

Online Appendix to “Why So Low for So Long? A Long-Term View of Real Interest Rates”

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Appendix B. Robustness Results

B.1 Static and Dynamic Regression on Broader Country Sample

To expand the country dimension of our panel, we exclude income inequality and life expectancy. This allows us to extend the analysis to 17 countries. The results, both for the static and for the dynamic specifications, are roughly in line with those in the main text.

Table B.1.1. Static Specification—Expanded Sample

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
GDP Growth (+)	-0.09*** (0.03)	0.01 (0.01)	-0.06 (0.05)	0.04 (0.04)	0.05 (0.05)	0.00 (0.04)
Population Growth (+/-)	-0.82*** (0.14)	-0.05 (0.14)	-0.02 (0.26)	-1.03*** (0.25)	-0.25 (0.29)	-0.67 (0.47)
Dependency Ratio (+)	-0.01 (0.02)	0.02 (0.02)	0.02 (0.08)	0.00 (0.03)	0.07 (0.04)	-0.10** (0.04)
Life Expectancy (-)	-0.06** (0.02)	-0.10*** (0.02)	0.43* (0.23)	0.14 (0.09)	0.31 (0.21)	-0.52*** (0.05)
Public Debt (+)	-0.01* (0.00)	-0.01 (0.02)	0.01 (0.03)	-0.01*** (0.00)	-0.02 (0.02)	0.02*** (0.01)
Fiscal Balance (-)	-0.02 (0.04)	-0.08 (0.06)	-0.17** (0.06)	-0.06 (0.05)	0.24* (0.12)	-0.06 (0.04)
Constant	8.27*** (2.62)	6.83*** (1.80)	-25.13 (17.06)	-7.53 (8.22)	-25.05 (17.22)	49.80*** (4.32)
Adjusted R ²	0.10	0.12	0.15	0.15	0.22	0.37
No. of Observations	1,937	508	290	1,074	494	580
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors' calculations.
Note: Standard errors in parentheses based on a robust weighting matrix; ***/**/* denotes results significant at the 1/5/10 percent level. Significant correlation with signs consistent with saving-investment theory is shown in green, while incorrectly signed significant correlation is shown in red. Negative adjusted R-squared values not reported. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

Table B.1.2. Dynamic Specification—Expanded Sample

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
Long-Run Coefficients						
GDP Growth (+)	-0.10 (0.08)	0.04 (0.17)	-0.07 (0.07)	-0.13 (0.09)	0.03 (0.08)	-0.06 (0.16)
Population Growth (+/-)	-0.62* (0.32)	-0.07 (0.36)	0.53 (0.58)	-0.53* (0.32)	-0.16 (0.48)	-1.26 (0.92)
Dependency Ratio (+)	-0.00 (0.02)	0.06* (0.03)	-0.08 (0.07)	0.03 (0.03)	0.11*** (0.04)	-0.09* (0.05)
Life Expectancy (-)	-0.06*** (0.02)	-0.21*** (0.05)	0.19 (0.13)	-0.00 (0.07)	0.17 (0.19)	-0.62*** (0.09)
Public Debt (+)	-0.00 (0.01)	-0.02 (0.03)	-0.02 (0.02)	-0.01 (0.01)	0.02 (0.01)	0.01 (0.01)
Fiscal Balance (-)	-0.01 (0.05)	0.18 (0.16)	-0.34*** (0.08)	0.05 (0.08)	0.29 (0.18)	0.04 (0.06)
Short-Run Coefficients						
Adjustment Parameter	-0.34*** (0.04)	-0.20*** (0.08)	-0.78*** (0.06)	-0.25*** (0.04)	-0.37*** (0.06)	-0.34*** (0.05)
Constant	2.61** (1.19)	1.73** (0.73)	-0.85 (8.58)	0.32 (1.76)	-7.15 (5.57)	19.47*** (3.09)
Adjusted R ²	0.25	0.29	0.65	0.17	0.24	0.23
No. of Observations	1,774	463	254	1,045	471	574
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Lags	2	2	2	2	2	2

Source: Authors' calculations.

Note: Robust standard errors in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

B.2 Short-Term Market Rates as the Dependent Variable

This appendix replicates key specifications using short-term market interest rates instead of long-term ones. As short-term real rates rely less on inflation forecasts, they should be more robust to any measurement errors in expected inflation. As the tables below indicate, the results for the short-term rate are broadly in line with for the long-term rate. This is so in both the static and dynamic fixed-effects panel, as well as for the global specifications (Tables 3, 5, and 7 in the main text). The lack of stable relationships across all specifications is as clear as in the case of long-term interest rates.

Table B.2.1. Static Specification Using Short-Term Interest Rates

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
GDP Growth (+)	-0.20*** (0.05)	-0.20 (0.16)	-0.23** (0.07)	0.10 (0.10)	0.07 (0.10)	0.06 (0.06)
Population Growth (+/-)	-1.27*** (0.39)	-0.54 (0.37)	0.69 (0.82)	-0.58 (0.48)	0.31 (0.34)	-0.90 (1.20)
Dependency Ratio (+)	0.00 (0.03)	0.12* (0.06)	0.21* (0.09)	0.01 (0.04)	0.23*** (0.05)	-0.18 (0.10)
Life Expectancy (-)	-0.08* (0.04)	-0.16** (0.05)	0.43** (0.19)	0.29** (0.11)	0.43** (0.17)	-0.71*** (0.12)
Relative Price of Capital (+)	0.01 (0.02)	0.12*** (0.03)	-0.04 (0.04)	0.00 (0.02)	-0.04 (0.02)	0.05 (0.06)
Income Inequality (-)	0.02 (0.07)	-0.09 (0.16)	-0.29 (0.55)	-0.34*** (0.10)	-0.06 (0.26)	0.01 (0.21)
Public Debt (+)	-0.01* (0.01)	-0.08*** (0.01)	0.02 (0.05)	-0.02** (0.01)	0.01 (0.02)	0.02 (0.01)
Fiscal Balance (-)	-0.01 (0.05)	0.10 (0.21)	0.06 (0.16)	-0.05 (0.05)	0.28** (0.09)	-0.04 (0.04)
Constant	9.17* (5.03)	4.41 (4.22)	-34.39 (21.55)	-17.68 (10.87)	-48.86** (16.86)	69.90*** (12.84)
Adjusted R ²	0.14	0.37	0.22	0.16	0.25	0.40
No. of Observations	1,044	186	182	642	303	339
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors' calculations.

Note: Robust standard in parentheses based on country clusters; **/**/* denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

Table B.2.2. Dynamic Specification Using Short-Term Interest Rates

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
Long-Run Coefficients						
GDP Growth (+)	-0.26* (0.14)	-0.29** (0.12)	-0.20* (0.12)	0.17 (0.12)	0.14 (0.12)	0.34* (0.20)
Population Growth (+/-)	-1.02* (0.58)	-1.24* (0.66)	-1.18 (0.78)	-1.11* (0.61)	-1.44 (0.93)	-2.70 (1.89)
Dependency Ratio (+)	-0.01	-0.00	0.07	0.02	0.16***	-0.12
Life Expectancy (-)	-0.18*** (0.03)	-0.19* (0.08)	-0.14 (0.09)	0.14** (0.03)	-0.03 (0.05)	0.14 (0.14)
Relative Price of Capital (+)	0.01	0.23*** (0.10)	-0.05 (0.22)	0.01 (0.07)	-0.07* (0.29)	0.15 (0.15)
Income Inequality (-)	-0.15*** (0.02)	0.04	0.04	0.02	0.04	0.13** (0.06)
Public Debt (+)	-0.00	0.15* (0.09)	0.06 (0.25)	-0.45*** (0.11)	-0.11 (0.44)	0.01 (0.20)
Fiscal Balance (-)	0.01	-0.04 (0.03)	-0.03 (0.03)	-0.00 (0.01)	0.04*** (0.01)	0.01 (0.02)
Short-Run Coefficients						
Adjustment Parameter	-0.45*** (0.05)	-0.89*** (0.06)	-0.99*** (0.10)	-0.38*** (0.03)	-0.69*** (0.09)	-0.41*** (0.05)
Constant	8.29*** (2.29)	9.62 (9.52)	9.29 (17.13)	-2.38 (2.52)	-6.47 (20.14)	19.00** (7.66)
Adjusted R ²	0.36	0.52	0.81	0.31	0.48	0.31
No. of Observations	977	171	166	629	292	337
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Lags	2	2	2	2	2	2

Source: Authors' calculations.

Note: Robust standard in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

Table B.2.3. Dynamic Global Specification Using Short Rates

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
Long-Run Coefficients (Global)						
GDP Growth (+)	-0.08 (0.14)	-0.05 (0.20)	0.08 (0.25)	-0.08 (0.46)	0.53 (0.56)	-0.35 (0.60)
Population Growth (+/-)	-0.72 (0.92)	-4.98 (4.25)	0.00 (0.00)	-15.09*** (3.38)	-0.81 (9.28)	-37.16 (37.70)
Dependency Ratio (+)	-0.09 (0.08)	0.23 (0.50)	0.91 (0.82)	0.35 (0.22)	1.10* (0.58)	-1.50* (0.78)
Life Expectancy (-)	-0.34*** (0.06)	0.16 (0.46)	0.00 (0.00)	-0.96*** (0.37)	1.99 (1.35)	-9.82*** (2.72)
Relative Price of Capital (+)	-0.06 (0.05)	-0.12 (0.20)	-1.13 (0.70)	-0.19** (0.09)	0.78 (1.03)	0.33 (0.21)
Income Inequality (-)	-0.38*** (0.12)	0.86 (0.53)	0.00 (0.00)	-0.49 (0.44)	-3.55 (3.71)	4.37*** (1.31)
Public Debt (+)	0.00 (0.03)	-0.11 (0.13)	-0.08 (0.09)	0.16* (0.08)	0.53** (0.22)	0.62** (0.31)
Fiscal Balance (-)	0.15 (0.21)	0.80 (2.32)	-3.58 (2.55)	-2.19*** (0.62)	2.61 (1.68)	-0.92 (0.90)

(continued)

Table B.2.3. (Continued)

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
Long-Run Coefficients (Domestic) GDP Growth (+)	-0.06 (0.09)	-0.42* (0.22)	-0.17* (0.10)	0.18** (0.09)	0.02 (0.07)	0.15 (0.16)
Population Growth (+/-)	-0.49 (0.58)	-0.19 (0.81)	-1.34* (0.69)	-0.21 (0.78)	-0.24 (0.73)	-1.57 (1.12)
Dependency Ratio (+)	0.00 (0.02)	-0.02 (0.05)	-0.02 (0.10)	0.04 (0.04)	-0.02 (0.08)	0.03 (0.11)
Life Expectancy (-)	-0.19*** (0.06)	0.25* (0.13)	0.11 (0.11)	0.21 (0.24)	-0.73 (0.48)	0.79** (0.37)
Relative Price of Capital (+)	0.03 (0.02)	0.16*** (0.04)	-0.11** (0.05)	0.02 (0.02)	-0.03 (0.03)	0.09*** (0.04)
Income Inequality (-)	-0.16*** (0.05)	0.03 (0.13)	0.34 (0.23)	-0.17 (0.13)	-0.37 (0.39)	0.20 (0.19)
Public Debt (+)	-0.00 (0.01)	-0.04 (0.03)	-0.03 (0.02)	0.01 (0.01)	0.03*** (0.01)	0.01 (0.01)
Fiscal Balance (-)	0.01 (0.07)	0.03 (0.22)	-0.03 (0.16)	0.10 (0.09)	0.16 (0.14)	0.00 (0.05)
Short-Run Coefficients Adjustment Parameter	-0.55*** (0.05)	-1.00*** (0.04)	-0.90*** (0.13)	-0.41*** (0.04)	-0.62*** (0.06)	-0.62*** (0.07)
Constant	20.21*** (6.82)	-36.78 (68.67)	-59.03 (57.35)	21.80 (13.35)	-140.62* (82.13)	497.86*** (100.90)
Adjusted R ²	0.48	0.62	0.85	0.50	0.67	0.49
No. of Observations	977	171	166	629	292	337
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Lags	2	2	2	2	2	2

Source: Authors' calculations.

Note: Robust standard errors in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

B.3 Alternative Expectations of Inflation and GDP Growth

Because expected inflation is not observable, estimated measures of ex ante real interest rate may be subject to mismeasurement problems. Expectations of future saving-investment factors, e.g., GDP growth, could also be important. We deal with these issues in several ways.

In the first robustness check, we allow for the possibility that agents might anticipate future average 10-year inflation and GDP growth correctly, e.g., they might be able to foresee the protracted period of slower growth associated with the Great Recession and revise expected inflation down. We follow the approach by Galí and Gertler (1999), who impose the rational expectations hypothesis through an orthogonality condition. Equation (1) may then be written as

$$i_t = \varphi_1 E_t [\pi_{t+1,t+10}] + \varphi_2 E_t [g_{t+1,t+10}^Y] + r^* (\tilde{X}_t; \beta) + r_t^{MP},$$

where i_t is the nominal yield on government bonds, $\pi_{t+1,t+10}$ and $g_{t+1,t+10}^Y$ are the average 10-year-ahead inflation and GDP growth rates, respectively, and \tilde{X}_t excludes the GDP growth rate. Under rational expectations, errors in forecasting inflation are uncorrelated with information, Z_t , dated t or earlier. This gives the orthogonality condition

$$E_t \left[\left(i_t - \varphi_1 \pi_{t+1,t+10} - \varphi_2 g_{t+1,t+10}^Y - r^* (\tilde{X}_t; \beta) - r_t^{MP} \right) Z_t \right] = 0,$$

which can be used to estimate the parameters via GMM. With rational expectations, we would expect to find $\varphi_1 = 1$.

The GMM estimation results are shown in Table B.3.1. Allowing for potentially rational expectations does not increase the relevance of the saving-investment factors in explaining real interest rates. Again, the parameters for the saving-investment factors often have the wrong sign, are statistically insignificant, or vary across samples. This suggests that any mismeasurement of inflation expectations due to a high degree of agents' foresight is unlikely to be the culprit. In fact, the results seem inconsistent with the rational expectations hypothesis: φ is quite far from unity and statistically insignificant in most subsamples. Less than fully rational inflation expectations

may be one reason why monetary policy seems to have effects that last beyond the normal business cycle.

We next consider an alternative autoregression-based estimate of inflation expectations. In the main text, the autoregressive parameter is capped at 0.9, in order to impose stationarity on expected inflation even in periods of high inflation. We relax this constraint by capping the autoregressive parameter at 1. This results in real interest rates that are generally very similar to before, but more volatile in high inflation episodes. The estimates for static and dynamic specifications are shown in Tables B.3.2 and B.3.3, and are very similar to their counterparts of Tables 3 and 5 in the main text.

Lastly, we also reestimate the baseline regression computing real interest rates simply as the difference between nominal rates and ex post inflation. The general pattern remains the same: no saving-investment factor is systematically associated with real interest rates in the way predicted by theory. Similar findings across various measures of expected inflation suggest that our general conclusion is robust to mismeasurement problems.

Table B.3.1. Allowing for Anticipated Inflation with GMM Estimation

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
Average 10-Year-Ahead Inflation (+, =1 if perfect foresight)	0.62*** (0.17)	0.31*** (0.09)	-0.33*** (0.12)	0.95** (0.39)	-0.28 (0.56)	-3.09 (3.84)
GDP Growth (+)	-1.50*** (0.58)	-0.30 (0.32)	-0.06 (0.54)	-0.57 (0.87)	-2.02* (1.15)	-8.42 (9.42)
Population Growth (+/-)	0.01 (0.29)	-0.99 (2.33)	-0.16 (0.17)	-0.62 (0.90)	0.05 (0.53)	-0.50 (4.83)
Dependency Ratio (+)	0.02 (0.08)	0.14 (0.26)	0.12** (0.06)	-0.13* (0.07)	0.14 (0.12)	0.49 (0.49)
Life Expectancy (-)	-0.03 (0.14)	-0.10** (0.05)	-0.05 (0.09)	0.08 (0.33)	-0.02 (0.44)	-4.82 (4.83)
Relative Price of Capital (+)	0.02 (0.02)	-0.00 (0.04)	-0.07** (0.03)	0.05 (0.03)	0.08 (0.05)	-0.02 (0.29)
Income Inequality (-)	-0.20* (0.12)	0.15 (0.12)	0.23* (0.13)	-0.36* (0.18)	-0.41 (0.27)	0.50 (1.08)
Public Debt (+)	-0.03 (0.01)	0.04 (0.05)	-0.01 (0.00)	-0.02 (0.02)	-0.04*** (0.02)	-0.06 (0.07)
Fiscal Balance (-)	-0.26*** (0.07)	0.24*** (0.09)	-0.14 (0.14)	-0.23*** (0.09)	-0.01 (0.11)	-0.44 (0.40)
Constant	13.22 (16.33)	-8.74 (20.93)	-5.22 (7.46)	12.64 (27.86)	11.69 (35.19)	373.14 (371.82)
No. of Observations	705	33	65	590	296	294
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors' calculations.

Note: Robust standard errors in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. The set of instruments include all variables in \tilde{X}_t , as well as the current and lagged values of the year-on-year inflation and GDP growth rates. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

Table B.3.2. Static Specification Using Alternative Inflation Expectations

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
GDP Growth (+)	-0.14** (0.05)	-0.00 (0.01)	-0.10 (0.09)	0.10 (0.08)	0.11 (0.10)	0.07 (0.06)
Population Growth (+/-)	-0.89** (0.31)	-0.60 (0.42)	0.47 (0.39)	-0.61* (0.28)	-0.04 (0.30)	-0.32 (0.58)
Dependency Ratio (+)	-0.00 (0.02)	0.02 (0.03)	-0.01 (0.14)	0.02 (0.02)	0.16*** (0.03)	-0.09 (0.06)
Life Expectancy (-)	0.02 (0.03)	-0.18*** (0.05)	0.59 (0.47)	0.24*** (0.07)	0.50** (0.16)	-0.36*** (0.10)
Relative Price of Capital (+)	0.00 (0.02)	0.10** (0.04)	-0.12* (0.06)	-0.01 (0.02)	-0.08* (0.04)	0.02 (0.03)
Income Inequality (-)	0.11 (0.06)	0.03 (0.05)	0.07 (0.52)	-0.23** (0.07)	0.07 (0.24)	-0.06 (0.15)
Public Debt (+)	-0.01** (0.00)	-0.03* (0.01)	-0.06 (0.06)	-0.01** (0.00)	0.00 (0.02)	0.02* (0.01)
Fiscal Balance (-)	0.01 (0.05)	0.09 (0.11)	-0.10 (0.22)	-0.05 (0.05)	0.20** (0.08)	-0.08 (0.06)
Constant	1.74 (2.81)	9.95* (4.27)	-28.23 (38.03)	-14.55* (6.63)	-47.07* (15.43)	37.30*** (10.59)
Adjusted R ²	0.08	0.58	0.20	0.17	0.25	0.31
No. of Observations	1,059	186	198	635	296	339
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors' calculations.
Note: Robust standard errors in parentheses based on country clusters; *** ** * denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

Table B.3.3. Dynamic Specification Using Alternative Inflation Expectations

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
Long-Run Coefficients						
GDP Growth (+)	-0.08 (0.11)	0.04 (0.24)	-0.04 (0.11)	-0.02 (0.09)	0.16 (0.13)	-0.11 (0.12)
Population Growth (+/-)	-0.72 (0.55)	-1.18** (0.49)	-0.10 (0.79)	-0.50 (0.40)	-0.46 (0.60)	-0.83 (0.81)
Dependency Ratio (+)	-0.01 (0.03)	-0.04 (0.06)	-0.13 (0.10)	0.04 (0.03)	0.20*** (0.03)	-0.09 (0.09)
Life Expectancy (-)	-0.05* (0.03)	-0.21** (0.09)	0.33** (0.15)	0.13*** (0.04)	0.44* (0.23)	-0.36** (0.16)
Relative Price of Capital (+)	0.01 (0.01)	0.16*** (0.04)	-0.04 (0.04)	-0.00 (0.02)	-0.07* (0.04)	0.03 (0.02)
Income Inequality (-)	0.01 (0.04)	0.19*** (0.05)	0.03 (0.23)	-0.19* (0.10)	0.23 (0.36)	-0.08 (0.16)
Public Debt (+)	0.00 (0.00)	-0.00 (0.02)	-0.05* (0.03)	-0.00 (0.01)	0.03*** (0.01)	0.01 (0.01)
Fiscal Balance (-)	-0.01 (0.05)	0.11 (0.11)	-0.27 (0.18)	0.08 (0.06)	0.34** (0.13)	-0.03 (0.05)
Short-Run Coefficients						
Adjustment Parameter	-0.50*** (0.05)	-0.25*** (0.04)	-0.87*** (0.10)	-0.44*** (0.07)	-0.67*** (0.08)	-0.46*** (0.07)
Constant	3.69 (2.33)	3.01 (2.33)	-1.85 (12.64)	-3.57* (2.08)	-32.29** (15.28)	17.47*** (5.39)
Adjusted R ²	0.38	0.30	0.69	0.32	0.45	0.31
No. of Observations	990	171	184	620	283	337
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Lags	2	2	2	2	2	2

Source: Authors' calculations.

Note: Robust standard errors in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

B.4 Productivity Growth as an Independent Variable

In this robustness check we replace GDP growth with total factor productivity (TFP) growth in our baseline specification. This reduces the sample size somewhat, as the productivity variable has a smaller coverage. In the static specification, TFP growth is significant and correctly signed in all postwar periods, but incorrectly signed over the full sample. Under a dynamic specification, TFP growth is significant only for the pre-Volcker period, and not the full sample. Again, we do not find any systematic correlation between the other saving-investment factors and real interest rates over time.

Table B.4.1. Static Specification with Productivity in Place of GDP Growth

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
TFP Growth (+)	-0.14** (0.05)	-0.02 (0.01)	-0.03 (0.04)	0.19*** (0.05)	0.23*** (0.07)	0.08* (0.04)
Population Growth (+/-)	-1.01** (0.33)	-0.60* (0.30)	0.49 (0.41)	-0.67** (0.24)	-0.04 (0.20)	-0.20 (0.51)
Dependency Ratio (+)	0.01 (0.02)	0.10 (0.08)	-0.04 (0.10)	0.02 (0.02)	0.14*** (0.03)	-0.07 (0.05)
Life Expectancy (-)	0.02 (0.02)	-0.19*** (0.01)	0.47 (0.32)	0.27*** (0.06)	0.57*** (0.12)	-0.32*** (0.10)
Relative Price of Capital (+)	0.00 (0.01)	0.12*** (0.02)	-0.08 (0.05)	0.00 (0.02)	-0.04 (0.03)	0.03 (0.03)
Income Inequality (-)	0.08 (0.06)	-0.11 (0.08)	0.04 (0.37)	-0.24*** (0.06)	-0.00 (0.19)	-0.05 (0.14)
Public Debt (+)	-0.01*** (0.00)	-0.00 (0.01)	-0.03 (0.04)	-0.01*** (0.00)	-0.00 (0.01)	0.02* (0.01)
Fiscal Balance (-)	-0.01 (0.04)	-0.03 (0.06)	-0.09 (0.16)	-0.04 (0.06)	0.18** (0.07)	-0.07 (0.06)
Constant	0.73 (2.48)	3.62 (7.06)	-20.70 (25.90)	-16.56*** (5.13)	-50.40*** (11.67)	32.65*** (9.83)
Adjusted R ²	0.08	0.67	0.21	0.26	0.42	0.34
No. of Observations	1,013	140	198	635	296	339
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors' calculations.

Note: Robust standard errors in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

Table B.4.2. Dynamic Specification with Productivity in Place of GDP Growth

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
Long-Run Coefficients						
TFP Growth (+)	0.04 (0.13)	0.11 (0.13)	0.12 (0.11)	0.19 (0.13)	0.42*** (0.15)	0.12 (0.12)
Population Growth (+/-)	-0.57 (0.50)	-1.53*** (0.54)	-0.18 (0.59)	-0.62* (0.33)	-0.77 (0.61)	-0.73 (0.81)
Dependency Ratio (+)	-0.00 (0.03)	-0.04 (0.07)	-0.17*** (0.08)	0.03 (0.02)	0.17*** (0.03)	-0.03 (0.07)
Life Expectancy (-)	-0.04 (0.03)	-0.37*** (0.10)	0.27** (0.12)	0.17*** (0.03)	0.44** (0.17)	-0.26 (0.16)
Relative Price of Capital (+)	0.01 (0.01)	0.20** (0.09)	-0.04* (0.02)	0.01 (0.02)	-0.06* (0.03)	0.03 (0.03)
Income Inequality (-)	-0.04 (0.05)	0.18** (0.09)	0.06 (0.20)	-0.24*** (0.09)	0.04 (0.24)	-0.12 (0.17)
Public Debt (+)	0.00 (0.00)	0.02 (0.04)	-0.04** (0.02)	-0.00 (0.01)	0.02 (0.01)	0.01 (0.01)
Fiscal Balance (-)	0.00 (0.05)	0.05 (0.16)	-0.17 (0.11)	0.08 (0.05)	0.26*** (0.08)	-0.01 (0.06)

(continued)

Table B.4.2. (Continued)

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
Short-Run Coefficients						
Adjustment Parameter	-0.42*** (0.05)	-0.30*** (0.03)	-0.90*** (0.11)	-0.37*** (0.05)	-0.60*** (0.08)	-0.44*** (0.06)
Constant	2.77 (2.16)	5.68** (2.83)	3.34 (10.74)	-3.50** (1.58)	-26.09*** (10.02)	11.34** (4.70)
Adjusted R ²	0.36	0.43	0.70	0.29	0.46	0.29
No. of Observations	944	125	184	620	283	337
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Lags	2	2	2	2	2	2

Source: Authors' calculations.
Note: Robust standard errors in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

B.5 Savers' Ratio as an Independent Variable

This robustness check evaluates alternative definitions of the dependency ratio. In particular, we consider the “savers’ ratio,” used in Lunsford and West (2017), defined as the fraction of the population aged between 40 and 64. This measure is inversely related to the dependency ratio used in the baseline (and thus the expected sign should be negative). As reported in the tables below, only in the post-war subsample is this new variable significant and correctly signed across both static and dynamic specifications. In either specification, the savers’ ratio does not hold up in the full sample. We also experimented with the old-age dependency ratio (namely dropping the youngest population from the calculation), and found very little evidence of a systematic relationship (the result is not reported).

Table B.5.1.1. Static Specification with Savers' Ratio

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
GDP Growth (+)	-0.13*** (0.04)	0.00 (0.01)	-0.07 (0.06)	0.06 (0.06)	0.06 (0.07)	0.06 (0.05)
Population Growth (+/-)	-1.04*** (0.32)	-0.41 (0.43)	0.59 (0.40)	-0.55** (0.24)	-0.12 (0.27)	-0.25 (0.66)
Savers' Ratio (-)	-0.17 (0.16)	0.24 (0.41)	0.43 (0.48)	-0.43*** (0.08)	-0.49* (0.25)	-0.24 (0.15)
Life Expectancy (-)	0.07 (0.06)	-0.19*** (0.04)	0.42 (0.30)	0.36*** (0.07)	0.37** (0.12)	-0.12 (0.18)
Relative Price of Capital (+)	0.01 (0.02)	0.10** (0.03)	-0.09* (0.04)	-0.03 (0.02)	-0.07*** (0.02)	0.00 (0.03)
Income Inequality (-)	0.10* (0.05)	0.03 (0.05)	0.02 (0.36)	-0.17** (0.07)	-0.15 (0.25)	0.01 (0.15)
Public Debt (+)	-0.00 (0.00)	-0.02 (0.02)	-0.03 (0.04)	-0.00 (0.00)	-0.01 (0.01)	0.01 (0.01)
Fiscal Balance (-)	0.03 (0.03)	0.05 (0.11)	-0.10 (0.17)	0.01 (0.05)	0.16* (0.08)	-0.06 (0.05)
Constant	2.62 (2.38)	6.48 (7.87)	-30.50* (15.58)	-10.41** (3.51)	-9.90 (8.14)	19.31* (10.11)
Adjusted R ²	0.11	0.58	0.23	0.33	0.32	0.36
No. of Observations	1,059	186	198	635	296	339
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors' calculations.

Note: Robust standard errors in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

Table B.5.2. Dynamic Specification with Savers' Ratio

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
Long-Run Coefficients						
GDP Growth (+)	-0.10 (0.12)	0.03 (0.21)	-0.07 (0.08)	-0.05 (0.07)	0.11 (0.10)	-0.10 (0.11)
Population Growth (+/-)	-1.01* (0.57)	-1.34*** (0.32)	0.44 (0.61)	-1.25*** (0.31)	-1.89*** (0.40)	-1.33* (0.77)
Savers' Ratio (-)	-0.16** (0.07)	0.44 (0.31)	0.43 (0.37)	-0.33*** (0.07)	-0.31 (0.37)	-0.27** (0.13)
Life Expectancy (-)	-0.01 (0.02)	-0.16*** (0.06)	0.33* (0.19)	0.18*** (0.05)	0.04 (0.16)	-0.19 (0.13)
Relative Price of Capital (+)	0.01 (0.01)	0.15*** (0.03)	-0.00 (0.06)	-0.01 (0.01)	-0.09*** (0.03)	0.00 (0.03)
Income Inequality (-)	-0.02 (0.04)	0.23*** (0.07)	-0.04 (0.20)	-0.15 (0.11)	-0.04 (0.33)	0.09 (0.21)
Public Debt (+)	0.00 (0.00)	-0.00 (0.02)	-0.04* (0.02)	-0.01 (0.01)	0.01 (0.01)	-0.01 (0.01)
Fiscal Balance (-)	0.01 (0.05)	0.10 (0.12)	-0.14 (0.14)	0.10** (0.05)	0.26*** (0.10)	0.01 (0.06)
Short-Run Coefficients						
Adjustment Parameter	-0.42*** (0.05)	-0.27*** (0.05)	-0.89*** (0.09)	-0.38*** (0.04)	-0.53*** (0.06)	-0.44*** (0.06)
Constant	3.73*** (0.71)	-1.03 (2.26)	-20.39** (9.64)	0.45 (0.81)	5.03 (5.20)	11.80*** (3.78)
Adjusted R ²	0.37	0.31	0.65	0.28	0.40	0.32
No. of Observations	990	171	184	620	283	337
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Lags	2	2	2	2	2	2

Source: Authors' calculations.

Note: Robust standard errors in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

*B.6 Time-Varying Retirement Age
Interactions with Demographic Variables*

This exercise allows for the potential effects of a changing retirement age. We use the labor force participation rate of 65-year-olds as a proxy for the expected retirement age. The dynamic specification is then extended to include interaction terms between this proxy and the three demographic variables, as well as between the dependency ratio and life expectancy. The main findings survive. Neither specification delivers more stable relationships in any of the subsamples. The interaction terms are also either statistically insignificant or incorrectly signed.

Table B.6.1. Dynamic Specification with Time-Varying Retirement Age

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
Long-Run Coefficients						
GDP Growth (+)	-0.03 (0.17)	0.03 (0.10)	0.03 (0.09)	-0.04 (0.09)	0.15 (0.13)	-0.10 (0.15)
Population Growth (PG) (+/-)	-1.68** (0.73)	-1.00 (2.37)	-9.04** (3.58)	-1.93 (1.19)	3.79 (2.33)	-3.78 (4.06)
Dependency Ratio (DR)(+)	-0.29 (0.23)	0.04 (0.38)	-0.83* (0.46)	-0.07 (0.43)	0.18 (0.93)	-0.99 (2.82)
Life Expectancy (LE) (-)	-0.52* (0.30)	1.18** (0.53)	3.25 (3.17)	0.30 (0.64)	0.72 (1.57)	-1.53 (1.81)
Old-Age Participation (OP) (+)	2.03** (0.98)	3.28 (7.99)	20.19* (11.65)	3.66*** (1.05)	12.14*** (2.86)	2.02 (3.09)
PG × OP (+/-)	0.06 (0.05)	0.14 (0.16)	0.66** (0.29)	0.10 (0.07)	-0.26 (0.17)	0.13 (0.15)
DR × OP (+)	-0.01* (0.01)	0.01 (0.03)	-0.01 (0.05)	-0.01 (0.01)	-0.05*** (0.01)	-0.02 (0.01)
LE × OP (+/-)	-0.02* (0.01)	-0.10 (0.10)	-0.33*** (0.19)	-0.03*** (0.01)	-0.10** (0.04)	-0.01 (0.03)
DR × LE (+/-)	0.01* (0.00)	-0.00 (0.02)	0.01 (0.02)	0.00 (0.01)	0.01 (0.02)	0.02 (0.04)

(continued)

Table B.6.1. (Continued)

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
Relative Price of Capital (+)	-0.01 (0.01)	-0.03 (0.03)	-0.13*** (0.05)	0.00 (0.02)	-0.09*** (0.03)	0.02 (0.03)
Income Inequality (-)	-0.03 (0.07)	-0.10 (0.11)	-0.20 (0.41)	-0.11 (0.09)	0.23 (0.23)	-0.08 (0.16)
Public Debt (+)	-0.01 (0.01)	0.08 (0.07)	-0.05*** (0.01)	-0.01 (0.01)	0.00 (0.01)	-0.01 (0.01)
Fiscal Balance (-)	0.01 (0.06)	-0.10 (0.07)	0.11 (0.16)	0.08 (0.05)	0.18* (0.11)	0.00 (0.06)
Short-Run Coefficients						
Adjustment Parameter	-0.44*** (0.05)	-0.73*** (0.04)	-0.89*** (0.09)	-0.40*** (0.05)	-0.70*** (0.09)	-0.43*** (0.07)
Constant	12.16 (10.08)	-32.46 (31.41)	-147.55 (141.98)	-17.42 (15.44)	-101.44 (67.67)	39.59 (59.99)
Adjusted R ²	0.40	0.71	0.87	0.30	0.50	0.32
No. of Observations	858	84	139	620	283	337
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Lags	2	2	2	2	2	2

Source: Authors' calculations.
Note: Robust standard errors in parentheses based on country clusters; *** /** /* denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

B.7 Risk Premium as an Independent Variable

We proxy the risk premium with measures of fundamental risks in the economy, namely volatilities and higher moments of GDP growth and inflation, thereby also allowing for “tail risks,” e.g., Vlieghe (2017). We compute 20-year rolling moments, and use the series as additional saving-investment factors in the baseline. As shown in the tables below, in most cases the risk measures either are insignificant or have the wrong signs.

Table B.7.1. Static Specification Augmented by Fundamental Risk Measures

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
GDP Growth (+)	-0.06 (0.06)	0.03** (0.01)	-0.11 (0.09)	0.09* (0.04)	0.07 (0.05)	0.06 (0.05)
Population Growth (+/-)	-1.08*** (0.31)	-0.46 (0.29)	0.82 (0.57)	-0.82* (0.40)	-0.10 (0.32)	-0.14 (0.53)
Dependency Ratio (+)	0.03* (0.02)	0.13* (0.07)	0.01 (0.05)	0.05** (0.02)	0.15*** (0.02)	-0.07 (0.06)
Life Expectancy (-)	0.03 (0.04)	-0.12*** (0.03)	0.37*** (0.16)	0.24*** (0.07)	0.34*** (0.11)	-0.29 (0.16)
Relative Price of Capital (+)	-0.01 (0.01)	0.11* (0.03)	-0.00 (0.03)	-0.02 (0.02)	-0.06** (0.02)	0.03 (0.03)
Income Inequality (-)	0.02 (0.09)	-0.09* (0.05)	-0.20 (0.25)	-0.24** (0.08)	-0.15 (0.15)	-0.05 (0.15)
Public Debt (+)	-0.01** (0.00)	0.05*** (0.01)	0.01 (0.02)	-0.01*** (0.40)	0.00 (0.01)	0.01 (0.01)
Fiscal Balance (-)	0.01 (0.04)	0.10 (0.09)	-0.03 (0.10)	-0.02 (0.05)	0.12 (0.07)	-0.08 (0.05)

(continued)

Table B.7.1. (Continued)

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
GDP Growth Volatility (-)	-0.19 (0.39)	-1.46** (0.43)	-0.54 (0.96)	-0.04 (0.40)	0.05 (0.32)	0.51 (0.66)
Inflation Volatility (-)	0.15 (0.18)	0.50*** (0.12)	0.59 (0.54)	-0.04 (0.13)	-0.53** (0.19)	0.11 (0.12)
GDP Growth Skewness (+)	0.28 (0.39)	-0.44** (0.17)	2.26 (2.16)	0.40 (0.33)	-0.02 (0.57)	0.48 (0.48)
Inflation Skewness (+)	-1.32** (0.58)	-0.59** (0.25)	-3.94*** (0.64)	-1.66*** (0.45)	-1.31** (0.50)	0.10 (0.34)
GDP Growth Kurtosis (-)	-0.03 (0.24)	-0.20 (0.12)	-0.39 (0.63)	0.04 (0.18)	-0.18 (0.28)	0.25* (0.13)
Inflation Kurtosis (-)	0.13 (0.19)	0.83** (0.29)	0.45 (0.87)	0.35* (0.17)	0.25 (0.19)	-0.08 (0.10)
Constant	-0.37 (4.20)	-5.61 (4.61)	-18.18 (12.72)	-15.99** (6.74)	-30.52*** (9.59)	28.36 (17.19)
Adjusted R ²	0.15	0.84	0.52	0.36	0.56	0.36
No. of Observations	963	144	168	622	283	339
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors' calculations.
Note: Robust standard errors in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

Table B.7.2. Dynamic Specification Augmented by Fundamental Risk Measures

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
Long-Run Coefficients						
GDP Growth (+)	-0.03 (0.12)	0.25* (0.15)	-0.13 (0.11)	-0.16 (0.12)	-0.14 (0.10)	-0.19 (0.14)
Population Growth (+/-)	-0.73*** (0.24)	-0.43 (0.67)	-0.77 (1.21)	-0.69 (0.44)	-0.88 (0.77)	0.60 (0.91)
Dependency Ratio (+)	0.02 (0.02)	0.08 (0.05)	0.02 (0.14)	0.06** (0.03)	0.14*** (0.02)	0.14 (0.15)
Life Expectancy (-)	-0.06* (0.03)	-0.21** (0.10)	0.33 (0.23)	0.03 (0.09)	0.16 (0.12)	-0.01 (0.26)
Relative Price of Capital (+)	-0.01 (0.01)	0.12** (0.06)	-0.07 (0.07)	0.00 (0.02)	-0.05** (0.03)	0.01 (0.03)
Income Inequality (-)	-0.14*** (0.04)	-0.03 (0.08)	0.11 (0.21)	-0.14 (0.10)	-0.09 (0.16)	0.03 (0.23)
Public Debt (+)	-0.00 (0.00)	0.04 (0.03)	0.01 (0.03)	-0.01* (0.01)	0.00 (0.01)	-0.01 (0.02)
Fiscal Balance (-)	0.00 (0.03)	0.12 (0.12)	-0.17 (0.13)	0.03 (0.04)	0.07 (0.07)	0.01 (0.08)

(continued)

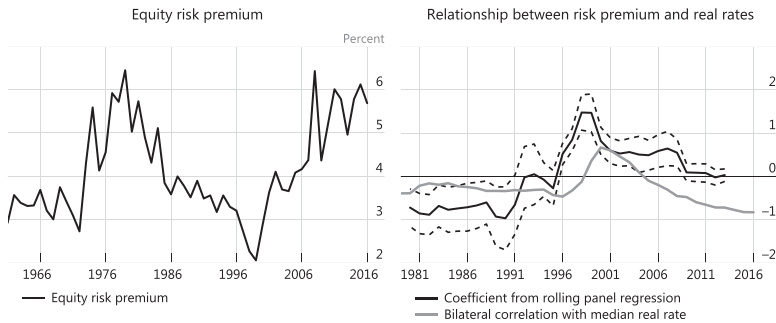
Table B.7.2. (Continued)

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
GDP Growth Volatility (-)	0.13 (0.33)	-1.62*** (0.61)	-0.94 (1.33)	-0.71** (0.35)	-0.23 (0.33)	-0.26 (0.48)
Inflation Volatility (-)	-0.00 (0.12)	0.29** (0.14)	0.32 (0.85)	0.27 (0.22)	-0.28 (0.20)	0.60 (0.39)
GDP Growth Skewness (+)	0.92*** (0.20)	-0.14 (0.42)	-0.23 (0.93)	0.52 (0.47)	0.33 (1.01)	0.63 (0.44)
Inflation Skewness (+)	-0.53 (0.43)	-0.61*** (0.22)	0.20 (1.23)	-1.33*** (0.49)	-1.10 (0.69)	-1.02 (0.71)
GDP Growth Kurtosis (-)	0.46*** (0.14)	0.10 (0.23)	-0.85* (0.45)	0.24 (0.30)	0.05 (0.66)	0.12 (0.19)
Inflation Kurtosis (-)	-0.09 (0.13)	0.95*** (0.32)	-0.07 (0.79)	0.22 (0.19)	0.28 (0.23)	-0.18 (0.20)
Short-Run Coefficients						
Adjusted Parameter	-0.41*** (0.06)	-0.47*** (0.11)	-1.18*** (0.23)	-0.36*** (0.04)	-0.73*** (0.08)	-0.43*** (0.05)
Constant	2.69 (2.00)	0.86 (4.32)	-14.89 (30.423)	-0.42 (3.23)	-12.19 (7.80)	-2.01 (11.93)
Adjusted R ²	0.39	0.65	0.88	0.40	0.65	0.39
No. of Observations	848	125	115	600	263	337
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Lags	2	2	2	2	2	2

Source: Authors' calculations.

Note: Robust standard errors in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

Figure B.7.1. Equity Risk Premium and Real Interest Rates



Source: A. Damodaran, <http://pages.stern.nyu.edu/~adamodar/>; authors' calculations.

Note: Dashed lines in the right-hand panel indicate \pm two standard deviations.

As a second test, we use the U.S. equity risk premium as a proxy for the global risk premium (left panel of Figure B.7.1). We focus on the specification that allows for the global effects of this risk premium measure, namely an extension of Tables 6 and 7 in the main text. The estimates are reported in Tables B.7.3 and B.7.4, corresponding to static and dynamic specifications, respectively. For the static specification, the risk premium has a significant and correctly signed coefficient for the full sample, but this is entirely driven by the earlier part of the sample (the rolling-regression coefficient is shown in right-hand panel of Figure B.7.1). For the last 30 years, risk premium has an incorrect sign. For the dynamic specification, risk premium has the wrong sign over the full sample and is insignificant in all subsamples. These mixed results again point to little systematic role of risk premium in determining real interest rates as posited by theory.

**Table B.7.3. Static Global Specification
with Risk Premium**

	Full Sample (1)	1961–1979 (2)	1980–2016 (3)
Global Component			
GDP Growth (+)	0.15** (0.07)	0.51*** (0.08)	0.13* (0.07)
Population Growth (+/-)	-1.63 (1.97)	-20.82*** (5.58)	15.32* (8.20)
Dependency Ratio (+)	-0.15* (0.08)	0.12 (0.13)	-0.13 (0.16)
Life Expectancy (-)	-0.34 (0.25)	-0.63 (0.53)	0.77** (0.33)
Relative Price of Capital (+)	-0.02 (0.04)	0.34*** (0.08)	0.03 (0.05)
Income Inequality (-)	-0.38 (0.22)	0.49 (1.09)	-1.07*** (0.23)
Public Debt (+)	0.02 (0.02)	0.18* (0.09)	-0.01 (0.01)
Fiscal Balance (-)	-0.10 (0.11)	0.62** (0.26)	0.09 (0.09)
Risk Premium (-)	-0.24** (0.10)	-1.05*** (0.27)	0.21*** (0.06)
Country-Specific Component			
GDP Growth (+)	0.05 (0.07)	0.04 (0.10)	0.00 (0.06)
Population Growth (+/-)	-0.14 (0.49)	-1.28 (0.79)	0.21 (0.57)
Dependency Ratio (+)	0.01 (0.03)	0.01 (0.05)	-0.00 (0.05)
Life Expectancy (-)	0.17 (0.24)	-1.00** (0.39)	0.48 (0.40)
Relative Price of Capital (+)	0.01 (0.02)	-0.05** (0.02)	0.02 (0.03)
Income Inequality (-)	0.10 (0.09)	-0.14 (0.12)	0.11 (0.12)
Public Debt (+)	0.00 (0.01)	0.01 (0.02)	0.01** (0.01)
Fiscal Balance (-)	0.01 (0.04)	0.09 (0.06)	-0.04 (0.06)
Constant	43.97* (22.37)	47.27 (41.04)	-46.37 (27.32)
Adjusted R ²	0.24	0.42	0.45
No. of Observations	539	200	339
Country Fixed Effects	Yes	Yes	Yes
Source: Authors' calculations.			
Note: Robust standard errors in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; global components calculated as the averages of each variable based on real GDP at purchasing power parity.			

**Table B.7.4. Dynamic Global Specification
with Risk Premium**

	Full Sample (1)	1961–1979 (2)	1980–2016 (3)
Long-Run Coefficients (Global)			
GDP Growth (+)	-0.95 (0.67)	-0.63 (0.82)	-2.26** (0.97)
Population Growth (+/-)	-31.04** (12.34)	0.00 (0.00)	-93.21** (38.61)
Dependency Ratio (+)	-0.07 (0.28)	-1.29 (0.84)	1.03** (0.47)
Life Expectancy (-)	-4.15*** (0.99)	0.00 (0.00)	-11.28*** (3.28)
Relative Price of Capital (+)	-0.15 (0.12)	-1.84 (1.30)	0.05 (0.19)
Income Inequality (-)	1.02** (0.42)	0.00 (0.00)	3.73*** (0.91)
Public Debt (+)	0.30*** (0.08)	0.45 (0.49)	-1.11*** (0.39)
Fiscal Balance (-)	-0.13 (0.57)	0.00 (0.00)	-1.96 (1.84)
Risk Premium (-)	-1.13* (0.66)	-0.68 (1.36)	-1.99 (1.51)
Long-Run Coefficients (Domestic)			
GDP Growth (+)	0.10 (0.10)	0.33** (0.13)	-0.15 (0.15)
Population Growth (+/-)	-1.19** (0.55)	-3.12** (1.36)	0.33 (0.62)
Dependency Ratio (+)	0.06 (0.04)	0.10 (0.09)	0.04 (0.07)
Life Expectancy (-)	0.23 (0.21)	-0.94 (0.61)	0.69*** (0.25)
Relative Price of Capital (+)	0.02 (0.01)	-0.05 (0.03)	0.02 (0.04)
Income Inequality (-)	0.14 (0.09)	0.35* (0.20)	0.05 (0.11)
Public Debt (+)	0.00 (0.01)	0.04** (0.02)	0.01 (0.01)
Fiscal Balance (-)	0.12** (0.06)	0.27*** (0.09)	0.02 (0.06)
Short-Run Coefficients			
Adjustment Parameter	-0.40*** (0.08)	-0.60*** (0.16)	-0.42*** (0.05)
Constant	127.85*** (27.61)	66.35* (39.41)	-320.49*** (85.78)
Adjusted R ²	0.43	0.62	0.58
No. of Observations	515	178	337
Country Fixed Effects	Yes	Yes	Yes
No. of Lags	2	2	2

Source: Authors' calculations.

Note: Robust standard errors in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; global components calculated as the averages of each variable based on real GDP at purchasing power parity.

B.8 Excluding Periods after the World Wars

Although we have excluded the wars from all our empirical analysis, it might be argued that the reconstruction periods following the wars could unduly influence the results. In this exercise, we drop five years immediately after both world wars from the estimation sample. Doing so does not materially affect the conclusions for any of our previous results, as shown in the tables below.

Table B.8.1. Static Specification Dropping Five Years after the World Wars from Sample

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
GDP Growth (+)	-0.07** (0.02)	-0.00 (0.01)	-0.11*** (0.04)	0.07 (0.06)	0.06 (0.08)	0.07 (0.05)
Population Growth (+/-)	-1.54*** (0.43)	-0.60 (0.42)	-0.10 (0.42)	-1.44*** (0.38)	-1.16** (0.52)	-0.25 (0.54)
Dependency Ratio (+)	0.00 (0.02)	0.02 (0.03)	-0.17*** (0.04)	0.03 (0.02)	0.15*** (0.02)	-0.07 (0.05)
Life Expectancy (-)	-0.04* (0.02)	-0.18*** (0.05)	0.07 (0.07)	0.23*** (0.06)	0.49** (0.19)	-0.33*** (0.10)
Relative Price of Capital (+)	0.01 (0.01)	0.10** (0.04)	-0.11*** (0.03)	-0.01 (0.02)	-0.06 (0.04)	0.03 (0.03)
Income Inequality (-)	0.02 (0.04)	0.03 (0.05)	0.02 (0.21)	-0.23** (0.07)	-0.00 (0.27)	-0.06 (0.14)
Public Debt (+)	-0.01 (0.00)	-0.03* (0.01)	-0.00 (0.01)	-0.02*** (0.00)	-0.00 (0.02)	0.02* (0.01)
Fiscal Balance (-)	-0.06 (0.03)	0.09 (0.11)	-0.26* (0.12)	-0.04 (0.06)	0.18** (0.08)	0.08 (0.06)
Constant	6.79** (2.55)	9.95* (4.27)	13.20** (5.14)	-13.83** (5.67)	-44.06** (17.10)	33.07*** (10.23)
Adjusted R ²	0.13	0.58	0.40	0.25	0.41	0.35
No. of Observations	971	186	159	626	287	339
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors' calculations.

Note: Robust standard errors in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

Table B.8.2. Dynamic Specification Dropping Five Years after the World Wars from Sample

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
Long-Run Coefficients						
GDP Growth (+)	-0.01 (0.08)	0.04 (0.24)	-0.12 (0.08)	-0.02 (0.15)	0.23 (0.18)	-0.07 (0.12)
Population Growth (+/-)	-0.63* (0.34)	-1.18* (0.49)	-1.22*** (0.31)	-0.17 (0.68)	0.61 (1.30)	-0.85 (0.83)
Dependency Ratio (+)	-0.01 (0.03)	-0.04 (0.06)	-0.19*** (0.05)	0.01 (0.03)	0.19*** (0.03)	-0.04 (0.08)
Life Expectancy (-)	-0.07** (0.03)	-0.21** (0.09)	0.04 (0.05)	0.07 (0.05)	0.64** (0.28)	-0.34* (0.18)
Relative Price of Capital (+)	0.00 (0.01)	0.16*** (0.04)	-0.09** (0.04)	0.01 (0.02)	-0.02 (0.04)	0.03 (0.03)
Income Inequality (-)	-0.05 (0.04)	0.19*** (0.05)	-0.08 (0.13)	-0.14* (0.08)	0.56** (0.25)	-0.07 (0.17)
Public Debt (+)	-0.00 (0.00)	-0.00 (0.02)	-0.01 (0.01)	-0.00 (0.01)	0.01 (0.01)	0.00 (0.01)
Fiscal Balance (-)	-0.01 (0.04)	0.11 (0.11)	-0.28* (0.14)	0.02 (0.03)	0.20*** (0.08)	-0.03 (0.06)

(continued)

Table B.8.2. (Continued)

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
Short-Run Coefficients						
Adjustment Parameter	-0.30*** (0.05)	-0.25*** (0.04)	-1.33*** (0.28)	-0.34*** (0.05)	-0.51*** (0.08)	-0.43*** (0.06)
Constant	2.77* (1.54)	3.01 (2.33)	27.77** (11.63)	-0.49 (1.85)	-33.48** (15.97)	14.32*** (5.30)
Adjusted R ²	0.23	0.30	0.66	0.27	0.42	0.30
No. of Observations	905	171	137	597	260	337
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Lags	2	2	2	2	2	2

Source: Authors' calculations.
Note: Robust standard errors in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

B.9 Endogeneity and Nickell Bias

In this robustness exercise, we use the system GMM estimator (see Arellano and Bover 1995 and Blundell and Bond 1998) to solve two econometric concerns: (i) the potential Nickell bias associated with dynamic fixed-effects panels, and (ii) potential endogeneity between some of the saving-investment factors and the real interest rate. This estimator stacks both differences and levels of the original variables to fully exploit the available information in the data. The instruments also consist of differences and levels of the strictly exogenous variables, as well as lagged differences or levels of the endogenous variables (lagged level instruments in the equations for differences and vice versa). We treat the demographic variables, population growth, the dependency ratio, and life expectancy as exogenous, whereas the remaining variables are treated as endogenous.

The standard approach in dynamic panels with short time spans is to use “loner” lags with missing values replaced by zero as instruments. However, this becomes impractical in panels with large time dimensions, T , as the instrument count grows with the square of T . To avoid over-expanding the set of instruments, we use regular lags and limit the maximum number of instrument lags to five. Even so, with many instruments, the number of over-identifying restrictions can be hard to satisfy so that the Sargan test may reject. This is, for instance, the case in the full sample specification. The residuals for the estimator should display autocorrelation of the first order by construction but no higher-order autocorrelation if correctly specified. Following standard practice, we report tests for second-order autocorrelation below. In all cases, we cannot reject the null of no second-order autocorrelation at the 5 percent significance levels. Finally, we use the delta method to calculate standard errors for the steady-state coefficients and the adjustment parameter.

Table B.9.1. System GMM Estimates of the Baseline Dynamic Specification with Non-demographic Variables Treated as Endogenous

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
Long-Run Coefficients						
GDP Growth (+)	0.00 (0.15)	-0.01 (1.83)	0.16 (0.18)	-0.41* (0.23)	-0.41** (0.20)	-0.13 (0.64)
Population Growth (+/-)	-0.64* (0.39)	0.37 (5.34)	-1.08 (1.15)	0.01 (0.93)	-0.12 (0.80)	0.05 (1.27)
Dependency Ratio (+)	0.04 (0.03)	-0.05 (0.55)	-0.04 (0.19)	0.12** (0.06)	0.09* (0.06)	-0.13 (0.19)
Life Expectancy (-)	-0.05 (0.07)	1.24 (4.69)	0.29 (0.33)	-0.12 (0.18)	-0.08 (0.37)	0.01 (0.22)
Relative Price of Capital (+)	-0.03 (0.07)	0.17 (0.51)	0.09 (0.10)	-0.13*** (0.05)	-0.14*** (0.05)	0.04 (0.12)
Income Inequality (-)	-0.06 (0.12)	0.07 (0.71)	0.90** (0.41)	-0.50* (0.28)	-0.75 (0.47)	-0.47 (0.35)
Public Debt (+)	0.02 (0.02)	0.48 (1.87)	-0.02 (0.03)	0.01 (0.03)	-0.02 (0.03)	-0.03* (0.02)
Fiscal Balance (-)	-0.04 (0.09)	-1.69 (6.14)	0.19 (0.35)	-0.21 (0.24)	0.30 (0.27)	0.19 (0.16)

(continued)

Table B.9.1. (Continued)

	Full Sample (1)	Gold Standard (2)	Interwar (3)	Postwar (4)	Pre-Volcker (5)	Post-Volcker (6)
Short-Run Coefficients	-0.71*** (0.06)	-0.03 (0.10)	-0.73*** (0.12)	-0.40*** (0.11)	-0.55*** (0.11)	-0.23*** (0.05)
Adjustment Parameter	2.07 (4.07)	-2.09 (1.56)	-15.81 (27.09)	-2.78 (4.99)	5.14 (15.75)	3.79 (3.84)
Adjusted R ²	NA	NA	NA	NA	NA	NA
No. of Observations	990	171	184	620	283	337
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of Lags	2	2	2	2	2	2
Sargan Test	0.00	0.95	0.07	0.03	0.03	0.10
No. of Instruments	46	46	46	46	46	46
Test for AR(2)	0.53	0.15	0.27	0.05	0.05	0.66

Source: Authors' calculations.
Note: Robust standard errors in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. Full sample: 1870–2016; gold (metallic) standard: 1870–1913; interwar: 1920–1938; postwar: 1950–2016; pre-Volcker-tightening: 1950–1979; post-Volcker-tightening: 1980–2016.

B.10 Specifications with Only Global Variables

This section presents the results for the global specification using only global variables. This is to control for any potential multicollinearity that may arise when including both domestic and global variables together given their high correlation. For both the static and dynamic specifications, it is still the case that global saving-investment factors are not able to systematically explain real interest rates.

**Table B.10.1. Static Global Specification
Excluding Domestic Components**

	Full Sample (1)	1870–1945 (2)	1945–2016 (3)
Global Component			
GDP Growth (+)	0.04 (0.06)	-0.06 (0.07)	0.16* (0.09)
Population Growth (+/-)	-0.52 (0.38)	-2.00** (0.89)	0.12 (0.40)
Dependency Ratio (+)	0.01 (0.05)	-0.12 (0.21)	-0.01 (0.07)
Life Expectancy (-)	0.02 (0.05)	-0.16 (0.27)	-0.17 (0.20)
Relative Price of Capital (+)	-0.06** (0.03)	-0.10 (0.06)	-0.18*** (0.04)
Income Inequality (-)	0.14 (0.09)	0.34** (0.16)	-0.38 (0.28)
Public Debt (+)	-0.05*** (0.01)	0.04* (0.02)	-0.06* (0.03)
Fiscal Balance (-)	-0.07 (0.09)	0.36** (0.15)	-0.26** (0.12)
Constant	0.92 (6.97)	14.31 (32.59)	20.71 (17.95)
Adjusted R ²	0.46	0.43	0.72
No. of Observations	127	62	62
Country Fixed Effects	Yes	Yes	Yes
<p>Source: Authors' calculations.</p> <p>Note: Robust standard errors in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. Full sample: 1961–2016; global components calculated as averages of each variable based on real GDP at purchasing power parity.</p>			

**Table B.10.2. Dynamic Global Specification
Excluding Domestic Factors**

	Full Sample (1)	1870–1945 (2)	1945–2016 (3)
Long-Run Coefficients (Global)			
GDP Growth (+)	-0.25* (-0.14)	-0.15** (0.07)	-0.26 (0.38)
Population Growth (+/-)	-0.01 (0.74)	0.09 (0.70)	-4.22* (2.55)
Dependency Ratio (+)	0.08 (0.07)	-0.16 (0.13)	0.17 (0.18)
Life Expectancy (-)	-0.02 (0.07)	-0.42** (0.17)	-0.48 (0.45)
Relative Price of Capital (+)	-0.04 (0.04)	0.09** (0.04)	-0.18** (0.08)
Income Inequality (-)	-0.01 (0.13)	-0.15 (0.10)	-0.52 (0.59)
Public Debt (+)	-0.02 (0.02)	0.00 (0.01)	0.07 (0.07)
Fiscal Balance (-)	-0.44** (0.22)	-0.19 (0.18)	-0.69 (0.58)
Short-Run Coefficients			
Adjustment Parameter	-0.51*** (0.07)	-1.03*** (0.18)	-0.51*** (0.14)
Constant	-0.75 (4.95)	42.79* (21.22)	15.59 (19.73)
Adjusted R ²	0.82	0.93	0.91
No. of Observations	121	58	63
Country Fixed Effects	Yes	Yes	Yes
No. of Lags	2	2	2
Source: Authors' calculations.			
Note: Robust standard errors in parentheses based on country clusters; ***/**/* denotes results significant at the 1/5/10 percent level. Global components calculated as the averages of each variable based on real GDP at purchasing power parity.			