Appendix: Derivation of the welfare gain measure

In this section we derive the formula behind the steady-state consumption gain measure, ξ, used in the computational experiment. In other words, by what percent we need to increase household's steady-state consumption under the exogenous (observed) fiscal policy, in order to make it indifferent to the allocations from the optimal fiscal policy regime? That requires

$$\sum_{t=0}^{\infty} \beta^t \{\ln(1+\xi)c^e + \gamma \ln(1-h^e) + \phi \ln(g^c)^e\} = \sum_{t=0}^{\infty} \beta^t \{\ln c^o + \gamma \ln(1-h^o) + \phi \ln(g^c)^o\},$$

where "e" denotes an allocation from the exogenous (or "observed") policy case, while "o" is an allocation obtained under the optimal policy case. Since we focus on the long-run consumption gain, it follows that

$$\{\ln(1+\xi)c^e + \gamma \ln(1-h^e) + \phi \ln(g^c)^e\} \sum_{t=0}^{\infty} \beta^t = \{\ln c^o + \gamma \ln(1-h^o) + \phi \ln(g^c)^o\} \sum_{t=0}^{\infty} \beta^t,$$

or

$$\frac{1}{1-\beta}\{\ln(1+\xi)c^e + \gamma \ln(1-h^e) + \phi \ln(g^c)^e\} = \frac{1}{1-\beta}\{\ln c^o + \gamma \ln(1-h^o) + \phi \ln(g^c)^o\}.$$

Cancel the common multiplier to obtain

$$\ln(1+\xi) + \ln c^e + \gamma \ln(1-h^e) + \phi \ln(g^c)^e = \ln c^o + \gamma \ln(1-h^o) + \phi \ln(g^c)^o.$$

Rearrange terms, and after some algebra one can obtain

$$\ln(1+\xi) = \ln c^o - \ln c^e + \gamma[\ln(1-h^o) - \ln(1-h^e)] + \phi[\ln(g^c)^o - \ln(g^c)^e],$$

$$\ln(1+\xi) = \ln\left[\frac{c^o}{c^e}\right] + \gamma \ln\left[\frac{1-h^o}{1-h^e}\right] + \phi \ln\left[\frac{(g^c)^o}{(g^c)^e}\right],$$

$$\ln(1+\xi) = \ln\left[\frac{c^o}{c^e}\right]\left[\frac{1-h^o}{1-h^e}\right]^{\gamma}\left[\frac{(g^c)^o}{(g^c)^e}\right]^{\phi},$$

$$1+\xi = \left[\frac{c^o}{c^e}\right]\left[\frac{1-h^o}{1-h^e}\right]^{\gamma}\left[\frac{(g^c)^o}{(g^c)^e}\right]^{\phi},$$

$$\xi = \left[\frac{c^o}{c^e}\right]\left[\frac{1-h^o}{1-h^e}\right]^{\gamma}\left[\frac{(g^c)^o}{(g^c)^e}\right]^{\phi} - 1,$$