Mitigation model

1 State variables and law of motion

Total capital:

$$d\log K = (\mu_k + i - \frac{\kappa}{2}i^2 - \frac{\sigma_k^2}{2})dt + \sigma_k dW$$

Temperature anomaly:

$$dY = e(\theta_\ell dt + \varsigma dW)$$

$R\&D$ investment, X, leads to an increased arrival rate of a one time jump in green sector productivity:

$$d\log \mathcal{I}_g = -\zeta dt + \Psi_0(\frac{X}{\mathcal{I}_g})^{\Psi_1}dt - \frac{\sigma_g^2}{2}dt + \sigma_g dW$$

Here we use $\Psi_1 = 1/2$

2 Pre-damage and pre technology jump HJB

Denote $x = \frac{X}{K}$ as R& D invesment - total capital ratio, and there are two technology jumps. The pre damage jump and pre technology jump HJB:

$$\begin{aligned}
0 = \max_{i,e,x} \min_{\omega_\ell, \sum_{\ell=1}^L \omega_\ell = 1, g, g_m} & -\delta V(\log K, Y, \log \mathcal{I}_g) + \delta \log\left(\alpha - i - \alpha\overline{\vartheta}\left[1 - \left(\frac{e}{\alpha\overline{\lambda}K}\right)\right]^\theta - x\right) + \delta \log K \\
& + \frac{\partial V}{\partial \log K}\left[\mu_k + i - \frac{\kappa}{2}i^2 - \frac{|\sigma_k|^2}{2}\right] + \frac{|\sigma_k|^2}{2}\frac{\partial^2 V}{\partial \log K^2} \\
& + \frac{\partial V(\log K, Y)}{\partial Y}\sum_{\ell=1}^L \omega_\ell \theta_\ell e + \frac{1}{2}\frac{\partial^2 V}{\partial Y^2}|\varsigma|^2 e^2 \\
& - \left([\gamma_1 + \gamma_2 Y]\sum_{\ell=1}^L \omega_\ell \theta_\ell e + \frac{1}{2}(\gamma_2)|\varsigma|^2 e^2\right) \\
& + \frac{\partial V}{\partial \log \mathcal{I}_g}(-\zeta + \Psi_0 x^{\Psi_1} - \frac{\sigma_g^2}{2}) + \frac{\sigma_g^2}{2}\frac{\partial^2 V}{\partial \log \mathcal{I}_g^2} \\
& + \xi_a \sum_{\ell=1}^L \omega_\ell \left(\log \omega_\ell - \log \pi_\ell\right) \\
& + \xi_g \mathcal{I}_g \left(1 - g + g\log(g)\right) + \mathcal{I}_g g(V^{\text{post tech, m}} - V) \\
& + \sum_{m=1}^M \pi_d^m g_m (V^m - V) + \xi_d \sum_{m=1}^M \pi_d g_m (1 - g_m + g_m \log(g_m))
\end{aligned}$$

3 Uncertainty parameter configuration

- Smooth ambiguity: ξ_a
- Damage uncertainty, ξ_d,
- Technology jump uncertainty, ξ_g

	ξ_a	ξ_d	ξ_g
baseline	∞	∞	∞
case 1	2×10^{-4}	0.050	0.050
case 2	2×10^{-4}	0.025	0.025

4 Pathway comparisons, with 20 damage functions

4.1 pre damage jump, pre technology jump R& D investment

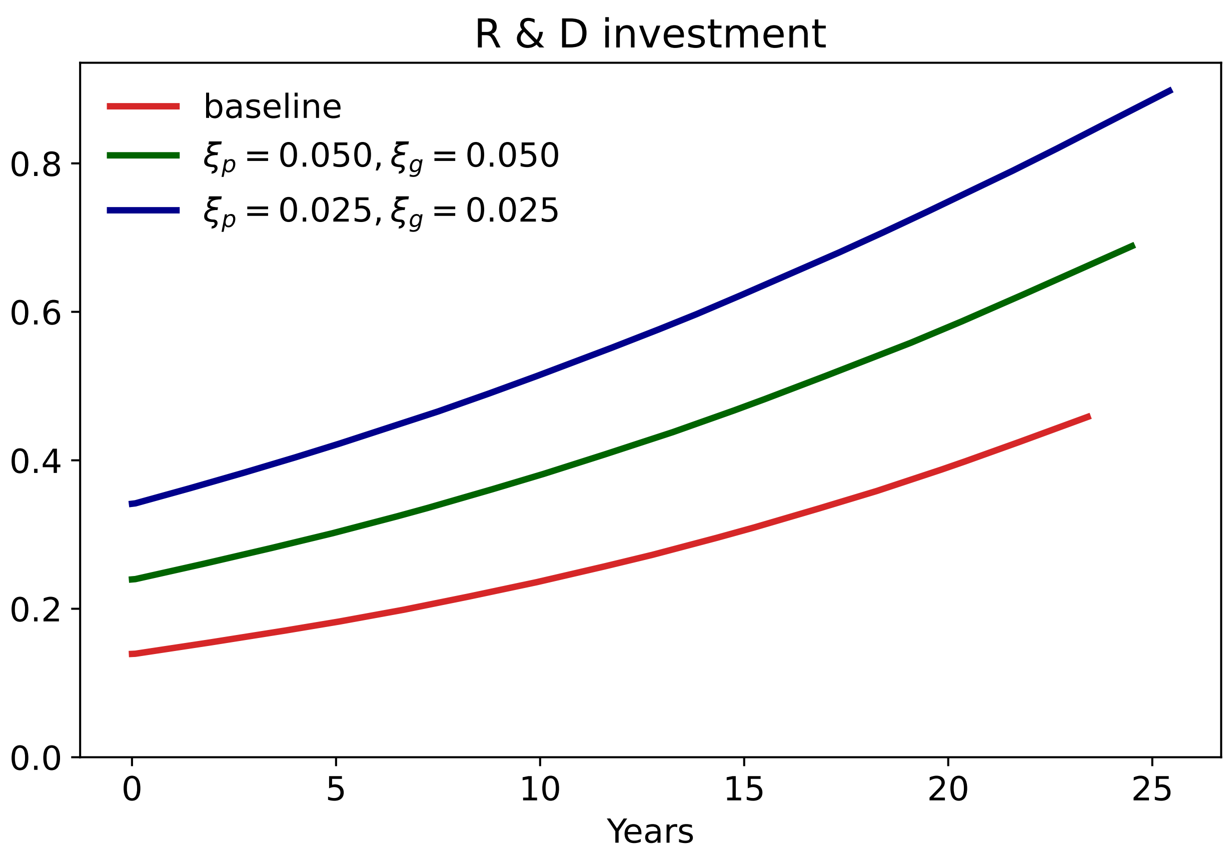


Figure 1: R & D investment, pathways stop when temperature anomaly hits 1.5^oC

4.2 pre damage jump, pre technology jump emission

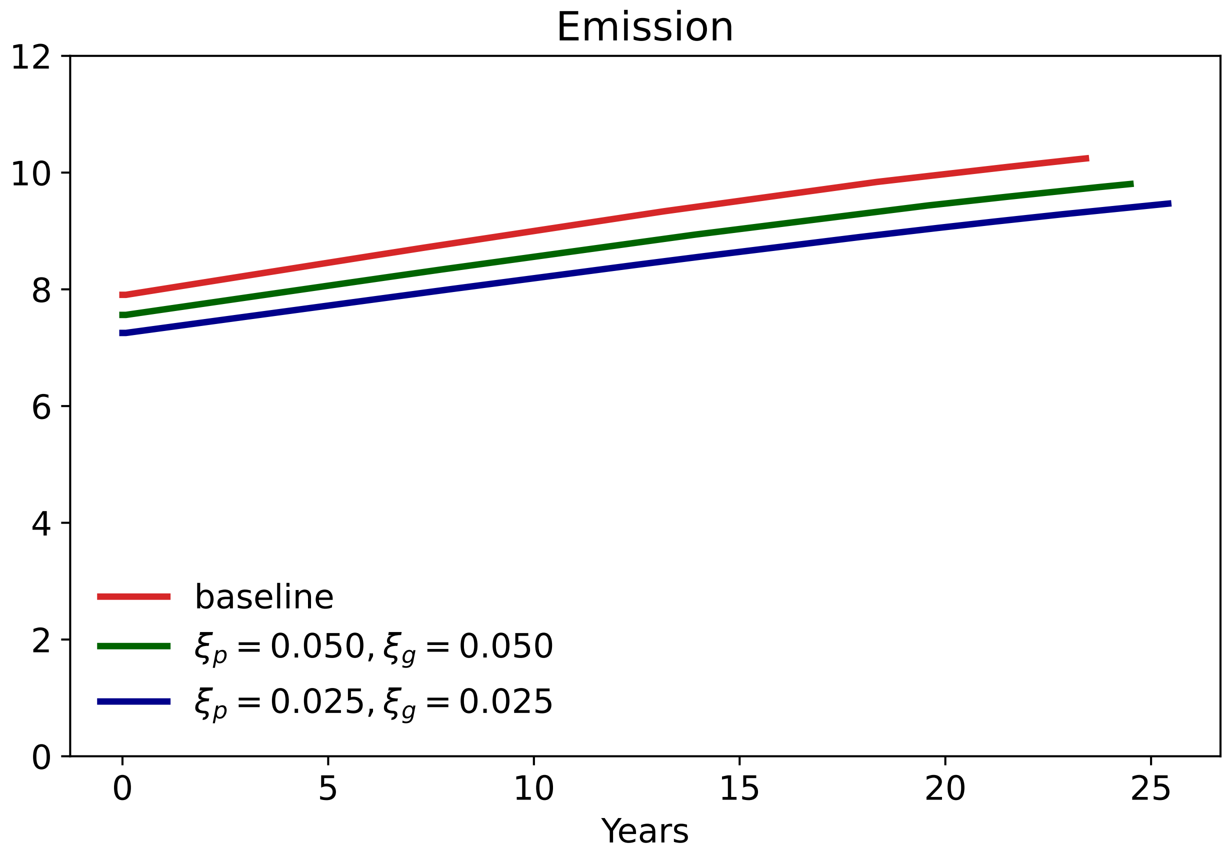


Figure 2: Emission, pathways stop when temperature anomaly hits 1.5^oC

4.3 pre damage jump, pre technology jump temperature anomaly

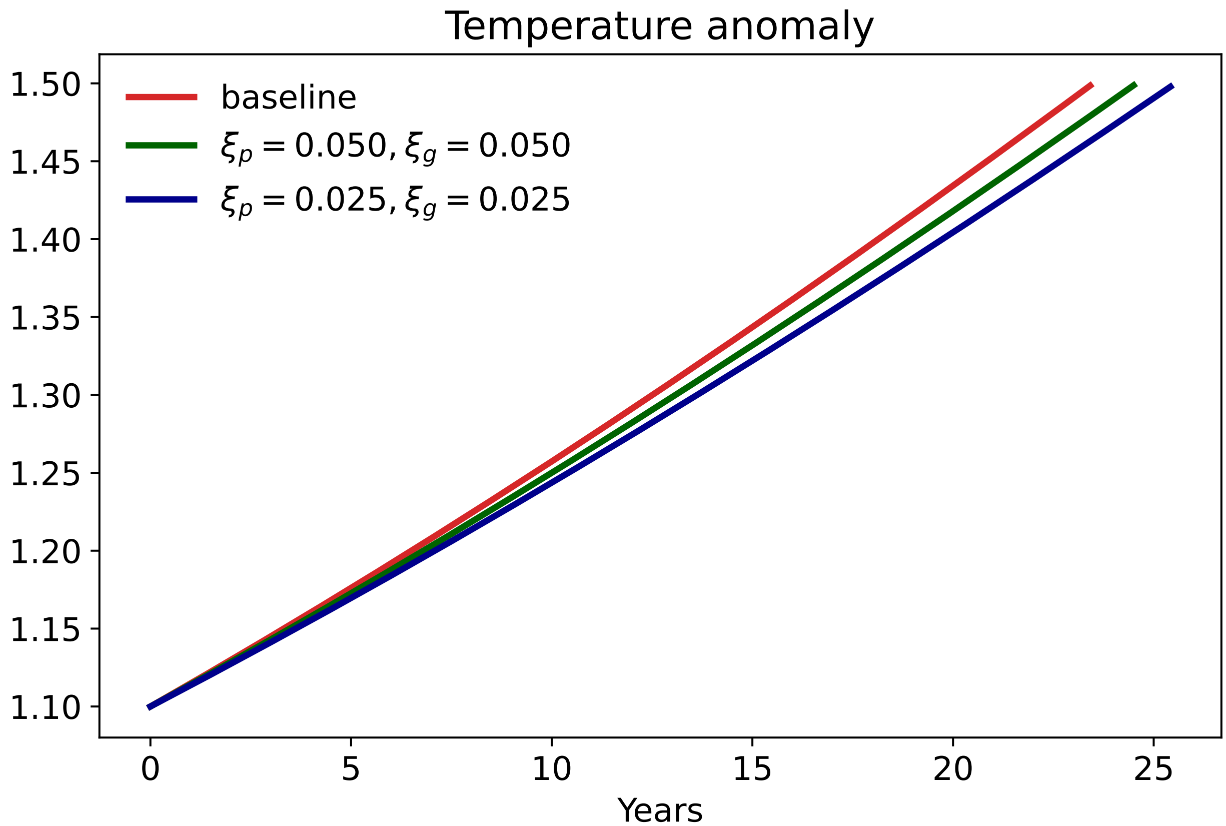


Figure 3: Temperature anomaly, pathways stop when temperature anomaly hits 1.5^oC

4.4 pre damage jump, pre technology jump technology jump intensity, $\mathcal{I}_g$

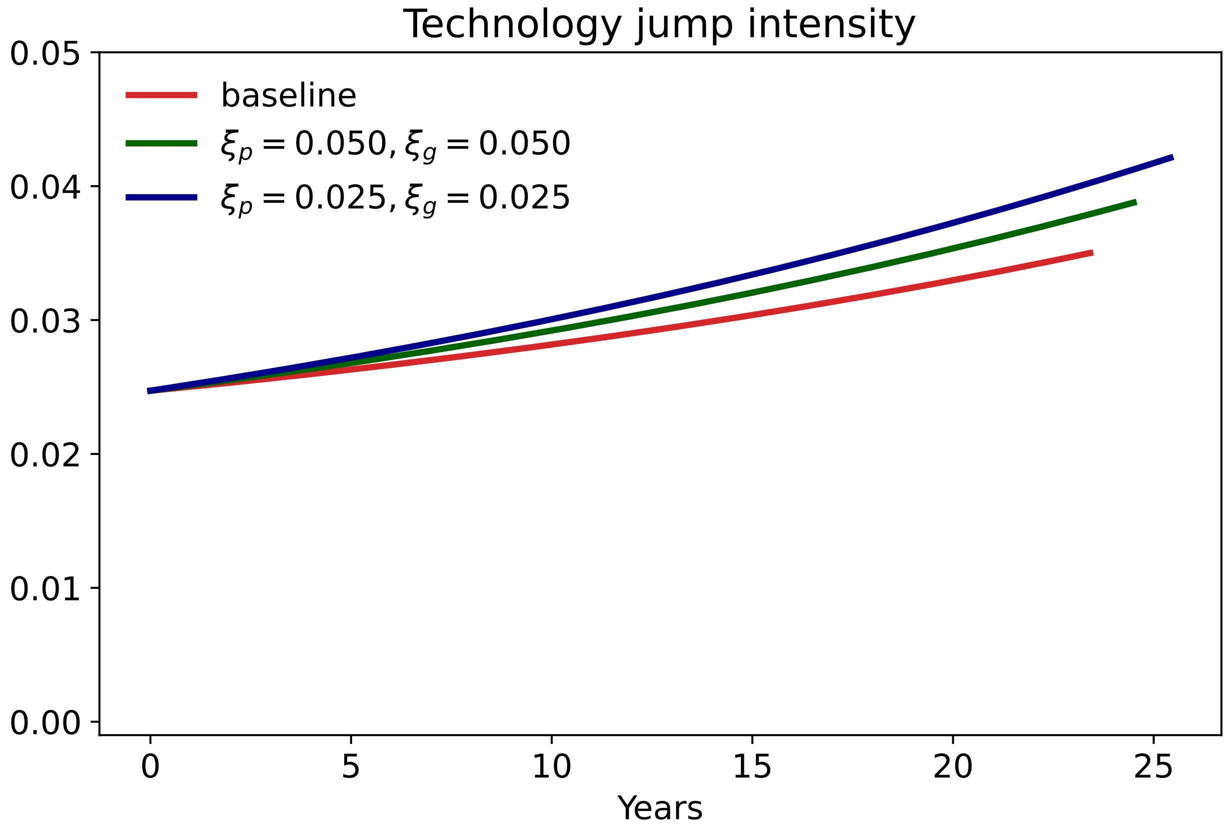
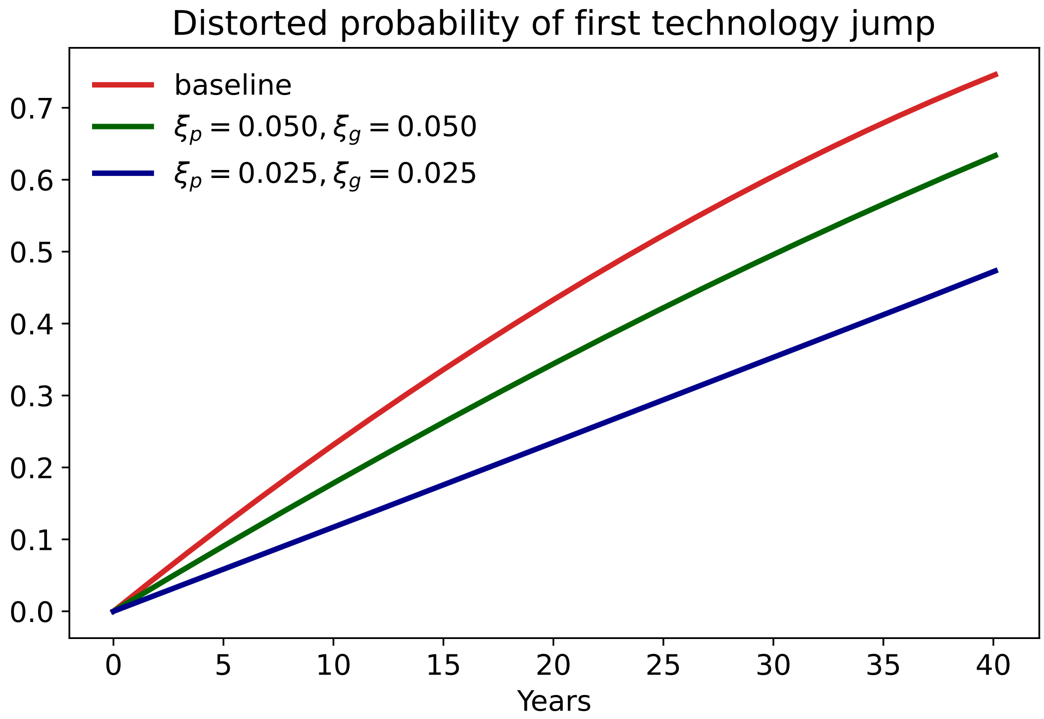
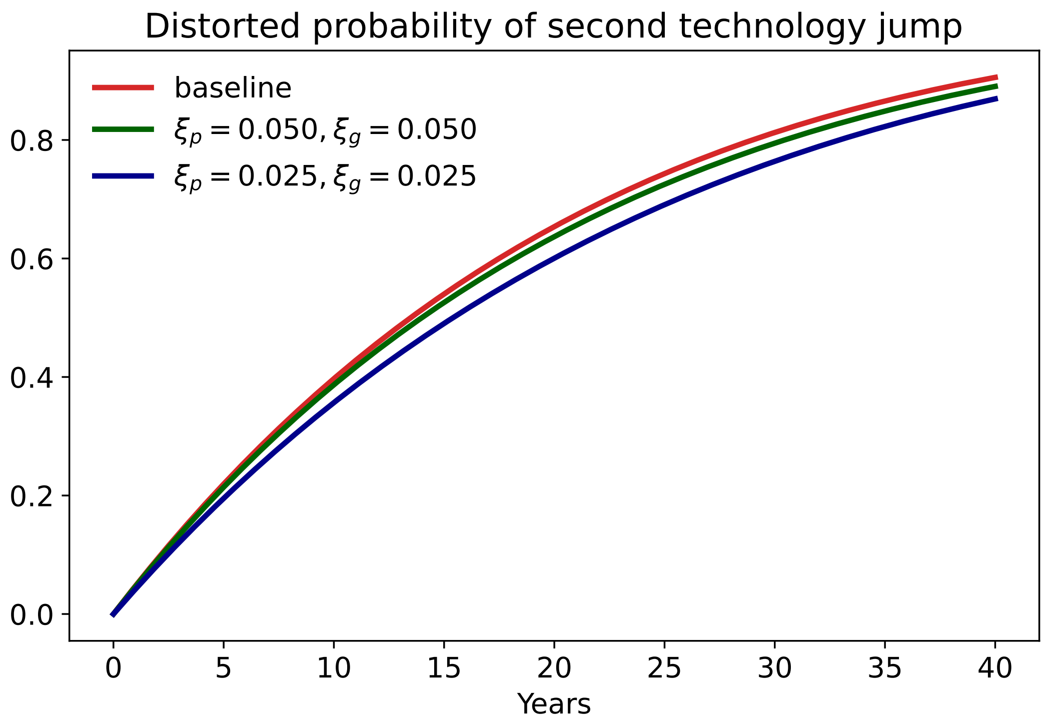


Figure 4: Technology jump intensity, $\mathcal{I}_g$, pathways stop when temperature anomaly hits 1.5^oC

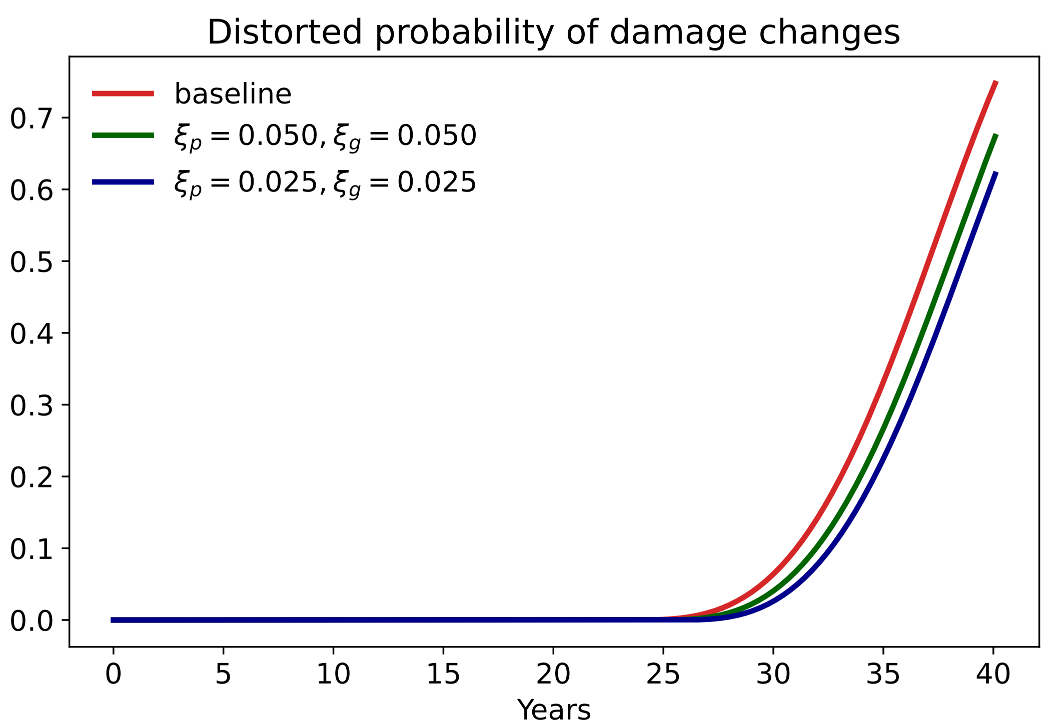
5 Jump probabilities and distorted probabilities

5.1 Distorted probability of Poisson events for technology changes with different uncertainty configurations





5.2 Distorted probability of Poisson events for damage with different uncertainty configurations



5.3 Probability distortion for damage function, with $\xi_a = 2 \times 10^{-4}$, $\xi_d = 0.05$ and $\xi_g = 0.05$

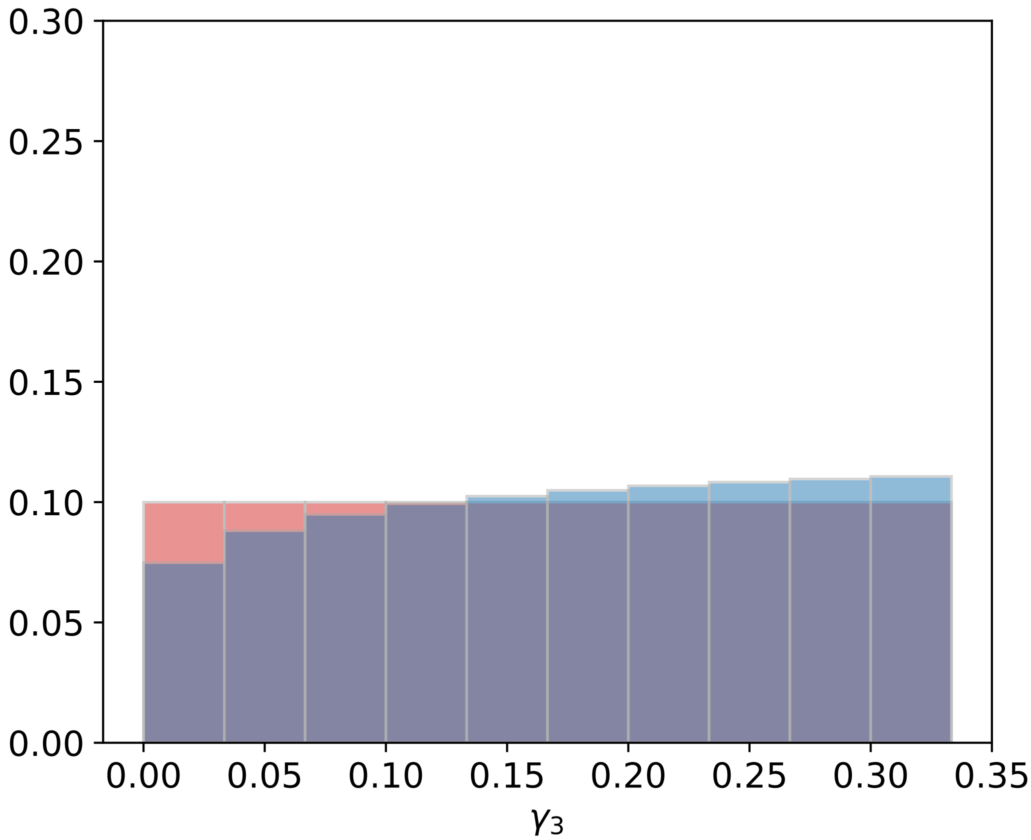


Figure 5: Red bars are for baseline probability, and blue bars are for distorted probability

5.4 Probability distortion for climate sensitivity models, with $\xi_a = 2 \times 10^{-4}$, $\xi_d = 0.05$ and $\xi_g = 0.05$

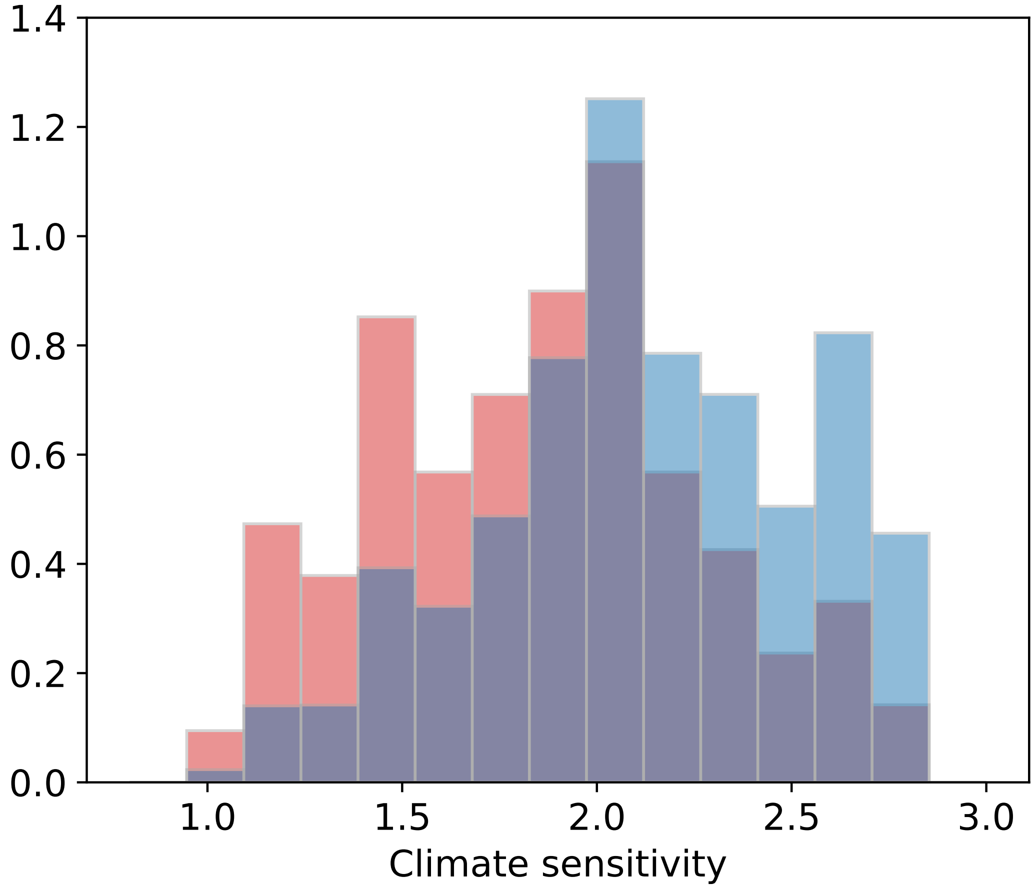


Figure 6: Red bars are for baseline density, and blue bars are for distorted density of climate sensitivity models