeneity in the perceptions about climate change is accounted for, i.e. $\theta_{j,t}$:

$$\max_{X_t} \sum_{t=0}^{\infty} \left(\frac{1}{1+r}\right)^t \left((1+r) \left(\int_0^1 y_{i,t}^Y di + \int_0^1 y_{i,t}^O di - \frac{1}{2} X_t^{2*} \bar{L}_t \right) + v(\bar{L}_t) + f\left(\bar{L}_{t+1}\right) \right) \tag{A24}$$

$$s.t. \qquad \mathbb{E}\left(\bar{L}_j\right) = \bar{L}_t \prod_{\iota=t}^{j-1} \left(1 - (1 - X_\iota)\, \mu \int_0^1 \tilde{\theta}_{j,t} dj \gamma_{\iota+1}\right).$$

In this case, the optimal level of public adaptation is

$$X_t^* = \frac{\mu_L \int_0^1 \tilde{\theta}_{j,t} dj \gamma_{t+1}}{(1+r)} \sum_{j=t+1}^{\infty} \left(\frac{1}{1+r}\right)^{j-t} \left[-\frac{1}{2}(1+r)X_j^2 + v'(\bar{L}_j)\right] \prod_{\iota=t+1}^{j-1} \left(1 - (1 - X_\iota)\, \mu_L \int_0^1 \tilde{\theta}_{j,t} dj \gamma_{\iota+1}\right)$$

$$+ \left(f'\left(\bar{L}_{j+1}\right) + \sum_{j=t+1}^{\infty} \left(\frac{1}{1+r}\right)^{j-t} f'\left(\bar{L}_{j+1}\right) \prod_{\iota=t+1}^{j} \left(1 - (1 - X_\iota)\, \mu_L \int_0^1 \tilde{\theta}_{j,t} dj \gamma_{\iota+1}\right) \right) \tag{A25}$$

D. Proof of Proposition A2

Proposition A2. *Let there be fewer young than old, the sceptics represent a majority ($\omega > 0.5$), high-income households are a minority ($\phi < 0.5$), Assumption 2(*) (see Lemma A1) is satisfied, $v(L_{j,t}) = ln(L_{j,t})$, and $f(\bar{L}_{t+1}) = ln(\bar{L}_{t+1})$. Then, if inequality is sufficiently low and*

$$\frac{1}{(1+\omega r)^2}\left(p_{t+1}+\left(1+\frac{(1-\omega)}{\omega}\frac{\tilde{\theta}_{r,t}}{\tilde{\theta}_{s,t}}\right)\pi_{s,r,t}\right)^2 \tag{A26}$$
$$-\left(\frac{[\phi q+(1-\phi)\,w]}{(1+\omega r)\,\phi q+(2+r)\omega\,(1-\phi)\,w}\right)^2$$
$$\left(p_{t+1}+\left((2-\phi)+\phi\frac{(1-\omega)}{\omega}\frac{\tilde{\theta}_{r,t}}{\tilde{\theta}_{s,t}}\right)\pi_{r,s,t}\right)^2$$
$$<\frac{\Delta v\left(L_{Ys,t}\right)+\Delta f\left(E_{P,t}\left(\bar{L}_{t+1}\right)\right)}{(1+r)}\frac{1}{(\omega\tilde{\theta}_{s,t}\mu\gamma_{t+1}\bar{L}_t)^2},$$

the political economy equilibrium is characterised by a coalition of young sceptics and old realists. The adaptation rate proposed by this coalition equals

$$\tau_t^{Ys,Orh,Orl*}=A\left(\frac{\omega\tilde{\theta}_{s,t}p_{t+1}+\left(\omega\tilde{\theta}_{s,t}+(1-\omega)\tilde{\theta}_{r,t}\right)\pi_{r,s,t}}{(1+\omega r)}\right)^2. \tag{A27}$$

If economic inequality is high and

$$\left(\frac{\left[p_{t+1}+\left((2-\phi)+\frac{(1-\omega)}{\omega}(1-\phi)\frac{\tilde{\theta}_{r,t}}{\tilde{\theta}_{s,t}}\right)\pi_{r,s,t}\right]}{\omega\,(1+r)\,[\phi q+(1-\phi)\,w]+(1-\phi)\,w}\right)^2 \tag{A28}$$
$$-\left(\frac{\left[p_{t+1}+\left((2-\phi)+\frac{(1-\omega)}{\omega}\phi\frac{\tilde{\theta}_{r,t}}{\tilde{\theta}_{s,t}}\right)\pi_{r,s,t}\right]}{(1+\omega r)\,\phi q+(2+r)\omega\,(1-\phi)\,w}\right)^2$$
$$<\frac{\Delta v\left(L_{Ys,t}\right)+\Delta f\left(E_{P,t}\left(\bar{L}_{t+1}\right)\right)}{(1+r)[\phi q+(1-\phi)\,w]}\frac{1}{(\omega\tilde{\theta}_{s,t}\mu\gamma_{t+1}\bar{L}_t)^2}$$

holds, the political economy equilibrium is characterised by a coalition of young sceptics and the low-income, old. The adaptation rate proposed by this coalition equals

$$\tau_t^{Ys,Orl,Osl*}=A[\phi q+(1-\phi)\,w]^2\left(\frac{\omega\tilde{\theta}_{s,t}p_{t+1}+\left(\omega(2-\phi)\tilde{\theta}_{s,t}+(1-\omega)(1-\phi)\tilde{\theta}_{r,t}\right)\pi_{s,r,t}}{\omega\,(1+r)\,[\phi q+(1-\phi)\,w]+(1-\phi)\,w}\right)^2. \tag{A29}$$

Alternatively, Assumption 2 is not satisfied (in either case), the political economy equilibrium is characterised by the mixed coalition. Then, the adaptation rate proposed equals

$$\tau_t^{Ys,Orh,Osl*}=A[\phi q+(1-\phi)\,w]^2\left(\frac{\omega\tilde{\theta}_{s,t}p_{t+1}+\left(\omega(2-\phi)\tilde{\theta}_{s,t}+(1-\omega)\phi\tilde{\theta}_{r,t}\right)\pi_{r,s,t}}{\omega(1+r)[\phi q+(1-\phi)\,w]+(1-\omega)\phi q+\omega(1-\phi)w}\right)^2. \tag{A30}$$

Low Economic Inequality Young sceptics prefer a coalition with high-income and low-income, old realists rather than with high-income, old realists and low-income, old sceptics if

$$\mathbb{E}_t\left(U_{Ys}\left(\tau^{Ys,Orh,Orl*}\right)\right) > \mathbb{E}_t\left(U_{Ys}\left(\tau^{Ys,Orh,Osl*}\right)\right). \tag{A31}$$

Using similar steps as in the Proof of Proposition 2, the relevant condition becomes

$$\begin{aligned}
&\frac{1}{(1+\omega r)^2}\left(p_{t+1}+\left(1+\frac{(1-\omega)}{\omega}\frac{\tilde{\theta}_{r,t}}{\tilde{\theta}_{s,t}}\right)\pi_{s,r,t}\right)^2 \\
&-\left(\frac{[\phi q+(1-\phi)w]}{(1+\omega r)\phi q+(2+r)\omega(1-\phi)w}\right)^2 \\
&\left(p_{t+1}+\left((2-\phi)+\phi\frac{(1-\omega)}{\omega}\frac{\tilde{\theta}_{r,t}}{\tilde{\theta}_{s,t}}\right)\pi_{r,s,t}\right)^2 \\
&<\frac{\Delta v\left(L_{Ys,t}\right)+\Delta f\left(E_{P,t}\left(\bar{L}_{t+1}\right)\right)}{(1+r)}\frac{1}{(\omega\tilde{\theta}_{s,t}\mu\gamma_{t+1}\bar{L}_t)^2}.
\end{aligned} \tag{A32}$$

High Economic Inequality Young sceptics prefer a coalition with the low-income, old realists and low-income, old sceptics rather than with the high-income, old realists and low-income, old sceptics if

$$\mathbb{E}_t\left(U_{Ys}\left(\tau^{Ys,Orl,Osl*}\right)\right) > \mathbb{E}_t\left(U_{Ys}\left(\tau^{Ys,Orh,Osl*}\right)\right). \tag{A33}$$

Using similar steps as in Proof of Proposition 2, the relevant condition becomes

$$\begin{aligned}
&\left(\frac{\left[p_{t+1}+\left((2-\phi)+\frac{(1-\omega)}{\omega}(1-\phi)\frac{\tilde{\theta}_{r,t}}{\tilde{\theta}_{s,t}}\right)\pi_{r,s,t}\right]}{\omega(1+r)[\phi q+(1-\phi)w]+(1-\phi)w}\right)^2 \\
&-\left(\frac{\left[p_{t+1}+\left((2-\phi)+\frac{(1-\omega)}{\omega}\phi\frac{\tilde{\theta}_{r,t}}{\tilde{\theta}_{s,t}}\right)\pi_{r,s,t}\right]}{(1+\omega r)\phi q+(2+r)\omega(1-\phi)w}\right)^2 \\
&<\frac{\Delta v\left(L_{Ys,t}\right)+\Delta f\left(E_{P,t}\left(\bar{L}_{t+1}\right)\right)}{(1+r)[\phi q+(1-\phi)w]}\frac{1}{(\omega\tilde{\theta}_{s,t}\mu\gamma_{t+1}\bar{L}_t)^2}.
\end{aligned} \tag{A34}$$

These conditions implicitly define an upper bound on the degree of dispersion in beliefs for which young sceptics prefer to form a coalition with high-income and low-income, old realists, respectively, low-income, old realists and low-income, old sceptics. If this

condition is not satisfied (in either case), a coalition of young sceptics, high-income, old realists, and low-income, old sceptics prevails.

A2. DERIVATION OF LEMMAS

A. Derivation of Lemma 1

Young Households Young households favour an adaptation rate that maximises their expected lifetime utility, i.e.,

$$\max_{\tau_t} \mathbb{E}\left(U\left(L_{j,t}, c_{i,t+1}, X_t\right)\right) = v\left(L_{j,t}\right) + \mathbb{E}_{j,t}\left(c_{i,t+1}\right) + f\left(\mathbb{E}_{j,t}\left(\bar{L}_{t+1}\right)\right) \tag{A35}$$

$$\begin{aligned} s.t. \quad & (1-\tau_t)\, y_{i,t} \leq p_t L_{j,t} + S_{i,t} \\ & c_{i,t+1} \leq (1-\tau_{t+1})\, y_i + \max\left\{p_{t+1}\left(1-\xi_{i,t+1}\right) L_{j,t} + \left(1+r^R_{t+1}\right) S_{i,t}, 0\right\} \\ & \tau_t \geq 0, \end{aligned}$$

where $c_{i,t+1}$ is consumption of household i in period $t+1$ and $\mathbb{E}_t$ denotes expectations formed at date t.

Given the probability of default, the expectation of household i's consumption in period $t+1$, $c_{i,t+1}$, as formed at date t, becomes

$$\mathbb{E}_t\left(c_{i,t+1}\right) = G\left(\hat{\xi}_{i,t+1}\right)\left(p_{t+1}\left(1-\mathbb{E}\left(\xi_{i,t+1}|\xi_{t+1} \leq \hat{\xi}_{i,t+1}\right)\right) L_{j,t} + (1+r^R_{t+1}) S_{i,t}\right). \tag{A36}$$

No arbitrage requires that the expected payoff of holding household debt to be equal to the riskless return earned on savings, i.e.,

$$(1+r)(-S_{i,t}) = G\left(\hat{\xi}_{i,t+1}\right)(1+r^R_{t+1})(-S_{i,t}) + \left(1-G\left(\hat{\xi}_{i,t+1}\right)\right) p_{t+1}\left(1-\mathbb{E}\left(\xi_{i,t+1}|\xi_{i,t+1} > \hat{\xi}_{i,t+1}\right)\right) L_{j,t}, \tag{A37}$$

where the expected payoff of holding household debt is equal to the repayment of the loan with interest in case the household does not default and the revenue from selling the collateral in case of default. Then, the expectation of household i's consumption in period $t+1$, $c_{i,t+1}$, as formed at date t, becomes

$$\mathbb{E}_{j,t}\left(c_{i,t+1}\right) = (1+r)(S_{i,t}) + p_{t+1}\left(1-\mathbb{E}_{j,t}\left(\xi_{i,t+1}\right)\right) L_{j,t}. \tag{A38}$$

Using that $\mathbb{E}_{j,t}(\xi_{i,t+1}) = (1 - X_t)\,\mu\theta_{j,t}\gamma_{t+1}$, the household optimization problem can be written as

$$\begin{aligned}\max_{\tau_t} \mathbb{E}\left(U\left(L_{j,t}, c_{i,t+1}, X_t\right)\right) &= (1+r)\left((1-\tau_t)\,y_{i,t} - p_t L_{j,t}\right) \\ &\quad + p_{t+1}\left(1 - (1 - X_t)\,\mu\theta_{j,t}\gamma_{t+1}\right)L_{j,t} + v\left(L_{j,t}\right) + f\left(\mathbb{E}_{j,t}\left(\bar{L}_{t+1}\right)\right) \\ \text{s.t.} \quad \tau_t &\geq 0.\end{aligned} \tag{A39}$$

We abstract from path-dependency in public policy (i.e. $\partial\tau_{t+1}/\partial\tau_t = 0$). We define

$$\pi_{j,t} \equiv f(\mathbb{E}_{j,t}(\bar{L}_{t+1}))/\partial\,\mathbb{E}_{j,t}(\bar{L}_{t+1}), \tag{A40}$$

and, for notational simplicity, we denote by $\tilde{\theta}_{j,t} \equiv \frac{\theta_{j,t}L^*_{j,t}}{\bar{L}_t}$ the belief-weighted landholdings of household j at time t .[28] Then, the first-order optimality condition for τ_t is

$$\begin{aligned}&-(1+r)y_{i,t} + \mu\tilde{\theta}_{j,t}\gamma_{t+1}\bar{L}_t\left(p_{t+1} + \pi_{j,t}\right)\frac{\partial X_t}{\partial\tau_t} + \\ &\underbrace{\left[-(1+r)p_t + p_{t+1}\left(1 - (1 - X_t)\,\mu\theta_j\gamma_{t+1}\right) + \frac{\partial v(L_{j,t})}{\partial L_{j,t}}\right]}_{=0}\frac{\partial L_{j,t}}{\partial\tau_t} = 0,\end{aligned} \tag{A41}$$

where

$$\frac{\partial X_t}{\partial\tau_t} = \sqrt{\frac{[\phi q + (1-\phi)\,w]}{\tau_t\bar{L}_t}} \geq 0. \tag{A42}$$

Then, the optimal choice of adaptation rate of a young household of belief type j is

$$\tau_t^{Yj*} = \frac{\bar{L}_t}{[\phi q + (1-\phi)\,w]}\left(\frac{\tilde{\theta}_j\mu\gamma_{t+1}\left(p_{t+1} + \pi_{j,t}\right)}{(1+r)}\right)^2. \tag{A43}$$

Old Households Old households maximise their expected utility

$$\begin{aligned}\max_{\tau_t} \mathbb{E}\left(U\left(c_{i,t},, X_t\right)\right) &= \mathbb{E}_t\left(c_{i,t}\right) + f\left(\mathbb{E}_{j,t}\left(\bar{L}_{t+1}\right)\right) \\ s.t. \quad c_{i,t} &\leq (1-\tau_t)\,y_t + \max\left\{p_t\left(1 - \xi_{i,t}\right)L_{i,t-1} + \left(1 + r^R_{t+1}\right)S_{i,t-1}, 0\right\} \\ \tau_t &\geq 0\end{aligned} \tag{A44}$$

[28]This allows us to rewrite the first-order condition without explicitly tracking heterogeneity in landholdings across belief type.

where $c_{i,t}$ is consumption of household i in period t and $\mathbb{E}_{j,t}$ denotes expectations formed at date t by belief type j. Using similar steps as before, the maximisation problem can be rewritten as

$$\begin{aligned}\max_{\tau_t} \mathbb{E}\left(U\left(c_{i,t+1}, X_t\right)\right) &= \left(1-\tau_t\right) y_t + (1+r) S_{i,t-1} \\ &\quad + p_{t+1}\left(1-\left(1-X_{t-1}\right)\mu\theta_{j,t}\gamma_t\right) L_{i,t-1} + f\,\mathbb{E}_{j,t}\left(\bar{L}_{t+1}\right) \\ \text{s.t.} \quad \tau_t &\geq 0,\end{aligned} \tag{A45}$$

and the optimal choice of adaptation rate of an old household of belief type j is given by

$$\tau_t^{Oj*} = \frac{\bar{L}_t}{\left[\phi q + (1-\phi)\, w\right]} \left(\tilde{\theta}_{j,t}\mu\gamma_{t+1}\pi_{j,t}\right)^2. \tag{A46}$$

B. Derivation of Lemma 2

The relative ordering of the adaptation rates follows directly from Assumption 1.

C. Derivation of Lemma 3

Coalitions choose the adaptation rate that maximises their joint utility function.

Coalition of Young Sceptics and Old Realists Consider first the coalition of the young sceptics and old realists. This coalition maximises

$$\max_{\tau_t} \mathbb{E}\left(U_{Ys,Or}\right) = \omega\left(v\left(L_{Ys,t}\right) + \mathbb{E}_t\left(c_{Ys,t+1}\right)\right) + (1-\omega)\left(\mathbb{E}_t\left(c_{Or,t}\right)\right) + f\left(\mathbb{E}_{Ys,Or,t}\left(\bar{L}_{t+1}\right)\right) \tag{A47}$$

$$\begin{aligned}\text{s.t.} \quad \left(1-\tau_t\right) y_{Ys,t} &\leq p_t L_{Ys,t} + S_{Ys,t} \\ c_{Ys,t+1} &\leq \left(1-\tau_{t+1}\right) y_{Ys,t+1} + \max\left\{p_{t+1}\left(1-\xi_{Ys,t+1}\right) L_{Ys,t} + \left(1+r_{t+1}^R\right) S_{Ys,t}, 0\right\} \\ c_{Or,t} &\leq \left(1-\tau_t\right) y_{Or,t} + \max\left\{p_t\left(1-\xi_{Or,t}\right) L_{Or,t-1} + \left(1+r_{t+1}^R\right) S_{Or,t-1}, 0\right\} \\ \tau_t &\geq 0.\end{aligned}$$

Using the no-arbitrage condition as in Lemma 2, the expectation of young sceptics' consumption in period $t+1$, $c_{Ys,t+1}$, as formed at date t, becomes

$$\mathbb{E}_t\left(c_{Ys,t+1}\right) = (1+r)\left(\left(1-\tau_t\right)y_{Ys,t} - p_t L_{Ys,t}\right) \tag{A48}$$
$$+ p_{t+1}\left(1-\left(1-X_t\right)\mu\theta_{Ys,t}\gamma_{t+1}\right)L_{Ys,t} + \left(1-\tau_{t+1}\right)y_{Ys,t+1},$$

and the expectation of old realists' consumption in period t, $c_{Or,t}$, as formed at date t, becomes

$$\mathbb{E}_t\left(c_{Or,t}\right) = \left(1-\tau_t\right)y_{Or,t} + (1+r)S_{Or,t-1} + p_t\left(1-\left(1-X_{t-1}\right)\mu\theta_{Or,t}\gamma_t\right)L_{Or,t-1}. \tag{A49}$$

Using similar definitions as in Proof of Lemma 2, the optimality condition for τ_t becomes

$$\omega\left(-(1+r)y_{Ys,t} + \mu\tilde{\theta}_{Ys,t}\gamma_{t+1}\bar{L}_t p_{t+1}\frac{\partial X_t}{\partial\tau_t}\right) + (1-\omega)\left(-y_{Or,t}\right) \tag{A50}$$
$$+ \pi_{r,s,t}\left(\omega\tilde{\theta}_{s,t} + (1-\omega)\tilde{\theta}_{r,t}\right)\mu\gamma_{t+1}\bar{L}_t\frac{\partial X_t}{\partial\tau_t} = 0.$$

Then, the adaptation rate preferred by a coalition of the young sceptics and the old realists is

$$\tau_t^{Ys,Or*} = \frac{\bar{L}_t}{\left[\phi q + (1-\phi)\,w\right]}\left(\frac{\mu\gamma_{t+1}\left(\omega\tilde{\theta}_{s,t}p_{t+1} + \pi\left(\omega\tilde{\theta}_{s,t} + (1-\omega)\tilde{\theta}_{r,t}\right)\right)}{(1+\omega r)}\right)^2. \tag{A51}$$

Coalition of Young and Old Sceptics Using similar steps as above, the adaptation rate preferred by a coalition of the young and old sceptics is

$$\tau_t^{Ys,Os*} = \frac{\bar{L}_t}{\left[\phi q + (1-\phi)\,w\right]}\left(\frac{\tilde{\theta}_{s,t}\mu\gamma_{t+1}\left(\frac{1}{2}p_{t+1} + \pi_{s,t}\right)}{\left(1+\frac{1}{2}r\right)}\right)^2. \tag{A52}$$

Coalition of Old Realists and Old Sceptics The adaptation rate preferred by a coalition of old realists and old sceptics is

$$\tau_t^{Or,Os*} = \frac{\bar{L}_t}{\left[\phi q + (1-\phi)\,w\right]}\left(\mu\gamma_{t+1}\pi_{r,s,t}\left(\omega\tilde{\theta}_{s,t} + (1-\omega)\tilde{\theta}_{r,t}\right)\right)^2. \tag{A53}$$

D. Derivation of Lemma 4

Old households maximise their expected utility

$$\max_{\tau_t}\mathbb{E}\left(U\left(c_{y,t},,\bar{L}_{t+1}\right)\right) = \mathbb{E}_t\left(c_{y,t}\right) + f\left(\mathbb{E}_{j,t}\left(\bar{L}_{t+1}\right)\right) \tag{A54}$$
$$s.t. \quad c_{y,t} \leq \left(1-\tau_t\right)y + \max\left\{p_t\left(1-\xi_{y,t}\right)L_{y,t-1} + \left(1+r_{t+1}^R\right)S_{y,t-1}, 0\right\}$$
$$\tau_t \geq 0,$$

where $c_{y,t}$ is the consumption of an old household with income $y \in \{w, q\}$ in period t and $\mathbb{E}_{j,t}$ denotes expectations formed at date t by belief type j.

Using similar steps as in Lemma 2, the optimal choice of adaptation rate of an old household of belief type j and with income y is

$$\tau_t^{Ojy*} = \frac{\bar{L}_t}{[\phi q + (1-\phi)\, w]} \left(\mu \tilde{\theta}_{j,t} \gamma_{t+1} \pi_{j,t}\right)^2. \tag{A55}$$

We determine the relative ordering of the adaptation rates preferred by the different types of old households. Specifically, as $q > w$, we have that $\tau^{Orl*} > \tau^{Orh*}$ and $\tau^{Osl} > \tau^{Osh*}$. Moreover, as $\bar{\theta} > \underline{\theta}$, we have $\tau^{Orh*} > \tau^{Osh*}$ and $\tau^{Orl} > \tau^{Osl*}$. If additionally

$$\frac{q}{w} < \frac{\theta_{r,t}}{\theta_{s,t}} \frac{\pi_{r,t}}{\pi_{s,t}} \tag{A56}$$

holds, then the relative ordering of the adaptation rates preferred by old households is given by

$$\tau^{Orl*} > \tau^{Orh*} > \tau^{Osl*} > \tau^{Osh*}. \tag{A57}$$

Otherwise, this becomes

$$\tau^{Orl*} > \tau^{Osl*} > \tau^{Orh*} > \tau^{Osh*}. \tag{A58}$$

E. Derivation of Lemma A1

Lemma A1. *Let there be fewer young than old, the sceptics represent a majority ($\omega > 0.5$), and high-income households are a minority ($\phi < 0.5$). Then, if*

Assumption 2.

$$\tilde{\Theta} > \underbrace{\frac{p_{t+1} + \pi_{s,t}}{\pi_{r,t}(1+r)}}_{\textit{Assumption 1}} \times \underbrace{\frac{q}{\phi q + (1-\phi) w}}_{\textit{Inequality multiplier}}. \tag{A59}$$

holds and economic inequality is sufficiently low, then

$$\tau_t^{Yr*} > \tau_t^{Orl*} > \tau_t^{Orh*} > \tau_t^{Ys*} > \tau_t^{Osl*} > \tau_t^{Osh*} \tag{A60}$$

and thus the young sceptics are pivotal. The set of feasible coalitions is then:

(i) ***"High Ambition Coalition"****: Low-income, old realists ($(1-\phi)(1-\omega)$), high-income, old realists ($\phi(1-\omega)$) and young sceptics (ω), i.e. young sceptics and old realists.*

(ii) ***Mixed Coalition*** *: high-income, old realists ($\phi(1-\omega)$), young sceptics (ω), and low-income, old sceptics ($(1-\phi)\omega$). We refer to this as the "mixed coalition".*[29]

(iii) ***"Low Ambition Coalition"*** *: Young sceptics (ω), low-income, old sceptics ($(1-\phi)\omega$), and high-income, old sceptics ($\phi\omega$), i.e. young and old sceptics.*[30]

If economic inequality is sufficiently high, and

Assumption 2*.

$$\tilde{\Theta} < \frac{p_{t+1} + \pi_{s,t}}{\pi_{r,t}(1+r)} \times \frac{q}{\phi q + (1-\phi)w} \tag{A61}$$

holds, then

$$\tau_t^{Yr*} > \tau_t^{Orl*} > \tau_t^{Osl*} > \tau_t^{Ys*} > \tau_t^{Orh*} > \tau_t^{Osh*} \tag{A62}$$

and, the young sceptics are again pivotal. The set of feasible coalitions is then:

(i) ***"High Ambition Coalition*"*** *: low-income, old realists ($(1-\phi)(1-\omega)$), young sceptics (ω), and low-income, old sceptics ($\omega(1-\phi)$), i.e. young sceptics and low-income old.*

(ii) ***Mixed Coalition**** *: high-income, old realists ($\phi(1-\omega)$), young sceptics (ω), and low-income, old sceptics ($(1-\phi)\omega$) households. We refer to this as the "mixed coalition".*[31]

(iii) ***"Low Ambition Coalition*"*** *: Young sceptics (ω), high-income, old realists ($(1-\omega)\phi$), and high-income, old sceptics ($\phi\omega$), i.e. young sceptics and high-income, old.*

[29]For $\omega > 0.5$, a mixed coalition is always larger - and thus politically more powerful than the high ambition coalition. Moreover, under Assumption 1, a mixed coalition is always politically more powerful than the low-ambition coalition.

[30]If $\omega > 0.5$, the low-ambition coalition is always politically more powerful than the high-ambition coalition. Hence, the high ambition coalition always has the least political power.

[31]If $\phi < \omega$, the high ambition coalition is always larger and thus politically more powerful than a mixed coalition.

If Assumption 2 is not satisfied (in either case), the high-income, old realists emerge as pivotal group and the political equilibrium is characterised by the mixed coalition.
The adaptation rates that maximise joint utility of each coalition when economic inequality is sufficiently low are

$$\tau_t^{Ys,Orh,Orl*} = A\left(\frac{\omega\tilde{\theta}_{s,t}p_{t+1} + \left(\omega\tilde{\theta}_{s,t} + (1-\omega)\tilde{\theta}_{r,t}\right)\pi_{r,s,t}}{(1+\omega r)}\right)^2,$$

$$\tau_t^{Ys,Orh,Osl*} = A[\phi q + (1-\phi)\,w]^2\left(\frac{\omega\tilde{\theta}_{s,t}p_{t+1} + \left(\omega(2-\phi)\tilde{\theta}_{s,t} + (1-\omega)\phi\tilde{\theta}_{r,t}\right)\pi_{r,s,t}}{\omega(1+r)[\phi q + (1-\phi)\,w] + (1-\omega)\phi q + \omega(1-\phi)w}\right)^2,$$

$$\tau_t^{Ys,Osh,Osl*} = A\left(\frac{\tilde{\theta}_{s,t}\left(\frac{1}{2}p_{t+1} + \pi_{s,t}\right)}{\left(1+\frac{1}{2}r\right)}\right)^2.$$

The adaptation rates that maximise joint utility of each coalition when economic inequality is sufficiently high are

$$\tau_t^{Ys,Orl,Osl*} = A[\phi q + (1-\phi)\,w]^2\left(\frac{\omega\tilde{\theta}_{s,t}p_{t+1} + \left(\omega(2-\phi)\tilde{\theta}_{s,t} + (1-\omega)(1-\phi)\tilde{\theta}_{r,t}\right)\pi_{s,r,t}}{\omega\,(1+r)\,[\phi q + (1-\phi)\,w] + (1-\phi)\,w}\right)^2,$$

$$\tau_t^{Ys,Orh,Osl*} = A[\phi q + (1-\phi)\,w]^2\left(\frac{\omega\tilde{\theta}_{s,t}p_{t+1} + \left(\omega(2-\phi)\tilde{\theta}_{s,t} + (1-\omega)\phi\tilde{\theta}_{r,t}\right)\pi_{s,r,t}}{\omega(1+r)[\phi q + (1-\phi)\,w] + (1-\omega)\phi q + \omega(1-\phi)w}\right)^2,$$

$$\tau_t^{Ys,Orh,Osh*} = A[\phi q + (1-\phi)\,w]^2\left(\frac{\omega\tilde{\theta}_{s,t}p_{t+1} + \left(\omega(1+\phi)\tilde{\theta}_{s,t} + (1-\omega)\phi\tilde{\theta}_{r,t}\right)\pi_{s,r,t}}{\omega\,(1+r)\,[\phi q + (1-\phi)\,w] + \phi q}\right)^2.$$

Alternatively, if Assumption 2 is not satisfied (in either case), the adaptation rate that maximises the joint utility of the prevailing coalition is given by $\tau_t^{Ys,Orh,Osl*}$.

A3. ADDITIONAL SIMULATIONS

A. Evolution of climate risk, housing supply and prices

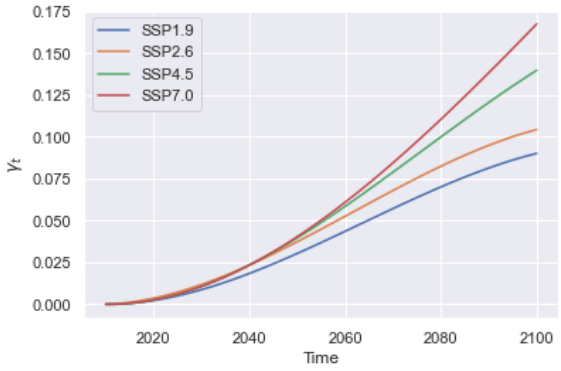


FIGURE A7: **Share of houses in IJmuiden that are at risk of flooding (γ_t).**



FIGURE A8: **The housing stock and housing prices without adaptation**

KEY: THE STEADY-STATE SUPPLY OF INHABITABLE HOUSES (LEFT PANEL, INDEXED TO 1 IN 2010) AND HOUSE PRICES (RIGHT PANEL, INDEXED TO 1 IN 2010) FOR DIFFERENT SSP TRAJECTORIES.

B. *Political tipping with no learning ($\delta = 0$)*

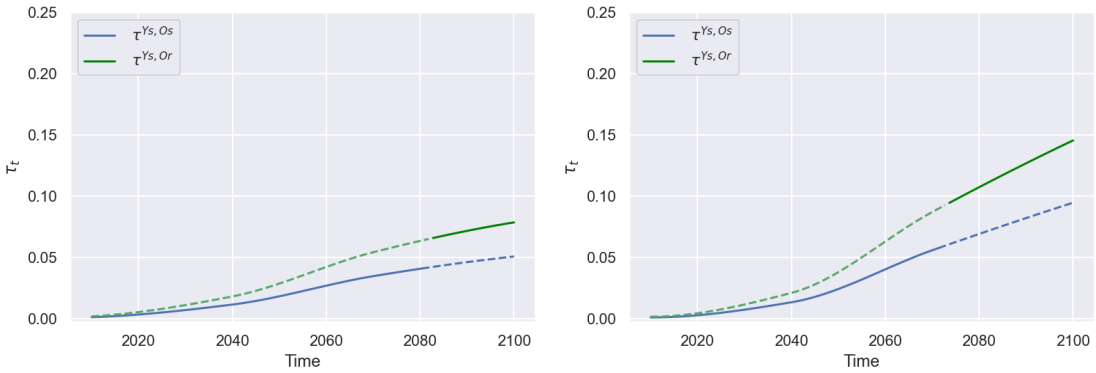


FIGURE A9: **Learning about climate damages and the speed of political tipping**

KEY: ADAPTATION RATE WHEN THE POLITICAL EQUILIBRIUM TIPS AROUND 2080 UNDER THE SSP1-2.6 (LEFT PANEL) AND AROUND 2070 UNDER THE SSP3-7.0 (RIGHT PANEL) SCENARIOS.

C. *Escalating Inequality*

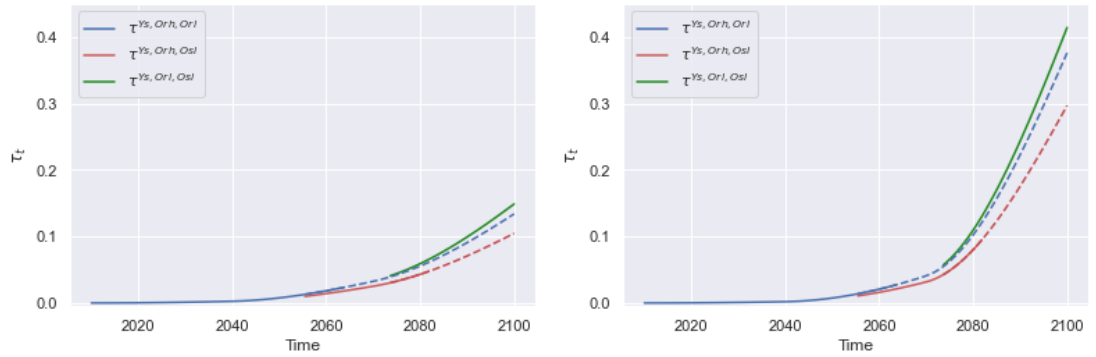


FIGURE A10: **Tipping of the adaptation rate with escalating inequality**

KEY: THE ADAPTATION RATE WHEN THE POLITICAL EQUILIBRIUM TIPS AROUND 2050, AND 2080, UNDER THE SSP1-2.6 (LEFT PANEL), AND THE SSP3-7.0 (RIGHT PANEL) SCENARIOS, WHEN THE WAGE GAP RISES AT AN INCREASING RATE.