we have,

$$\frac{d^2\Pi_0(e^{**}(\gamma),e^{**}(\gamma);0)-\Pi_0(e^*(\rho,\gamma),e^*(\rho,\gamma);x_h^*(\rho))}{d\gamma d\rho}$$

$$= 4\frac{\partial e^*(\rho,\gamma)}{\partial \rho}\left[(p_\ell R-L)-x_h^*(\rho)c\right]+2\left[1-2(\gamma+e^*(\rho,\gamma))\right]\frac{\partial x_h^*(\rho)}{\partial \rho}c \tag{42}$$

$$= \begin{cases} 2\left[1-2(\gamma+e^*(\rho,\gamma))\right]\left(-\frac{2\left[(p_\ell R-L)-x_h^*(\rho)c\right]}{2\left[(p_\ell R-L)-x_h^*(\rho)c\right]+k''(e^*(\rho,\gamma))}+1\right)\frac{\partial x_h^*(\rho)}{\partial \rho}c<0, & \text{if } \rho\in(\underline{\rho},\overline{\rho}),\\ 0, & \text{if } \rho\geq\overline{\rho}. \end{cases} \tag{43}$$

where the inequality follows from the fact that $\frac{\partial e^*(\rho,\gamma)}{\partial \rho}<0$ for $\rho\in(\underline{\rho},\bar{\rho})$ by (33). This then implies that that we have $\frac{d\Pi_0(e^{**}(\gamma),e^{**}(\gamma);0)-\Pi_0(e^*(\rho,\gamma),e^*(\rho,\gamma);x_h^*(\rho))}{d\gamma}<0$ for all $\rho>\underline{\rho}$.

Overall, we thus have that the welfare difference $W(e^{**}(\gamma);0)-W(e^*(\rho,\gamma);x_h^*)$ is strictly decreasing in γ for all $\rho>\underline{\rho}$ and $\gamma>\underline{\gamma}$, because $\Pi_0(e^{**}(\gamma),e^{**}(\gamma);0)-\Pi_0(e^*(\rho,\gamma),e^*(\rho,\gamma);x_h^*(\rho))$ is decreasing in γ and $C(e^{**}(\rho))-C(e^*(\rho,\gamma))$ is increasing in γ as shown above. Since we have that $W(e^{**}(\gamma);0)-W(e^*(\rho,\gamma);x_h^*)$ is strictly positive at $\gamma=\underline{\gamma}$, it follows that there exists $\tilde{\gamma}(\rho)>\underline{\gamma}$, such that $W(e^{**}(\gamma);0)-W(e^*(\rho,\gamma);x_h^*)\geq 0$ if and only if $\gamma\leq\tilde{\gamma}(\rho)$. □

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Gyöngyi Lóránth
University of Vienna and CEPR; email: gyoengyi.loranth@univie.ac.at

Anatoli Segura
Banca d'Italia and CEPR; email: anatoli.seguravelez@bancaditalia.it

Jing Zeng
University of Bonn and CEPR; email: jzeng@uni-bonn.de

Postal address 60640 Frankfurt am Main, Germany
Telephone +49 69 1344 0
Website www.ecb.europa.eu

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