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Some International Evidence on Indebted Demand*

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Some International Evidence on Indebted Demand*

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[Comments Welcome]

The theory of *indebted demand* proposed by Mian, Straub and Sufi (2021) has attracted significant attention, in part due to its unifying explanation of several prominent secular trends which have occurred since the 1980s, such as rising income inequality and debt levels, financial deregulation, and declining natural rates of interest. The core of their theory relies on the notion that rich households have a higher marginal propensity to save than poorer households. As a result shifts in the distribution of income play an important role in shaping the behavior of interest rates and household debt.

In this note we explore the relationship between income inequality and long-run or *natural* rates of interest in a panel of countries/regions. Our hypothesis follows from the relationship stated succinctly in their Proposition 4.

Proposition 4 (Mian, Straub and Sufi 2021). *An increase in income inequality (greater ω^s) unambiguously reduces long-run equilibrium interest rates and raises household debt. In the homothetic model, long-run interest rates and household debt are unaffected by rising income inequality.*

Our hypothesis. *Countries with greater income inequality should have lower long-run interest rates.*

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We begin by estimating natural rates of interest for Australia, Canada, the Euro area, Norway, UK, and US. Our estimation of natural rates follows Laubach and Williams (2003) and Holston et al. (2017), who use the Kalman filter to estimate the unobserved natural rate of interest based on a New Keynesian framework. We pair estimates of natural rates with income inequality measures from Madsen et al. (2018), who compile a long-run database of income inequality for 21 high income OECD countries dating back to 1870.[1] Importantly our income inequality variable, referred to as Net Gini, captures the dispersion in incomes *after* taxes and transfers which seems most consistent with the income that matters for indebted demand. Using our unbalanced panel we then assess the international evidence for a systematic relationship between inequality and natural rates of interest.

Findings

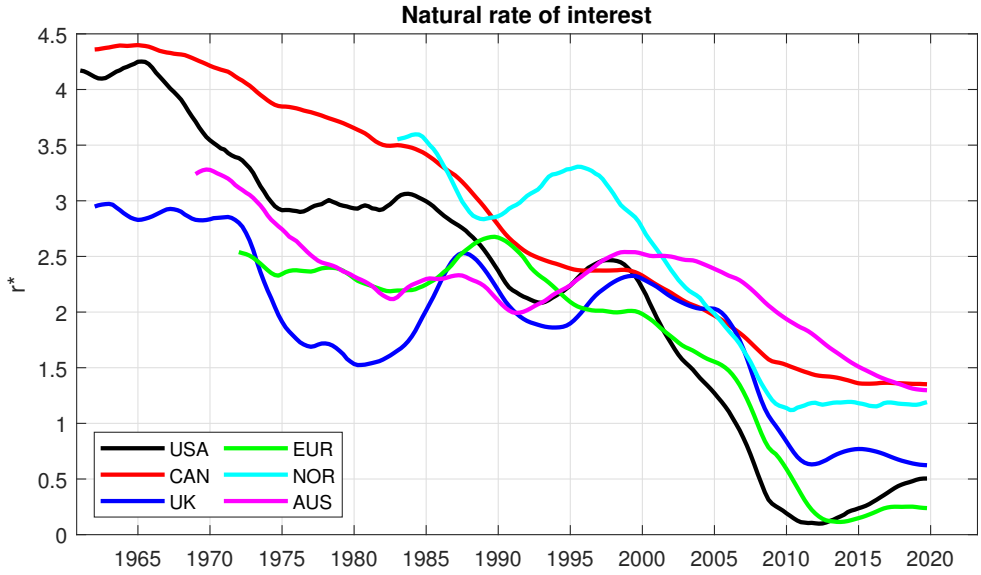
The top panel in Figure 1 plots estimated natural rates of interest obtained from the Kalman smoother. Unsurprisingly, the decline in natural rates is evident across all countries and the Euro area. However, the speed of declines seems to vary quite substantially across countries. The US experiences the largest decline in its natural rate over our sample, with an estimated natural rate above 4% in 1961 and about 0.5% in 2019. An apparent speed up in the decline of the natural rate around the Great Recession appears for many countries.

The bottom panel in Figure 1 plots the associated Net Gini coefficients for our countries and region.[2] Compared to the common comovements among natural rates, Net Gini patterns are more heterogeneous. The US, UK, and Australia have experienced significant rises in their Net Gini coefficients since 1980. The respective change in Net Gini for the US, UK, and Australia from 1980 to 2015 is 5.93, 7.11 , 6.88. Compared to Canada, the Euro area, and Norway where the change in Net Gini from 1980 to 2015 is 2.72, 0.97, and 2.45. At least observationally, Canada and Norway have natural rates about 1% higher than the high inequality countries, supporting the link between inequality and natural rates.

[1]We thank Jakob Madsen for providing us with the data.

[2]Madsen et al. (2018) do not report inequality measures for the Euro area. To compute a Euro area income inequality measure, we take the average of Net Gini coefficients for Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, and Sweden.

Figure 1


Natural rate of interest
r*
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
USA
CAN
UK
EUR
NOR
AUS

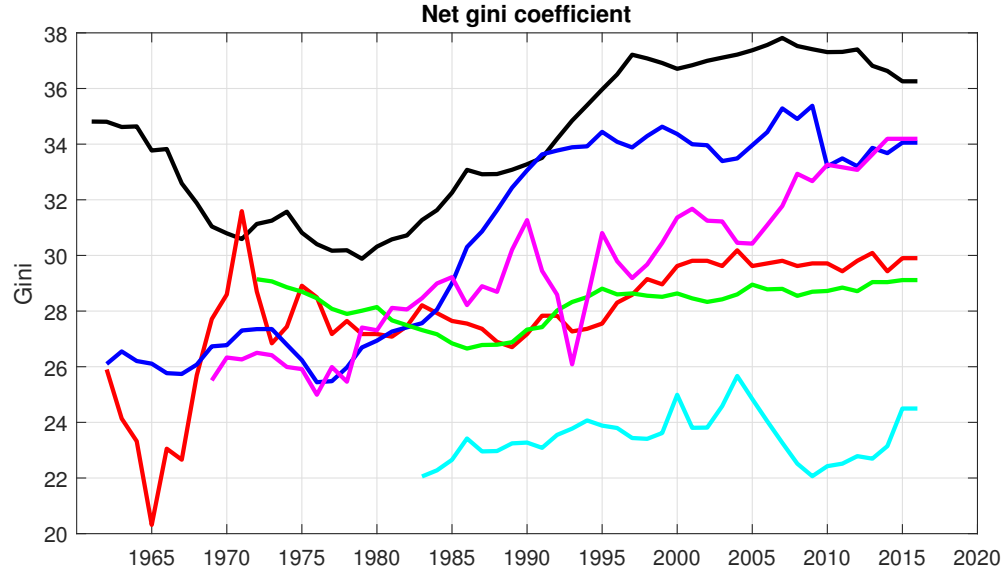
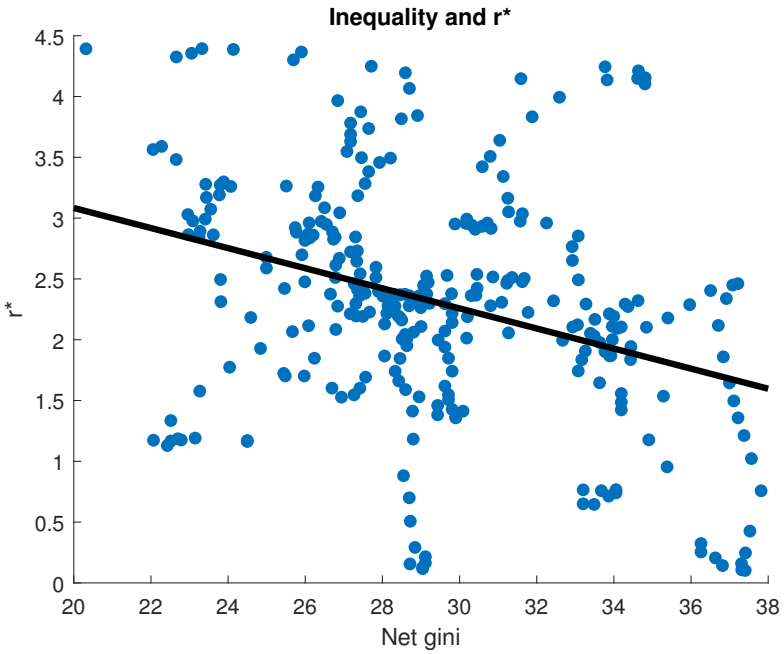

Net gini coefficient
Gini
38
36
34
32
30
28
26
24
22
20
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020

Figure 2 plots the Net Gini-natural rate pairs in our unbalanced panel.[3] Consistent with the theory of indebted demand, higher inequality is associated with lower natural rates of interest. The black line in Figure 2 is a simple least squares line of the data points. One argument against the suggestive evidence in this figure is that all our cross-sections have exhibited a decline in their natural rates. However we find that even after controlling for the global decline in natural rates via time fixed-effects, a regression of Net Gini on $r^\star$ shows significant negative link between inequality and natural rates of interest. For example, a rise in Net Gini from 20 to 30 is associated with a 30 basis point decline in the natural rate of interest.

Figure 2



Notes: Our estimates of quarterly natural rates are converted to an annual frequency by taking the yearly average. Our unbalanced panel contains 293 year-country observations.

One challenge in interpreting the strength of the relationship between inequality and natural rates is that the Laubach-Williams method specifies the natural rate of interest as a linear

[3]Our natural rate estimates are at a quarterly frequency whereas our Net Gini measure is reported at an annual frequency. We convert out natural rate estimates to an annual frequency by taking the yearly average.

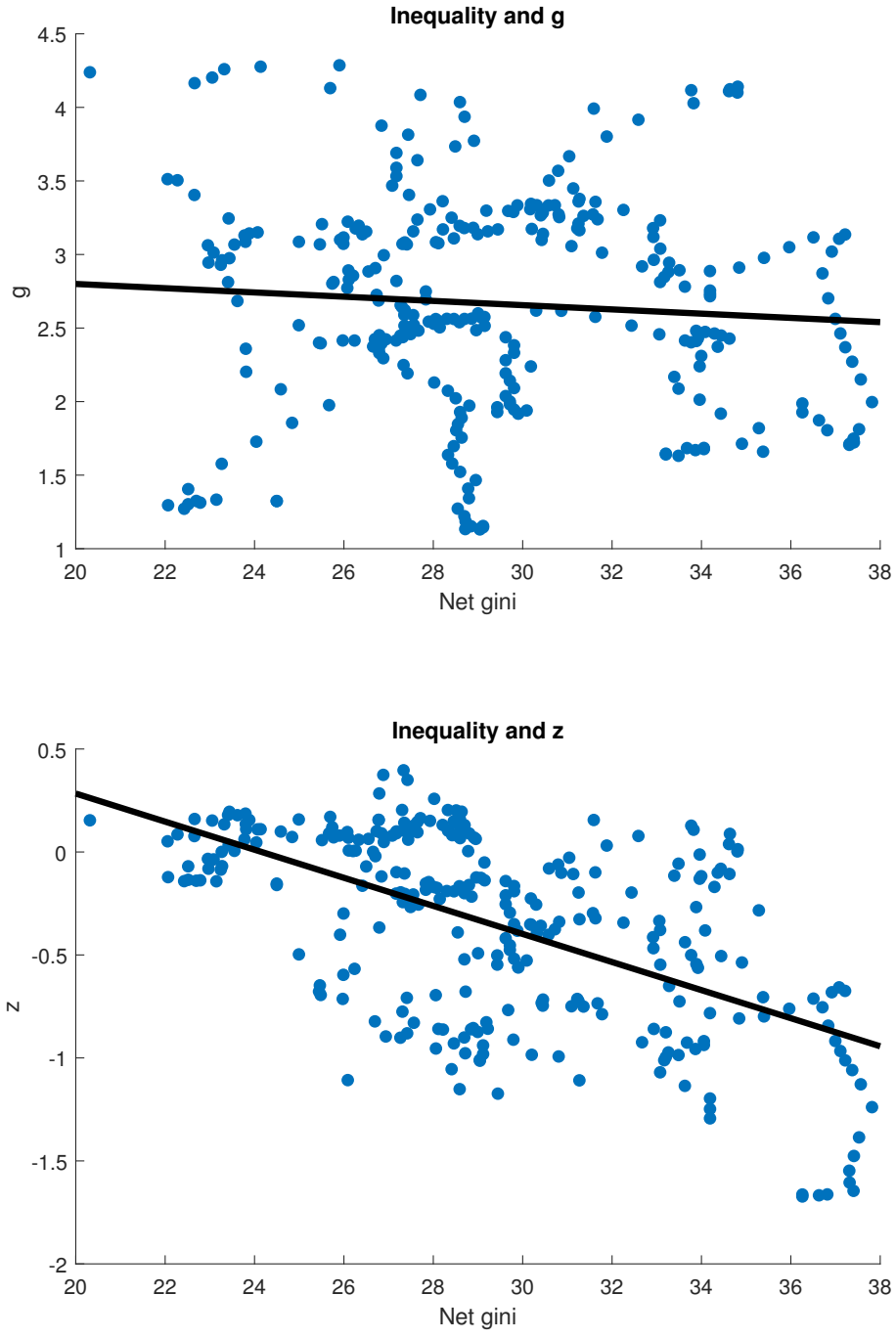
combination of the trend growth rate of the natural rate of output and z which is intended to capture *other determinants* of the natural rate of interest,

$$r_t^\star = g_t + z_t. \tag{1}$$

Our interpretation of the Mian, Straub and Sufi (2021) story is that if inequality is exerting downward pressure on natural rates of interest, this should appear in the latter component of the natural rate, z_t. To this end, Figure 3 presents the decomposition of the natural rate where we plot the relationships between: (1) income inequality and the estimated trend growth rate of the natural rate of output; and (2) income inequality and other determinants of $r^\star$, that is, z_t. The top panel in Figure 3 quite clearly shows a minimal relationship between income inequality and trend growth rates of the natural rate of output. OLS estimates of income inequality on trend growth rates are not statistically different from zero by any conventional standard. In sharp contrast, the bottom panel of Figure 3 shows a strong negative relationship between *other determinants* of the natural rate of interest and income inequality. This relationship is significant at the 1% level.

Our findings lend support to the central prediction of the theory of indebted demand proposed in Mian, Straub and Sufi (2021), that income inequality is putting downward pressure on natural rates of interest.

Figure 3



Notes: g refers to the estimated trend growth rate of the natural rate of output and z captures other determinants of $r^{\star}$.

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A Data & Methodology

A.1 Inequality

Our measures of income inequality are obtained from Madsen et al. (2018). The authors compile post-tax, post-transfer Gini coefficients and pre-tax 10% income shares for 21 high income OECD countries at an annual frequency that spans the years 1870-2016. We work with the post-tax, post-transfer Gini coefficient as our measure of income inequality since this measure seems most consistent with income inequality described in Mian et al. (2021).

A.2 $r^\star$

For country specific measures of the natural rate of interest, we estimate a variant of the model in Laubach and Williams (2003) following Holston et al. (2017). The intuition of the model is grounded in New Keynesian theory, but remains more agnostic about the exact timing of output gap-inflation interactions. We briefly sketch the model here, but interested readers can find complete details in Holston et al. (2017). The model is comprised of 5 equations given by

$$\tilde{y}_t = a_{y,1}\tilde{y}_{t-1} + a_{y,2}\tilde{y}_{t-2} + \frac{a_r}{2}\sum_{j=1}^{2}(r_{t-j} - r^\star_{t-j}) + \epsilon_{\tilde{y},t}, \tag{2}$$

$$\pi_t = b_\pi \pi_{t-1} + (1 - b_\pi)\pi_{t-2,4} + b_y \tilde{y}_{t-1} + \epsilon_{\pi,t}, \tag{3}$$

$$r^\star_t = g_t + z_t, \tag{4}$$

$$y^\star_t = y^\star_{t-1} + g_{t-1} + \epsilon_{y^\star,t}, \tag{5}$$

$$g_t = g_{t-1} + \epsilon_{g,t}, z_t = z_{t-1} + \epsilon_{z,t}, \tag{6}$$

where $\tilde{y}_t = 100(y_t - y^\star_t)$ (i.e., the *output gap*), r_t is the observed ex-ante real interest rate, π_t is observed inflation, and $\pi_{t-2,4} \equiv \frac{\pi_{t-2}+\pi_{t-3}+\pi_{t-4}}{3}$. Inflation expectations are based on the arithmetic mean of current and the previous three quarters of inflation.

Equation (3) specifies the natural rate of interest as a linear combination of trend growth, g_t, and other factors, z_t. Potential output, trend growth, and z_t follow random walk pro-

cesses, with potential output also containing a stochastic drift term. Equations (1) and (2) constitute the measurement equations of the state space model while (3), (4), and (5) are unobserved state variables to be estimated. Based on (1) and (2) the observables used in the estimation are log output, inflation, nominal and real interest rates. The estimation proceeds in three steps to avoid the pile-up problem as in Holston et al. (2017). Finally, since we are not concerned with real-time estimates of the natural rate, we work with the estimates obtained from the Kalman smoother.

B Data construction

In the following we describe the data construction for each country which is used in the estimation of $r^\star$. Our U.S. and Australian data is obtained from the Federal Reserve Bank of St. Louis (FRED) website. Data for the remaining countries is obtained primarily from IMF International Financial Statistics database.

Australia: Sample runs from 1968Q1 to 2019Q4. From 1968Q1 to 1969Q2 the nominal interest rate measure corresponds to the 3 month bank bill rate (FRED code: `IR3TBB01AUM156N`). From 1969Q3 onwards the nominal interest rate measure is the discount rate for Australia (FRED code: `INTDSRAUM193N`). Real GDP is Constant Price Gross Domestic Product (FRED code: `AUSGDPRQDSMEI`). From 1968Q1 to 1971Q1 inflation is the annualized quarterly log difference in the Consumer Price Index (All items) in the IFS database. From 1971Q2 onwards inflation corresponds to the reported core CPI minus food and energy (FRED code: `AUSCPICORQINMEI`).

Canada: Sample runs from 1961Q1 to 2019Q4. From 1961Q1 to 1992Q4, the nominal interest rate measure corresponds to the Treasury Bill rate reported in the Monetary and Financial Interest Rates Accounts. From 1993Q1 to 2019Q4, the nominal interest rate measure is the Monetary Policy-Related Interest Rate from the same accounts. Real GDP is defined by Nominal (Seasonally Adjusted) Gross Domestic Product in the Expenditure National Accounts divided by the Gross Domestic Product Deflator (Seasonally Adjusted). Inflation is

the annualized quarterly log difference in the Consumer Price Index (All items).

Euro Area: Sample runs from 1971Q1 to 2019Q4. The construction of this data makes use of data from the Euro Area Business Cycle Network and the ECB Statistical Data Warehouse. This construction for the Euro area is identical to the one in Holston et al. (2017). The interested reader can read their code guide for exact details on the construction.

Norway: Sample runs from 1982Q1 to 2019Q4. The nominal interest rate corresponds to the Monetary Policy-Related Interest Rate reported in the Monetary and Financial Accounts. Real GDP is defined by Nominal (Seasonally Adjusted) Gross Domestic Product in the Expenditure National Accounts divided by the Gross Domestic Product Deflator (Seasonally Adjusted). Inflation is the annualized quarterly log difference in the Consumer Price Index (All items).

United Kingdom: Sample runs from 1961Q1 to 2019Q4. The nominal interest rate corresponds to the Monetary Policy-Related Interest Rate reported in the Monetary and Financial Accounts. Real GDP is defined by Nominal (Seasonally Adjusted) Gross Domestic Product in the Expenditure National Accounts divided by the Gross Domestic Product Deflator (Seasonally Adjusted). From 1961Q1 to 1970Q4 inflation is measured as the total CPI from the OECD. From 1971Q1 onwards, inflation is measured as CPI inflation minus food and energy.

USA: Sample runs from 1960Q1 to 2019Q4. The nominal interest rate measure corresponds to the effective federal funds rate measured in quarterly frequency by averaging (FRED code: `FEDFUNDS`). Real GDP is the reported Real Gross Domestic Product (FRED code: `GDPC1`). Inflation is the annualized quarterly log difference in the Personal Consumption Expenditures excluding food and energy index (FRED code: `PCEPILFE`).