Short-Run Fluctuations and Long-Run Growth with Recursive Preferences
Online Appendix

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Additional Results

In this appendix, we provide some additional findings that complement the core analysis presented in the main text.

Figure A-1 shows the relationship between five-year moving averages of per capita GDP growth and its standard deviation, while Figure A-2 presents the correlation between five-year moving averages of per capita GDP growth and its standard deviation. The correlations, computed over twenty-year sliding windows, are mostly negative across all G7 countries.

Figure A-3 shows the response of the economy to a 1% positive shock to productivity in our baseline model (continuous lines) compared to a model without endogenous leisure choices (dotted lines). This comparison helps us understand how, in this specific setting, endogenous leisure choices amplify the economy's response to external shocks, making it more sensitive to volatility in the shocks. It can be observed that our baseline model reproduces some established empirical regularities of the labor market dynamics, i.e. the procyclicality of wages and employment and the countercyclicality of the human-to-physical capital ratio. On this last piece of evidence, see, e.g., Alessandrini et al. (2015). We observe that labor increases sharply in response to the positive productivity shock, further fueling the initial jump in output growth. The remaining variables behave as expected: wages track the dynamics of productivity, and consumption growth initially dips before recovering due to increased capital accumulation.

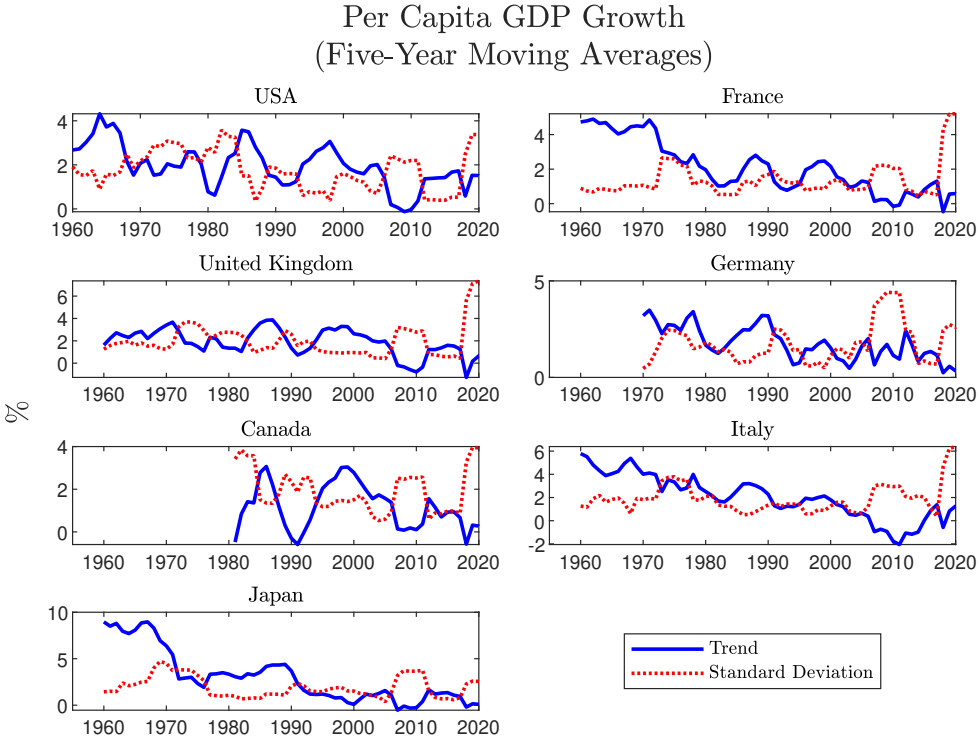
Figure A-4 shows the response to the economy to a 1% positive shock to productivity in the case of CRRA preferences with a risk aversion γ set to 2, as in Trabandt and Uhlig (2011). We observe a reduced labor procyclicality compared to our baseline model. It can be shown that labor tends to react less to shocks the higher the degree of risk aversion. This is due to the fact that by restricting the intertemporal elasticity of substitution to be the inverse of risk aversion, a higher value for the latter makes the income effect prevail and pushes agents to accumulate less capital (in fact, consumption grows on impact) and work relatively less than in our baseline model.

Figure A-5 replicates Figure 3 for CRRA preferences. As expected, higher volatility is associated with higher mean growth and welfare gains.

Figure A-6 replicates Figure 3 and compares the baseline model with endogenous labor supply to a model with an inelastic labor supply, further elucidating the effects of labor flexibility.

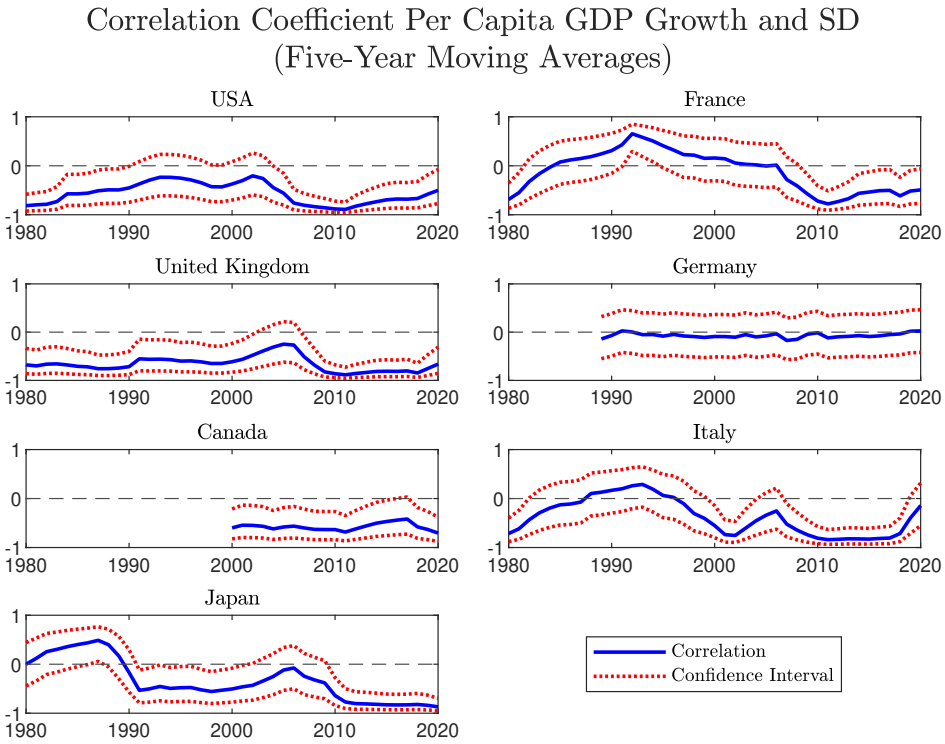
Table A-1 presents the results for different values of the elasticity of output for physical capital, α. Finally, Table A-2 shows the results for various combinations of the depreciation rates of human and physical capital while keeping the baseline risk aversion level of 20.

Figure A-1: Growth and Business Cycles in G7 Countries



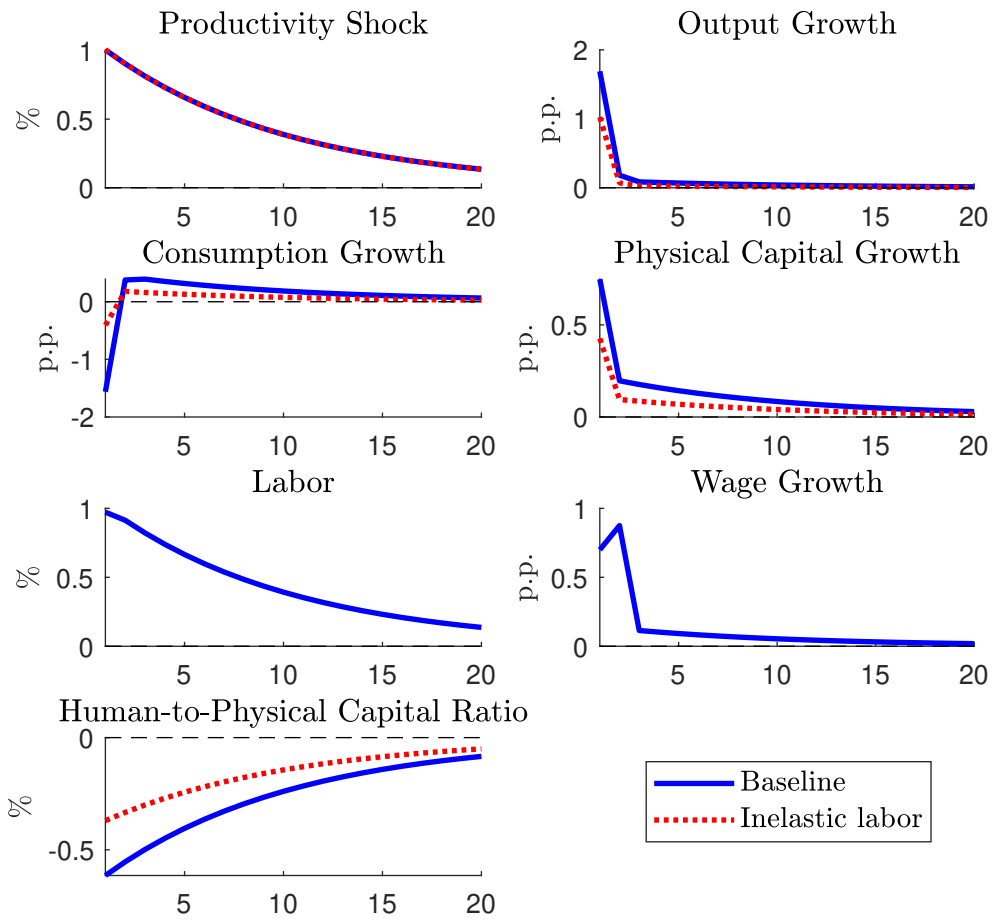
Source: Our elaborations on available yearly per capita GDP data for the period 1954-2019 across G7 Countries. The graphs show the five-year moving averages of per capita GDP growth and its standard deviation. Data source: World Bank Group (2023), World Development Indicators, retrieved from the Federal Reserve Bank of St Louis Data (FRED).

Figure A-2: Relationship between Growth and Business Cycles in G7 Countries



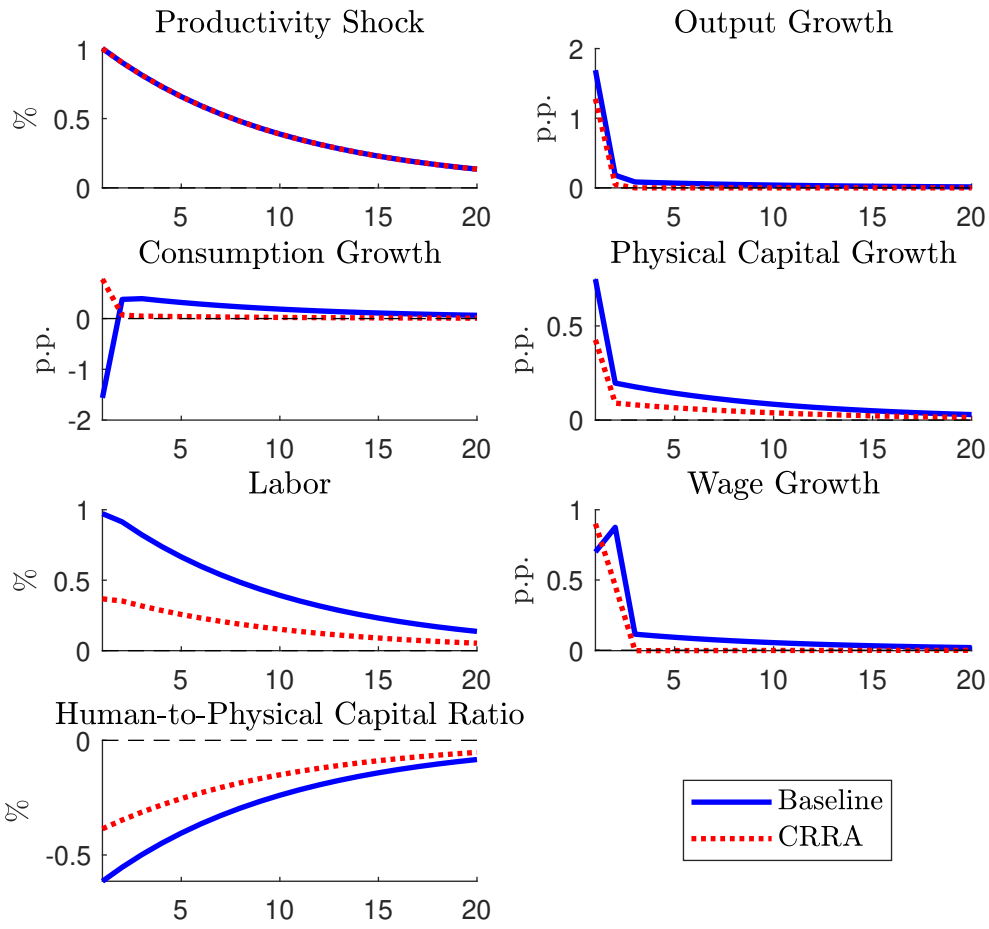
Source: Our elaborations on available yearly per capita GDP data for the period 1954-2019 across G7 Countries. The graphs show correlations between ten-year moving averages of per capita GDP growth and its standard deviation (SD). Correlations are computed over twenty-year sliding windows. Data source: World Bank Group (2023), World Development Indicators, retrieved from the Federal Reserve Bank of St Louis Data (FRED).

Figure A-3: Dynamic Response of the Economy to a Positive Productivity Shock



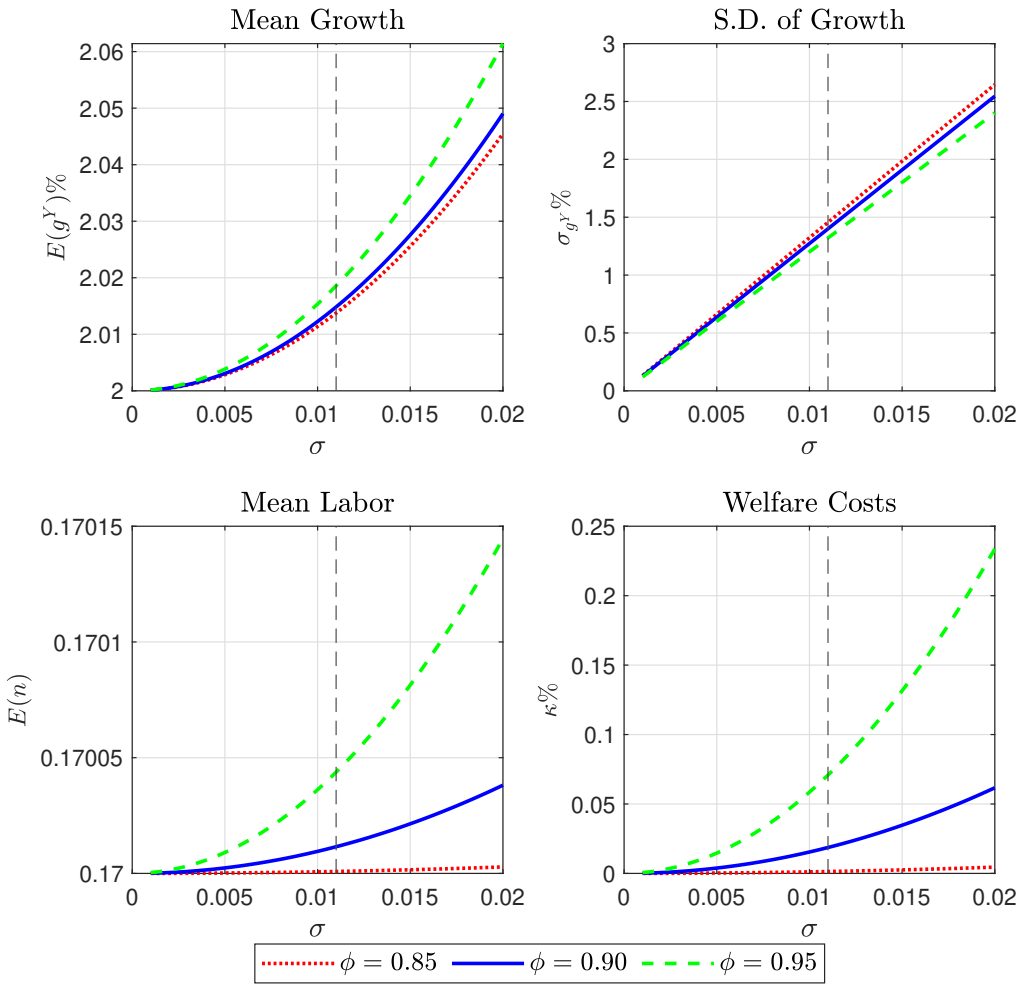
Note: Time on the x-axis is in years. Growth rates are measured in percentage point (p.p.) deviations from the deterministic steady state level, while labor and human-to-physical capital ratio are in percentage deviation from steady state.

Figure A-4: Dynamic Response of the Economy to a Positive Productivity Shock - CRRA Preferences



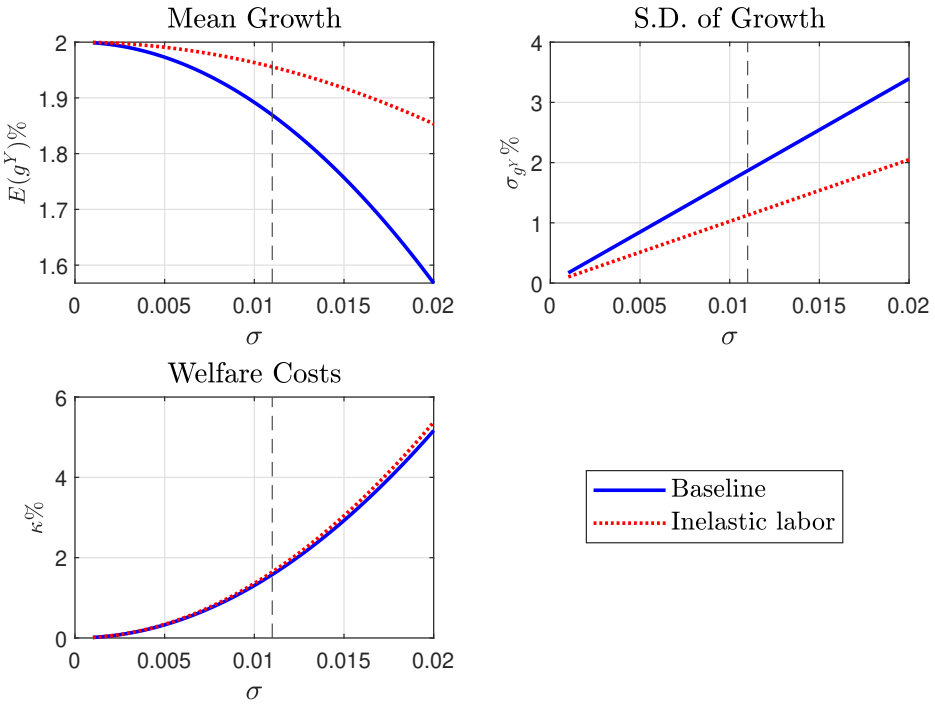
Note: Time on the x-axis is in years. Growth rates are measured in percentage point (p.p.) deviations from the deterministic steady state level, while labor and human-to-physical capital ratio are in percentage deviation from steady state. The coefficient of risk aversion, γ, is set to 2 under the CRRA.

Figure A-5: Volatility of Shocks, Growth, Labor, and Welfare Costs - Baseline and CRRA Preferences



Note: The figure plots the unconditional means for output growth, its standard deviation (S.D.), the unconditional means for labor, and the welfare cost of volatility for different values of the technological shock volatility σ. The vertical lines refer to the baseline value set for σ. At the deterministic steady state, $g^Y = 2\%$ and $n = 0.17$. The coefficient of risk aversion, γ, is set to 2 under the CRRA.

Figure A-6: Volatility of Shocks, Growth, and Welfare Costs - Baseline and Inelastic Labor Supply



Note: The figure plots the unconditional means for output growth, its standard deviation (S.D.), and the welfare cost of volatility for different values of the technological shock volatility σ. The vertical lines refer to the baseline value set for σ. At the deterministic steady state, $g^Y = 2\%$ and $n = 0.17$.

Table A-1: Mean Growth and Labor, and Welfare Costs for Different Values of α

$\psi = 1.73$									
	$\alpha = 0.2$			$\alpha = 0.33$			$\alpha = 0.5$		
γ	$E(g^Y)$	$E(n)$	κ	$E(g^Y)$	$E(n)$	κ	$E(g^Y)$	$E(n)$	κ
0.5	2.0608	0.1703	-0.2007	2.0510	0.1702	-0.1982	2.0406	0.1702	-0.1966
2	2.0455	0.1701	-0.0683	2.0363	0.1701	-0.0511	2.0266	0.1701	-0.0264
5	2.0149	0.1699	0.1963	2.0067	0.1698	0.2426	1.9986	0.1698	0.3135
10	1.9639	0.1695	0.6364	1.9574	0.1694	0.7312	1.9520	0.1694	0.8784
20	1.8619	0.1686	1.5133	1.8589	0.1686	1.7041	1.8588	0.1685	2.0028
30	1.7598	0.1678	2.3856	1.7603	0.1677	2.6715	1.7656	0.1676	3.1197
40	1.6578	0.1670	3.2535	1.6618	0.1669	3.6334	1.6724	0.1667	4.2292
$\psi = 0.5$									
	$\alpha = 0.2$			$\alpha = 0.33$			$\alpha = 0.5$		
γ	$E(g^Y)$	$E(n)$	κ	$E(g^Y)$	$E(n)$	κ	$E(g^Y)$	$E(n)$	κ
0.5	2.0162	0.1700	-0.0951	2.0140	0.1700	-0.0969	2.0120	0.1700	-0.1005
2	2.0197	0.1700	0.0062	2.0176	0.1700	0.0143	2.0156	0.1700	0.0259
5	2.0269	0.1701	0.2082	2.0247	0.1701	0.2360	2.0227	0.1701	0.2781
10	2.0387	0.1702	0.5435	2.0365	0.1702	0.6040	2.0346	0.1702	0.6965
20	2.0625	0.1705	1.2095	2.0601	0.1705	1.3342	2.0583	0.1705	1.5257
30	2.0862	0.1708	1.8691	2.0838	0.1708	2.0568	2.0820	0.1708	2.3450
40	2.1100	0.1710	2.5224	2.1074	0.1710	2.7718	2.1057	0.1711	3.1547

Note: The table reports the unconditional means for output growth and labor, and the welfare cost of volatility, κ (in %) for different values of the risk aversion γ, of intertemporal elasticity of substitution ψ and of the output elasticity for physical capital α. When $\psi = 1.73$ for the triplet of values of α, $\{0.2, 0.33, 0.5\}$, the corresponding values of γ, above which mean growth goes below its deterministic counterpart, are $\{6.46, 5.68, 4.85\}$. At the deterministic steady state, $g^Y = 2\%$ and $n = 0.17$.

Table A-2: Mean Growth and Labor, and Welfare Costs for Different Depreciation Rates

$\psi = 1.73$									
	$\delta_K = 0.075$			$\delta_K = 0.1$			$\delta_K = 0.12$		
δ_H	$E(g^Y)$	$E(n)$	κ	$E(g^Y)$	$E(n)$	κ	$E(g^Y)$	$E(n)$	κ
0.02	1.9270	0.1690	1.1245	1.9167	0.1690	1.2067	1.9097	0.1689	1.2602
0.04	1.8773	0.1687	1.5669	1.8589	0.1686	1.7041	1.8459	0.1685	1.7952
0.075	1.7730	0.1681	2.3735	1.7350	0.1679	2.6341	1.7074	0.1677	2.8116
$\psi = 0.5$									
	$\delta_K = 0.075$			$\delta_K = 0.1$			$\delta_K = 0.12$		
δ_H	$E(g^Y)$	$E(n)$	κ	$E(g^Y)$	$E(n)$	κ	$E(g^Y)$	$E(n)$	κ
0.02	2.0455	0.1703	0.9405	2.0479	0.1704	1.0067	2.0497	0.1704	1.0512
0.04	2.0562	0.1705	1.2341	2.0601	0.1705	1.3342	2.0629	0.1705	1.4023
0.075	2.0772	0.1706	1.7625	2.0845	0.1707	1.9347	2.0897	0.1708	2.0542

Note: The table reports the unconditional means for output growth and labor, and the welfare cost of volatility, κ (in %) for different values of the intertemporal elasticity of substitution ψ and of the depreciation rates δ_H and δ_K, for risk aversion γ set to 20. At the deterministic steady state, $g^Y = 2\%$ and $n = 0.17$.

References

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Trabandt, M. and Uhlig, H. (2011). The Laffer curve revisited. *Journal of Monetary Economics*, 58(4):305–327.

World Bank Group (2023). *World Development Indicators*. World Bank.