Inequality and Subjective Well-Being

Betsey Stevenson
Wharton School, University of Pennsylvania; CESifo and NBER
Justin Wolfers
Wharton School, University of Pennsylvania; CEPR, CESifo, IZA and NBER

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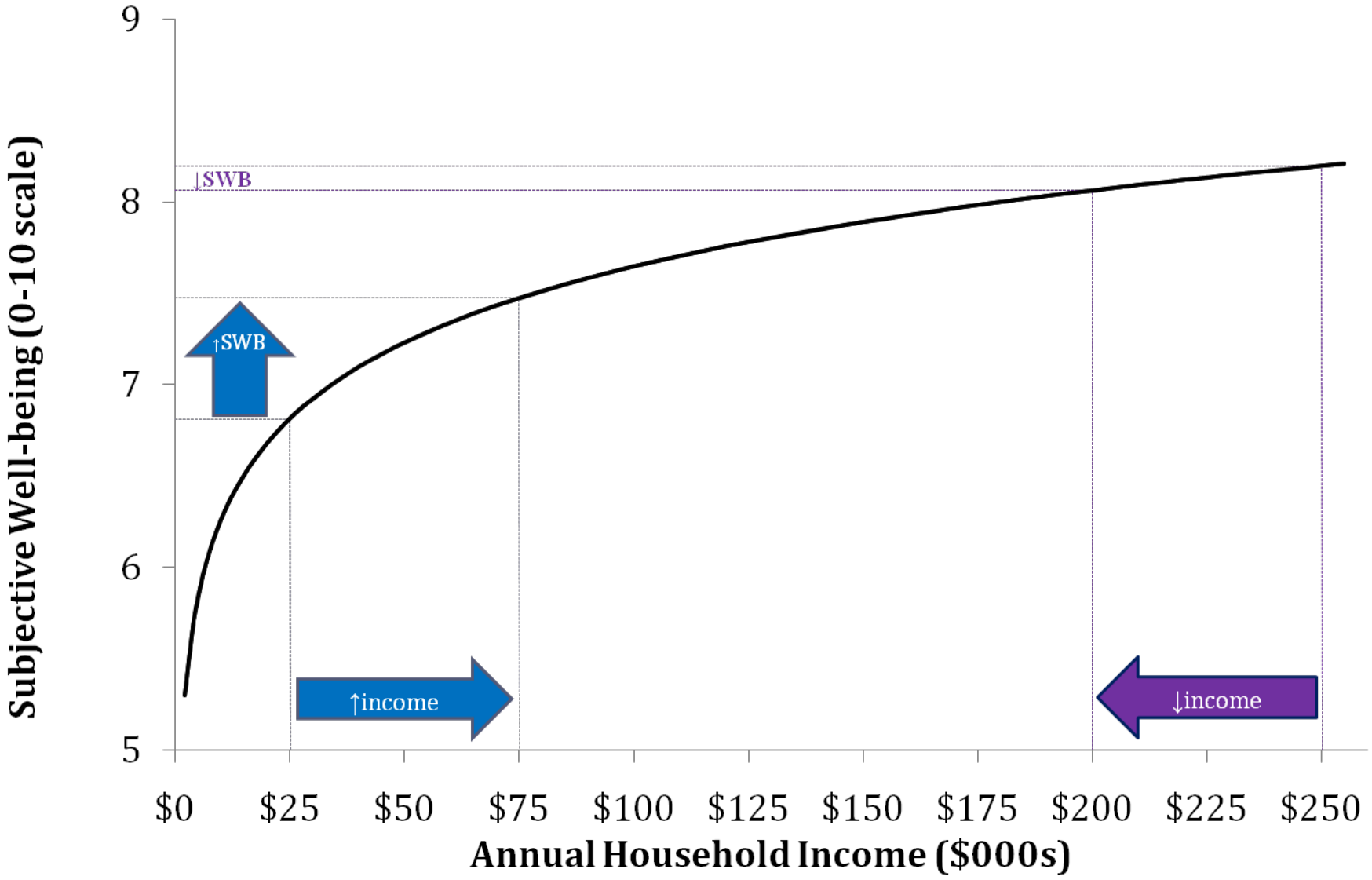
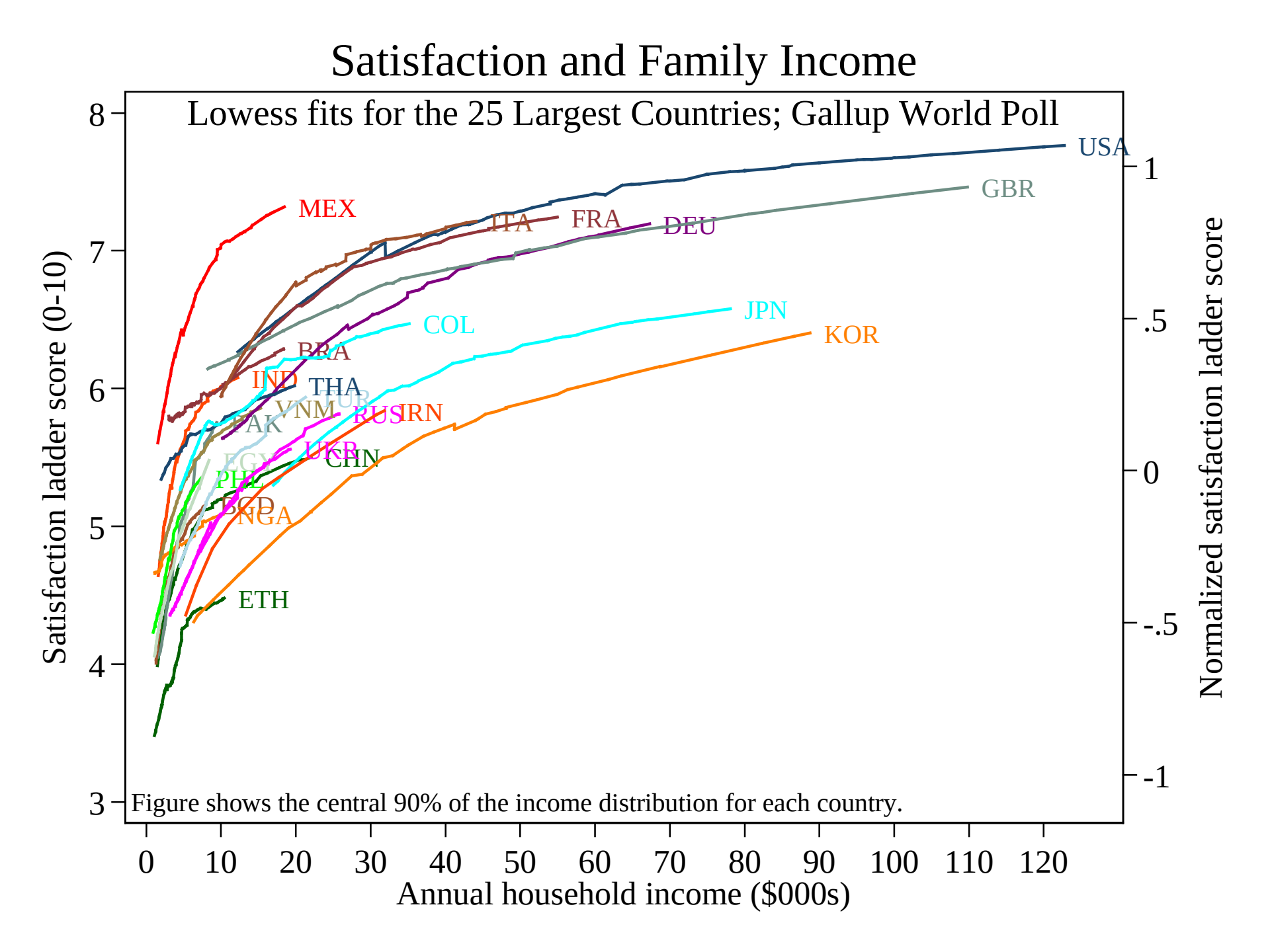
Research Question

- Does inequality undermine average levels of subjective well-being?
- Examining standard "Utilitarian" logic:
  - "We can examine how far extra income increases happiness for people at different points in the income scale, and we find that the benefit from extra income is indeed less and less the richer the person."
  - "From this psychological reality it follows that if money is transferred from a richer person to a poorer person, the poor person gains more happiness than the rich person loses. So average happiness increases."
  - "Thus a country will have a higher level of average happiness the more equally its income is distributed—all else being equal."
    - Richard Layard "Happiness: Lessons from a new science", pp.51-52

Diminishing Marginal Well-Being




Satisfaction and Family Income
Lowess fits for the 25 Largest Countries; Gallup World Poll
Satisfaction ladder score (0-10)
Normalized satisfaction ladder score
Annual household income ($000s)
Figure shows the central 90% of the income distribution for each country.
USA
GBR
DEU
FRA
ITA
MEX
JPN
KOR
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BRA
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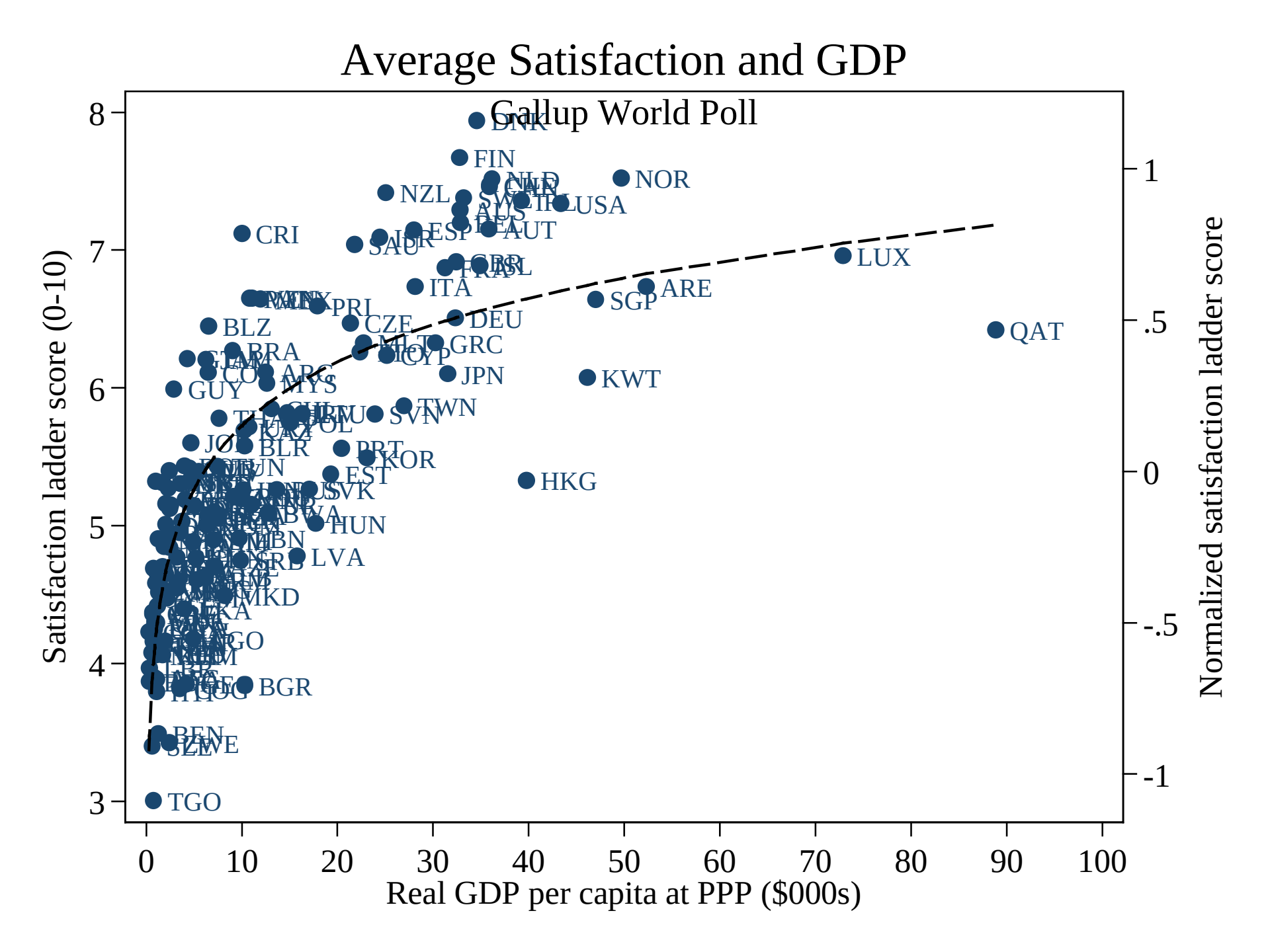
Average Satisfaction and GDP
Gallup World Poll
Satisfaction ladder score (0-10)
Normalized satisfaction ladder score
Real GDP per capita at PPP ($000s)
8
7
6
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Existing Literature

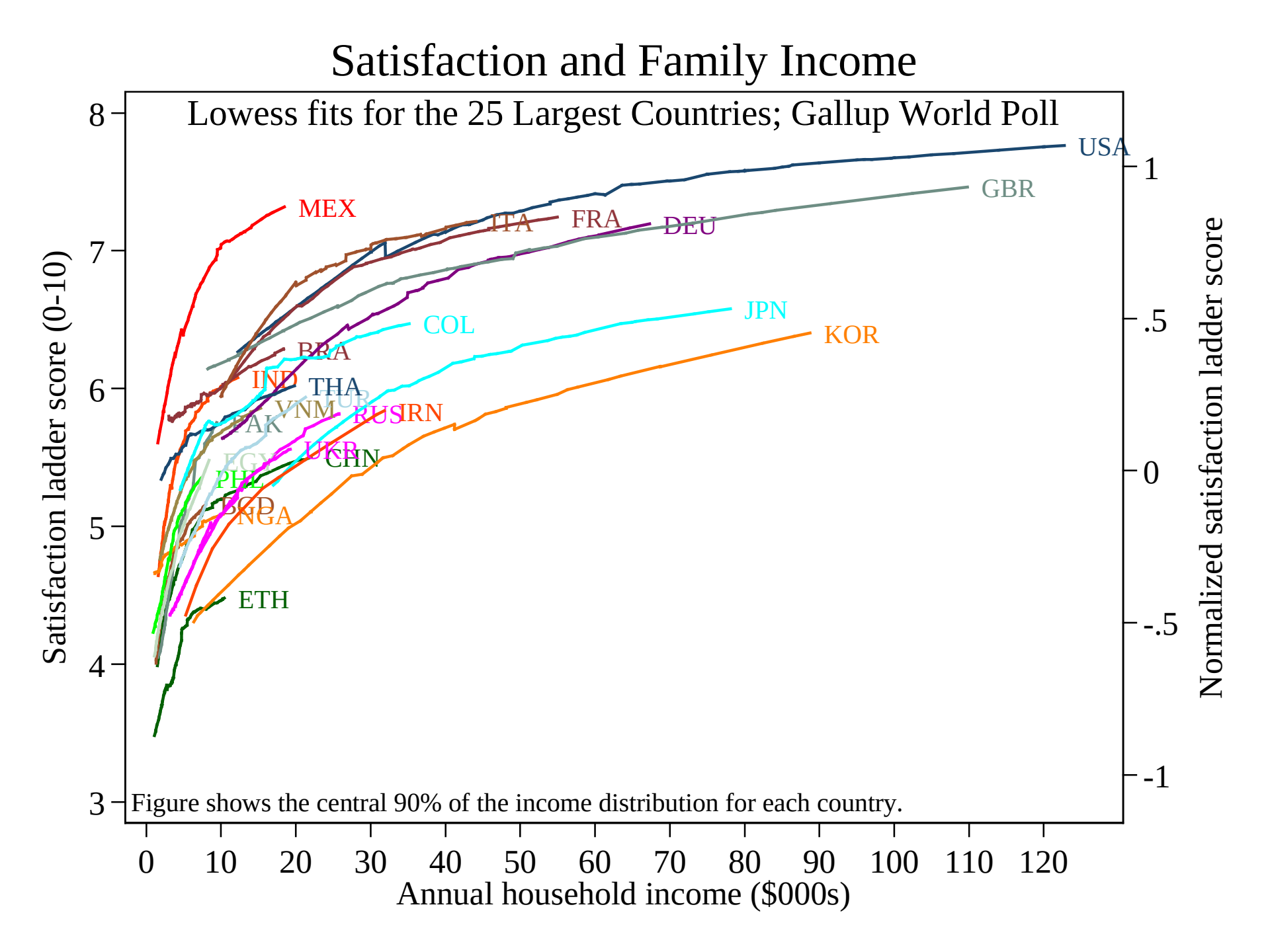
Surprisingly mixed findings:

- "The presumed link between equality and happiness fails to appear, at least where income inequality is concerned. Average happiness is as high in countries with great income inequality as in nations where income differences are small"
  - Veenhoven (2000)
- Including inequality in our regressions using the available data, we find that is has a negative effect, although its' size and significance levels are both low.
  - Di Tella and MacCulloch (2008)
- "Adding a World Bank estimate of the Gini coefficient for each national economy added no explanatory power to the well-being equation."
  - Helliwell (2003)
  - "More tests and perhaps better data are required to permit more confident conclusions."
- "In the whole World Values Survey sample, the Gini coefficient has a positive (albeit not always significant) effect on life satisfaction."
  - Guriev and Zhuravskaya (JEP 2008, p.157)
- "Europeans and Americans report themselves less happy when inequality is high; however the effect of inequality on happiness is more precisely estimated for Europe"
  - Alesina, DiTella and MacCulloch, 2004, p.2011

Outline

- Research question:
  Does income inequality undermine subjective wellbeing?

1. Qualitative predictions: Diminishing marginal sensitivity
2. Quantitative predictions:
   - Well-being and log(income)
   - A simple framework
3. Measurement
   - Income inequality: Mean log deviation
   - Quantifying subjective well-being
4. Results
5. Statistical precision, redux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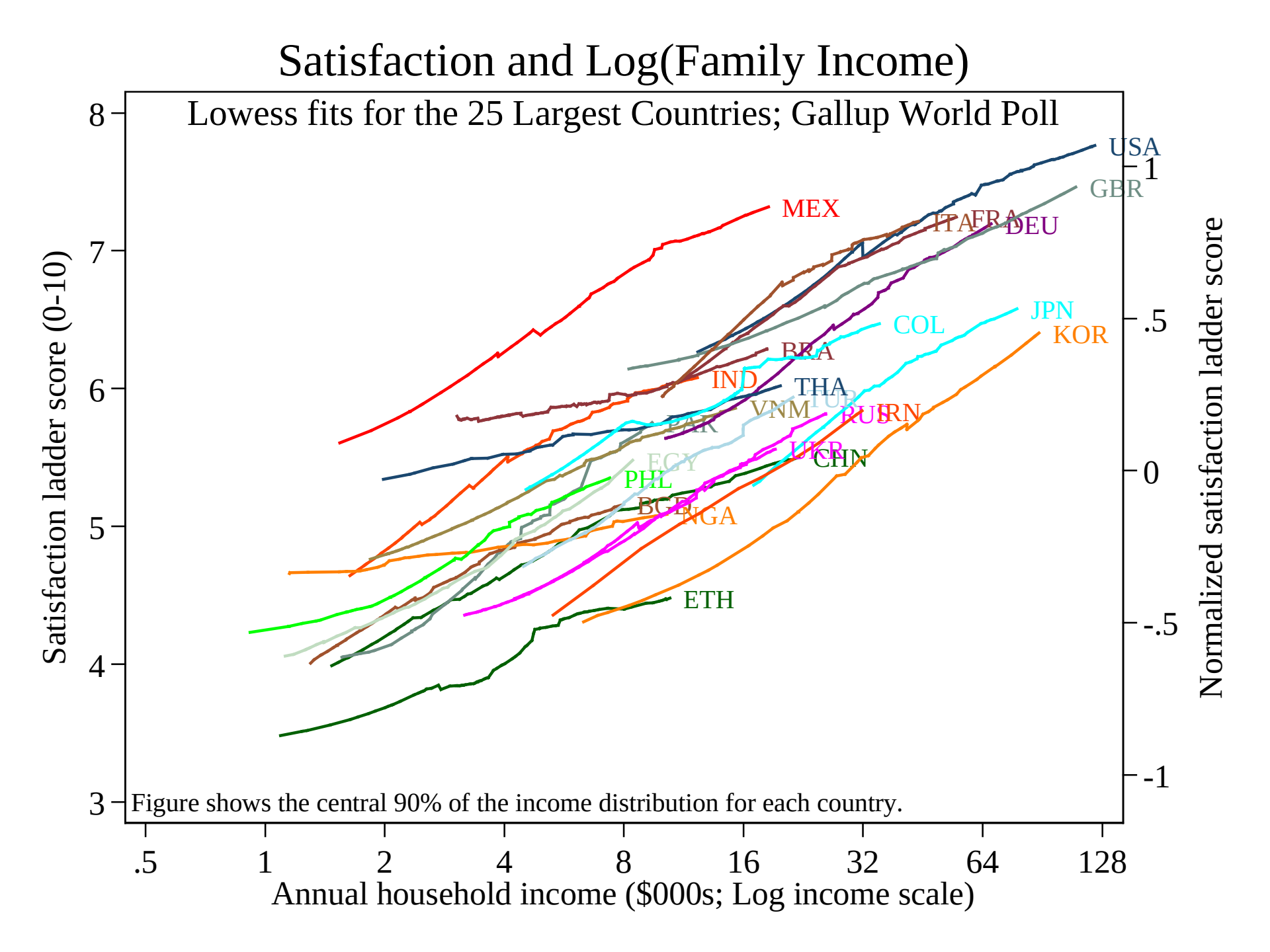
Satisfaction and Log(Family Income)
Lowess fits for the 25 Largest Countries; Gallup World Poll
Satisfaction ladder score (0-10)
Normalized satisfaction ladder score
Annual household income ($000s; Log income scale)
Figure shows the central 90% of the income distribution for each country.
USA
GBR
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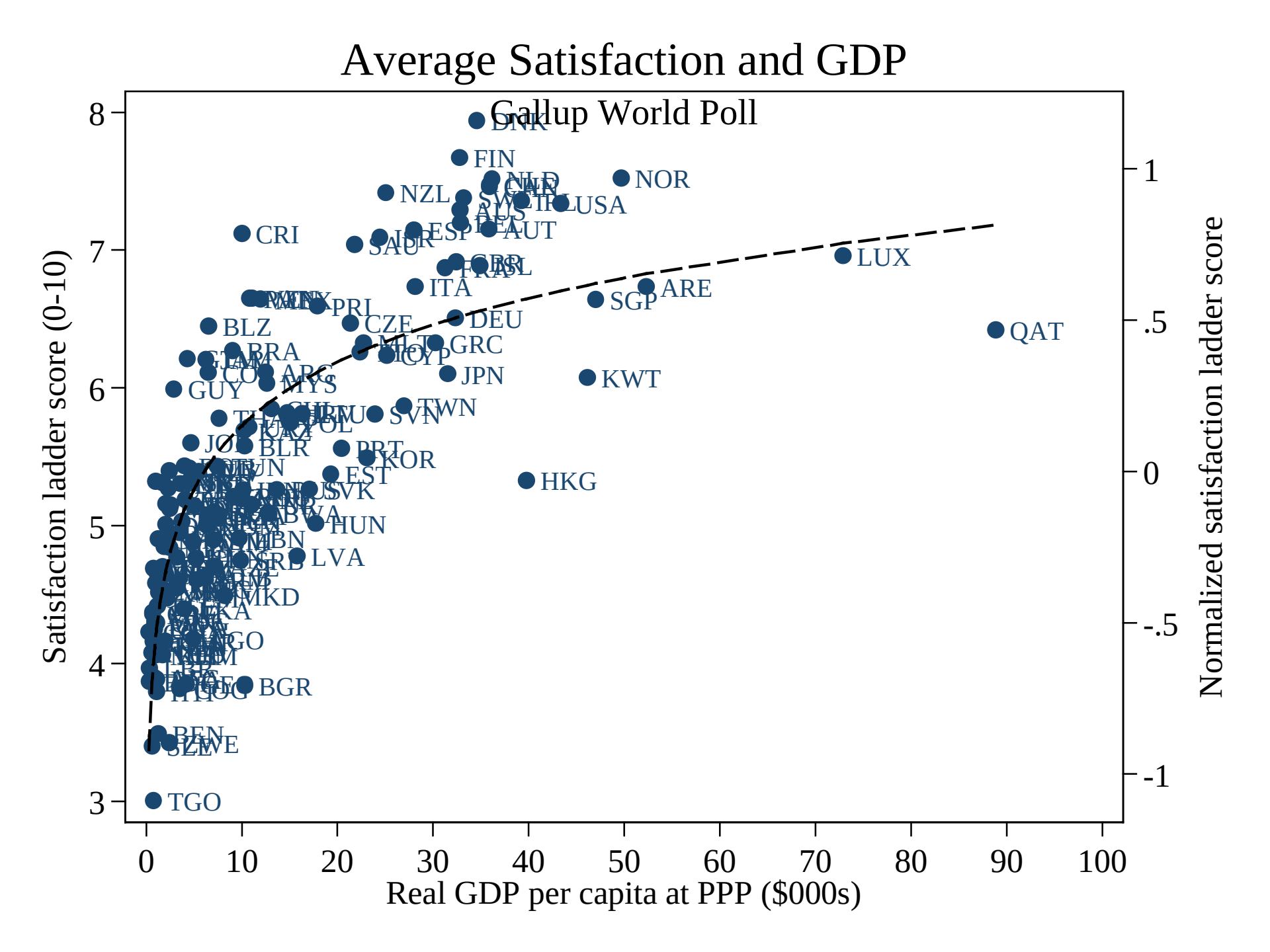
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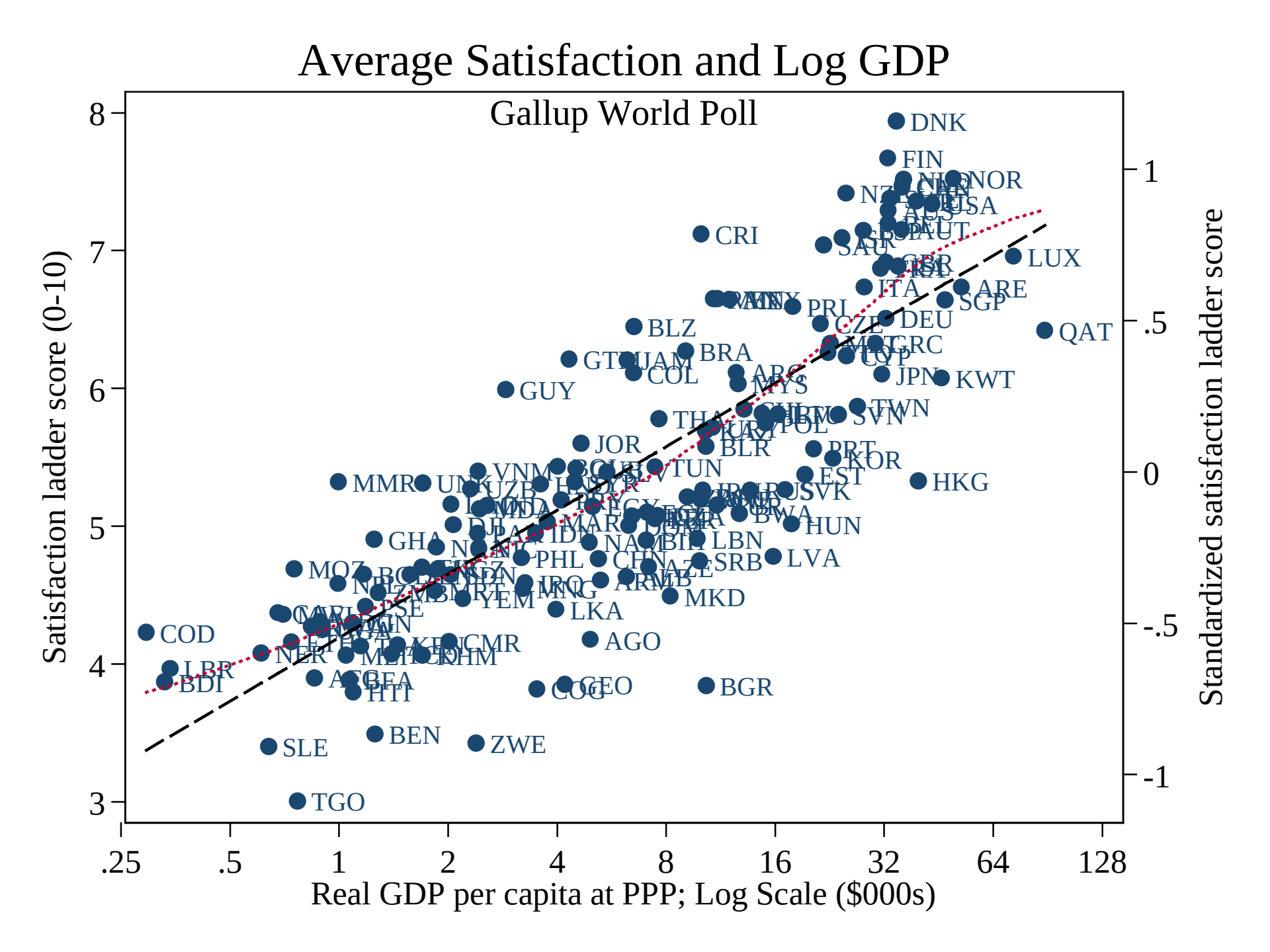
Average Satisfaction and Log GDP
Gallup World Poll
Satisfaction ladder score (0-10)
Standardized satisfaction ladder score
Real GDP per capita at PPP; Log Scale ($000s)
8
7
6
5
4
3
1
.5
0
-.5
-1
.25
.5
1
2
4
8
16
32
64
128
DNK
FIN
NOR
USA
CRI
LUX
ITA
ARE
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PRI
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KWT
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THA
POL
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HKG
MMR
SVK
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LVA
SRB
MOZ
PHL
MKD
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AGO
COD
LBR
BDI
HTI
GEO
BGR
BEN
ZWE
SLE
TGO

A Simple Framework

- Individual well-being:

$$Well-being_{ic} = \alpha + \beta \log(y_{ic}) + \epsilon_{ic}$$

- Average well-being in each country:

$$\overline{Well-being_c} = \alpha + \beta \overline{\log(y)}_c + \epsilon_c$$

Average of log income, not Log of average income

- Which implies:

$$\overline{Well-being_c} = \alpha + \beta \log(\overline{y}_c) - \beta \underbrace{\left(\log(\overline{y}_c) - \overline{\log(y)}_c\right)}_{\text{Mean log deviation}} + \epsilon_c$$

Equal and opposite effects

MLD: A Useful Measure of Income Inequality

- Mean log deviation (MLD) $= \log(\bar{y}_c) - \overline{\log(y)}_c$

- MLD measures the cost of income inequality
  - Compensating (or equivalent) variation measure of the cost of income inequality (assuming log utility)
  - "Theil's index"
  - e.g. U.S. MLD≈0.3 implies equally happy, on average, if:
    - Current levels of GDP per capita and income inequality
    - Eliminate income inequality and reduce GDP per capita by 30 log points (=26%)
  - MLD=-log(1-Atkinson index$_{\varepsilon=1}$)
    - Atkinson measures 1- "income lost" ($0 \geq A \geq 1$)
    - MLD measures "lost utility" (MLD ≥ 0)

A Richer Framework

- If people make relative income comparisons:

$$Well-being_{ic} = \alpha + \beta \log(y_{ic}) + \gamma \log\left(\frac{y_{ic}}{\overline{y}_c}\right) + \epsilon_{ic}$$

- Implies cross-country aggregates:

$$\overline{Well-being_c} = \alpha + \beta \log(\overline{y}_c) - (\beta + \gamma)\underbrace{\left(\log(\overline{y}_c) - \overline{\log(y)}_c\right)}_{\text{Mean log deviation}} + \epsilon_\epsilon$$

Larger coefficient on inequality

Further Complicating Thoughts

	Reference group	Individual well-being	Coefficient on log(GDP)	Coefficient on inequality (MLD)
Absolute income	None	$\beta \log(y_{ic})$	β	-β
Relative income	Country	$+\gamma \log\left(\frac{y_{ic}}{\overline{y}_c}\right)$	0	-γ
Relative income (local reference)	Local	$+\delta \log\left(\frac{y_{ic}}{\overline{y}_{rc}}\right)$	0	$-\delta(1-\frac{\sigma^2_{\overline{y}_r}}{\sigma^2_y})$
Hedonic treadmill	Own past income	$+\zeta \log\left(\frac{y_{i,t}}{y_{i,t-\tau}}\right)$	0	0
Relative well-being	Any	$+\eta \log\left(\frac{U_{ic}}{\overline{U}_c}\right)$	0	0
Income rank	Any	$+\theta$ rank(y_{ic})	0	0

Implications: Under all models, coefficient on inequality is:
1) Oppositely to coefficient on GDP;
2) Of at least equal magnitude;
3) and possibly larger (if some forms of relative comparisons are important)

Outline

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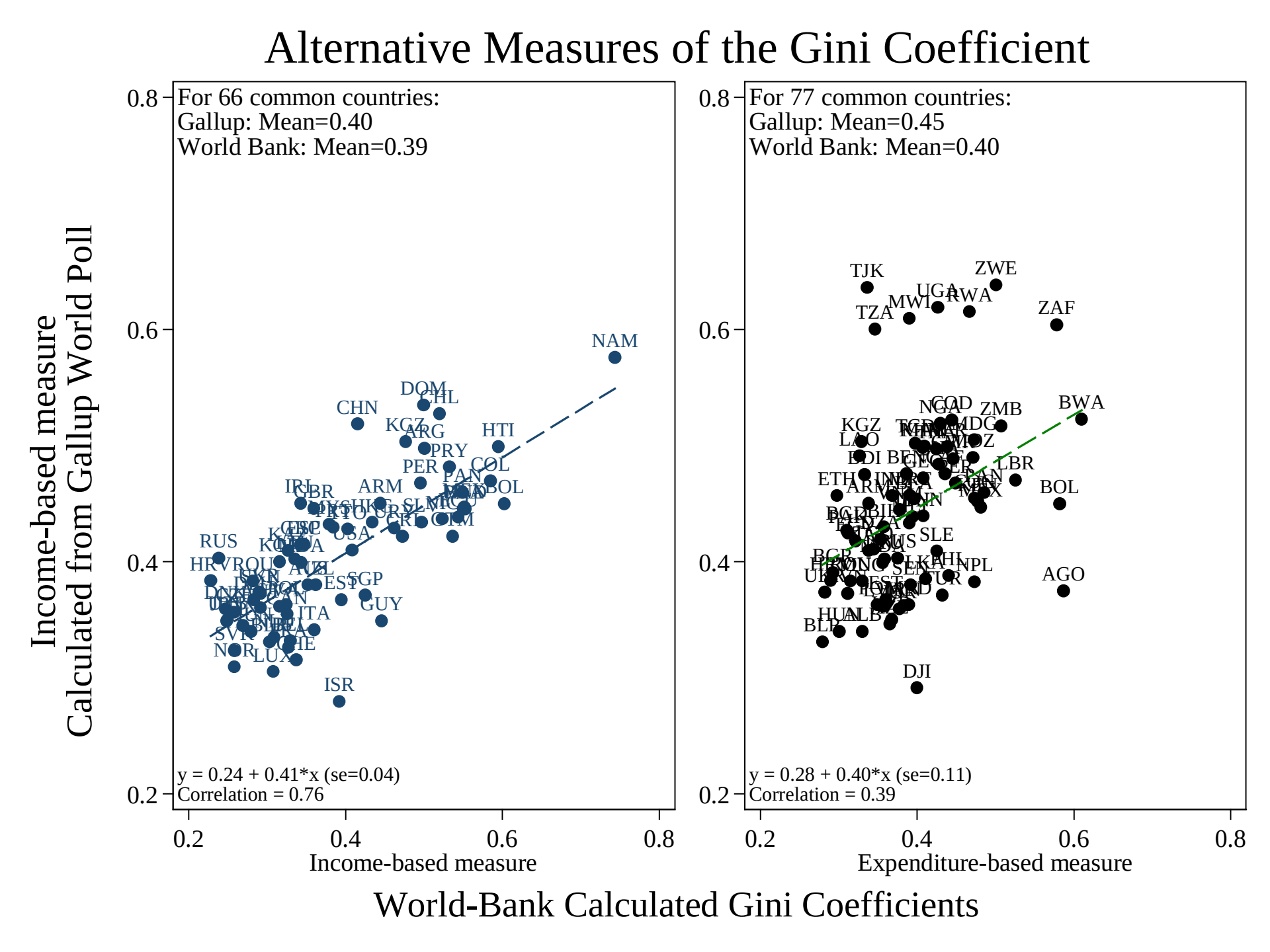
Measuring Inequality

- Gallup World Poll (2005-2008; n>380,000 over 142 countries)
  - Reports household income for each respondent
  - Can directly calculate:
    - Mean log deviation
    - Gini coefficient
- World Development Indicators: Gini Coefficient
  - Take most recent observation for each country
    - Range: 1992-2007; Mean=2002.6; n=128 countries
  - If incomes are log-normal:

$$MLD = \left(F_N^{-1} \left(\frac{1 + Gini}{2} \right) \right)^2$$


Alternative Measures of the Gini Coefficient
For 66 common countries:
Gallup: Mean=0.40
World Bank: Mean=0.39
y = 0.24 + 0.41*x (se=0.04)
Correlation = 0.76
For 77 common countries:
Gallup: Mean=0.45
World Bank: Mean=0.40
y = 0.28 + 0.40*x (se=0.11)
Correlation = 0.39
Income-based measure
Calculated from Gallup World Poll
Income-based measure
Expenditure-based measure
World-Bank Calculated Gini Coefficients
0.2
0.4
0.6
0.8
NAM
CHN
DOM
CHL
KGZ
ARG
HTI
PRY
PER
COL
PAN
BOL
IRL
GBR
ARM
USA
RUS
HRV
ROU
SGP
GUY
ITA
NOR
LUX
ISR
TJK
ZWE
UGA
RWA
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SLE
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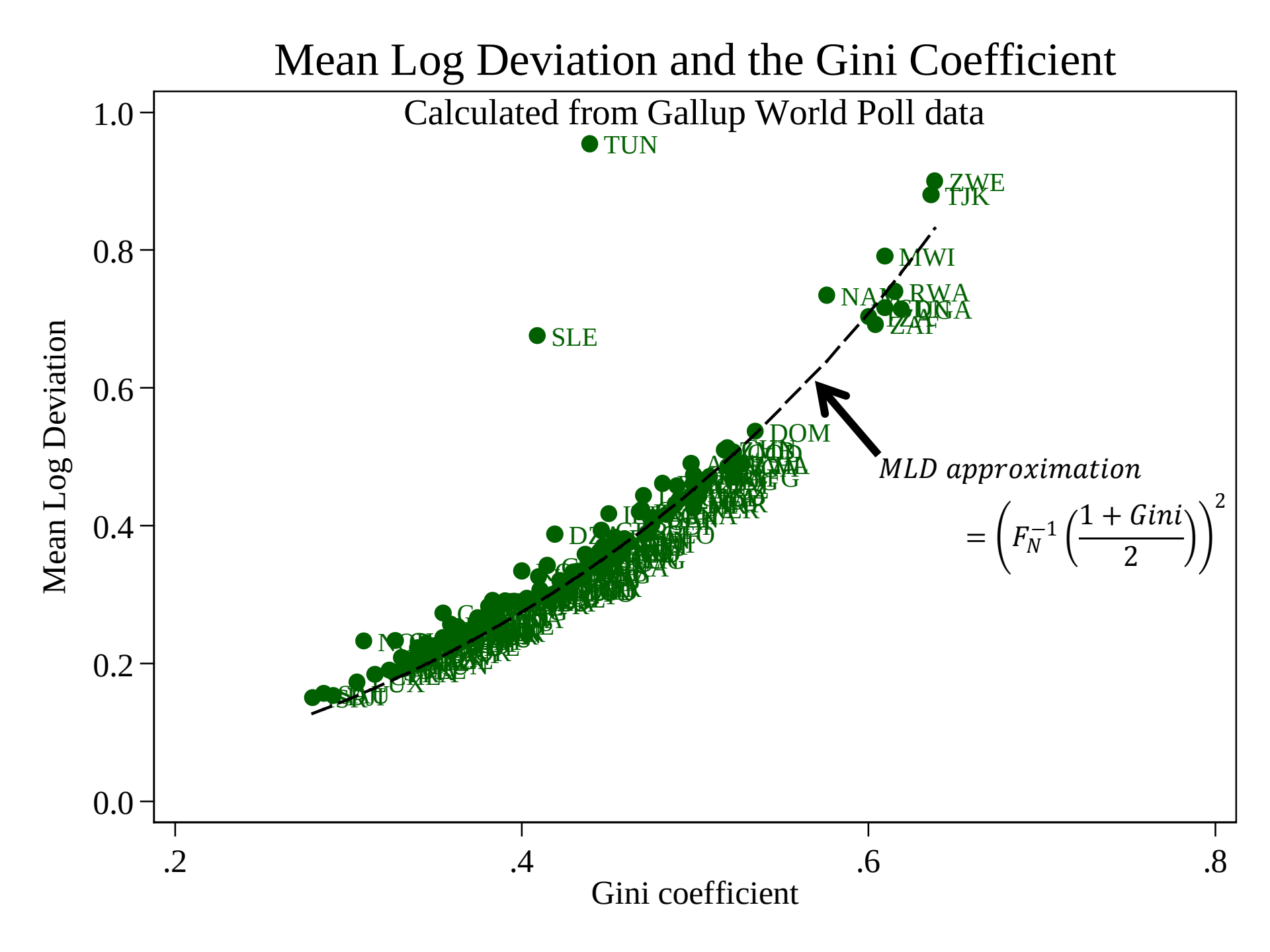
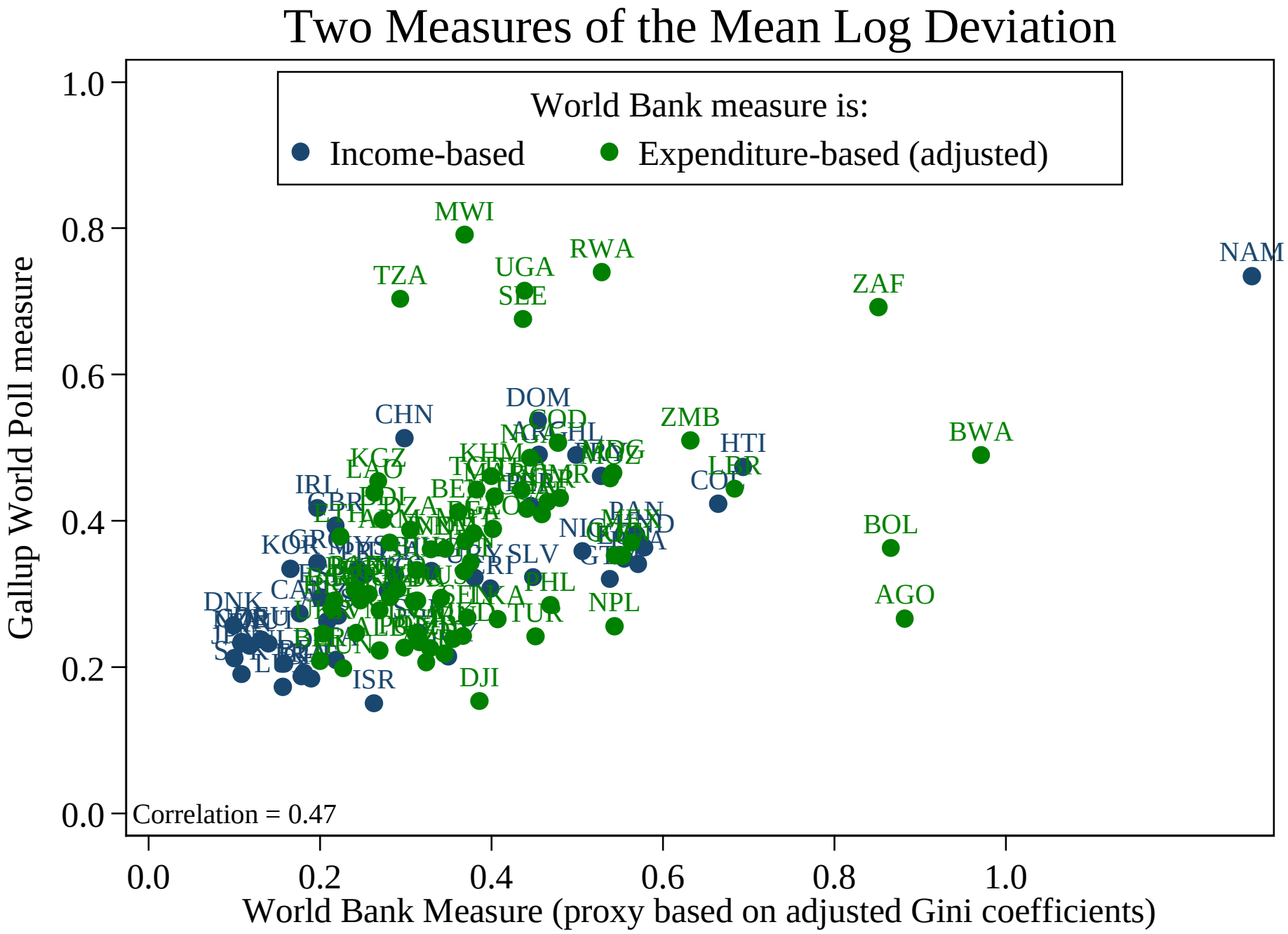
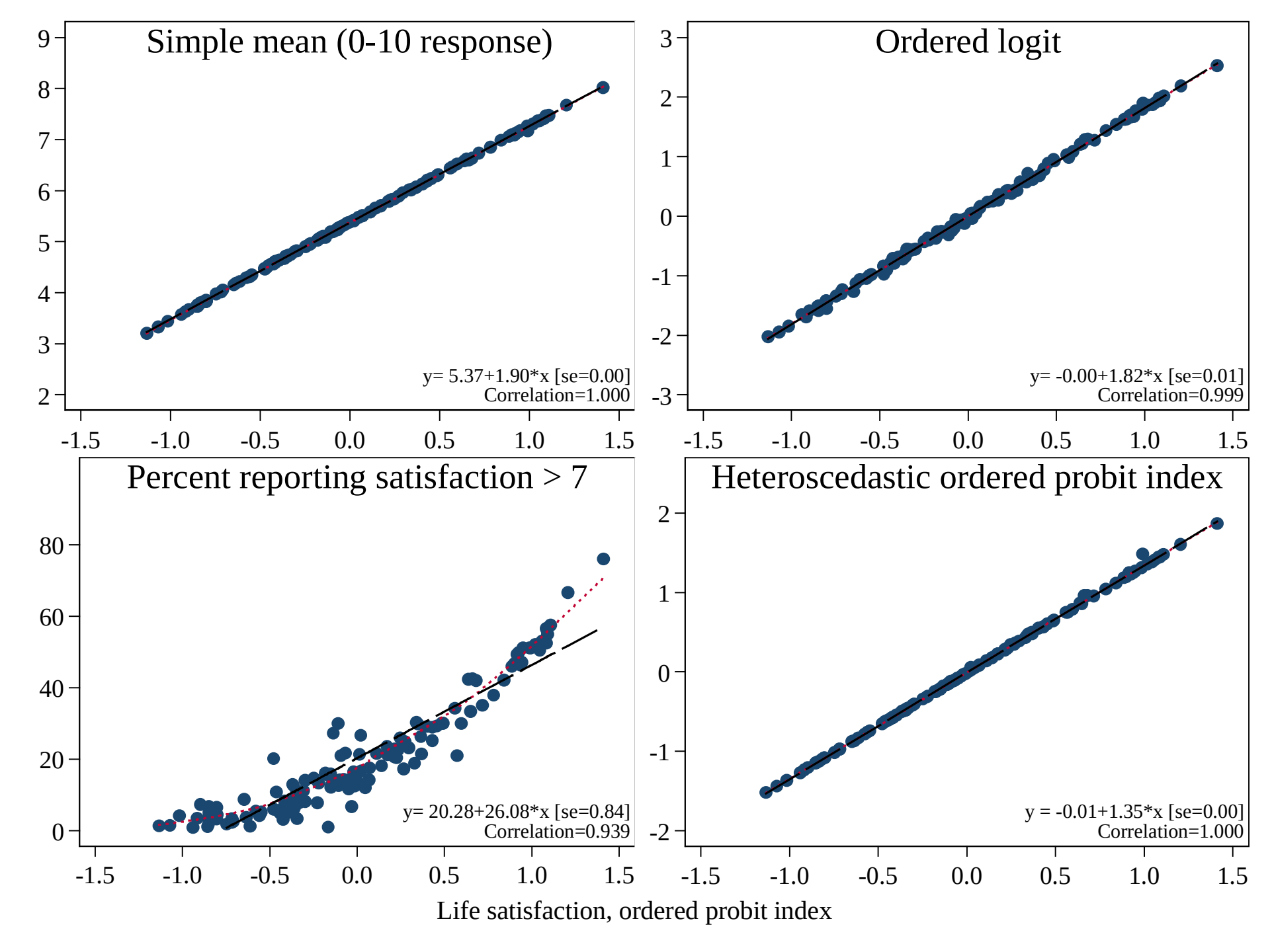
NPL
BLR
DJI


Mean Log Deviation and the Gini Coefficient
Calculated from Gallup World Poll data
Mean Log Deviation
Gini coefficient
1.0
0.8
0.6
0.4
0.2
0.0
.2
.4
.6
.8
TUN
ZWE
TJK
MWI
NAM
RWA
ZMB
ZAF
SLE
DOM
MLD approximation
$= \left(F_N^{-1} \left(\frac{1 + Gini}{2} \right) \right)^2$


Two Measures of the Mean Log Deviation
World Bank measure is:
Income-based
Expenditure-based (adjusted)
Gallup World Poll measure
1.0
0.8
0.6
0.4
0.2
0.0
MWI
RWA
TZA
UGA
SLE
NAM
ZAF
DOM
CHN
ZMB
HTI
BWA
KGZ
LAO
IRL
BOL
AGO
NPL
TUR
SLV
PHL
DNK
ISR
DJI
Correlation = 0.47
0.0
0.2
0.4
0.6
0.8
1.0
World Bank Measure (proxy based on adjusted Gini coefficients)

Measuring Subjective Well-Being

- Quantifying responses to:
  - *"Please imagine a ladder with steps numbered from zero at the bottom to ten at the top. Suppose we say that the top of the ladder represents the best possible life for you, and the bottom of the ladder represents the worst possible life for you. On which step of the ladder would you say you personally feel you stand at this time, assuming that the higher the step the better you feel about your life, and the lower the step the worse you feel about it? Which step comes closest to the way you feel?"*
- Our approach:
  - Report the standardized z-score (μ=5.4; σ=2.2)
    - Yields a directly interpretable metric (relative to cross-section SD)
- A caveat: Are we idenifying convexity in:
  - Happiness=f(income) ? OR
  - Reported happiness = g(Experienced happiness) ?
- Alternative approach:
  - Functional form assumptions about "latent" happiness $\sim N(0,\sigma_c)$
  - Yields similar findings


Simple mean (0-10 response)
y= 5.37+1.90*x [se=0.00]
Correlation=1.000
Ordered logit
y= -0.00+1.82*x [se=0.01]
Correlation=0.999
Percent reporting satisfaction > 7
y= 20.28+26.08*x [se=0.84]
Correlation=0.939
Heteroscedastic ordered probit index
y = -0.01+1.35*x [se=0.00]
Correlation=1.000
Life satisfaction, ordered probit index

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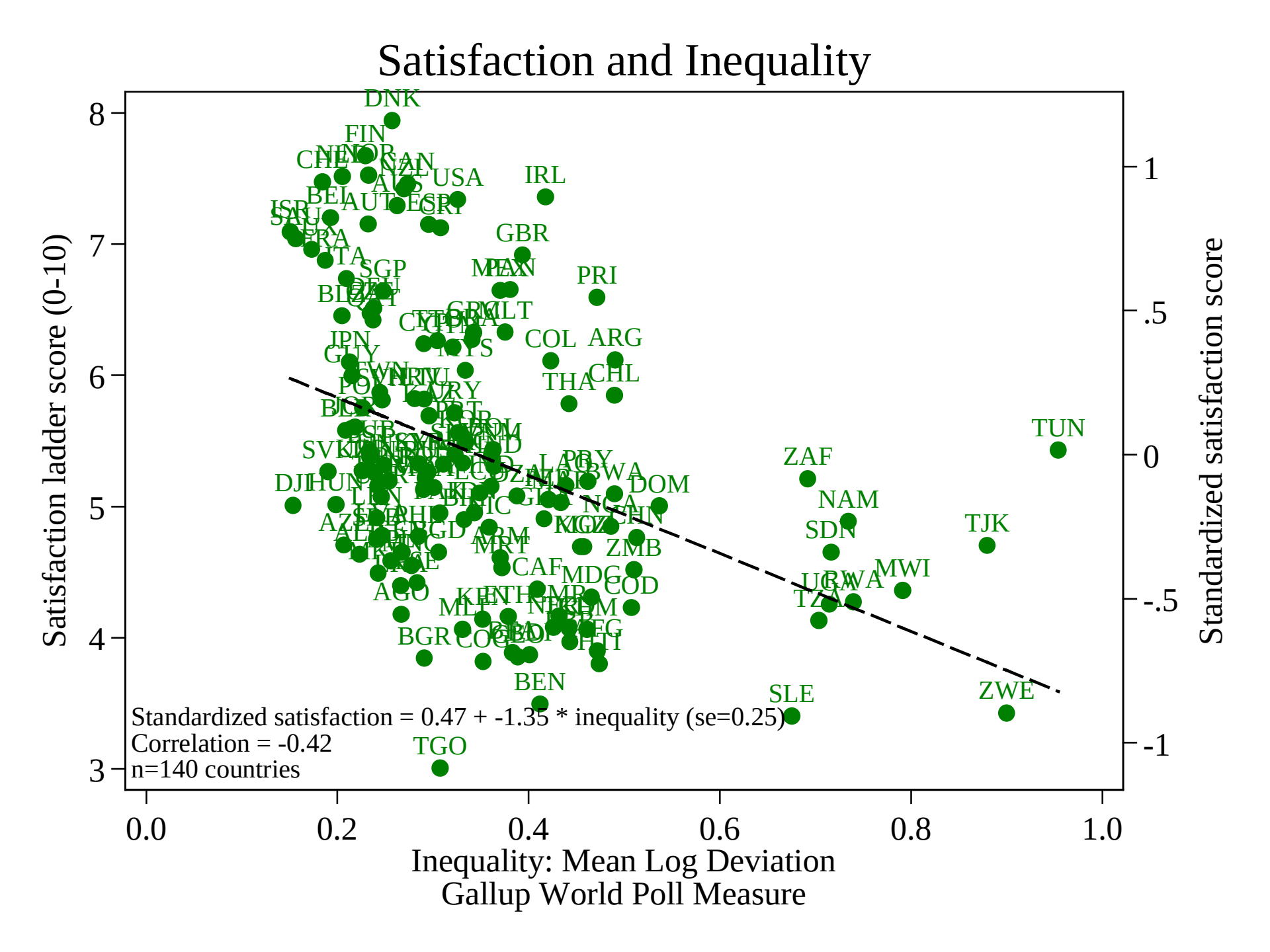
Satisfaction and Inequality
Satisfaction ladder score (0-10)
Standardized satisfaction score
Inequality: Mean Log Deviation
Gallup World Poll Measure
Standardized satisfaction = 0.47 + -1.35 * inequality (se=0.25)
Correlation = -0.42
n=140 countries
DNK
FIN
IRL
USA
GBR
PRI
COL
ARG
THA
CHL
TUN
ZAF
NAM
SDN
TJK
ZMB
MWI
SLE
ZWE
TGO
BEN
BGR
0.0
0.2
0.4
0.6
0.8
1.0
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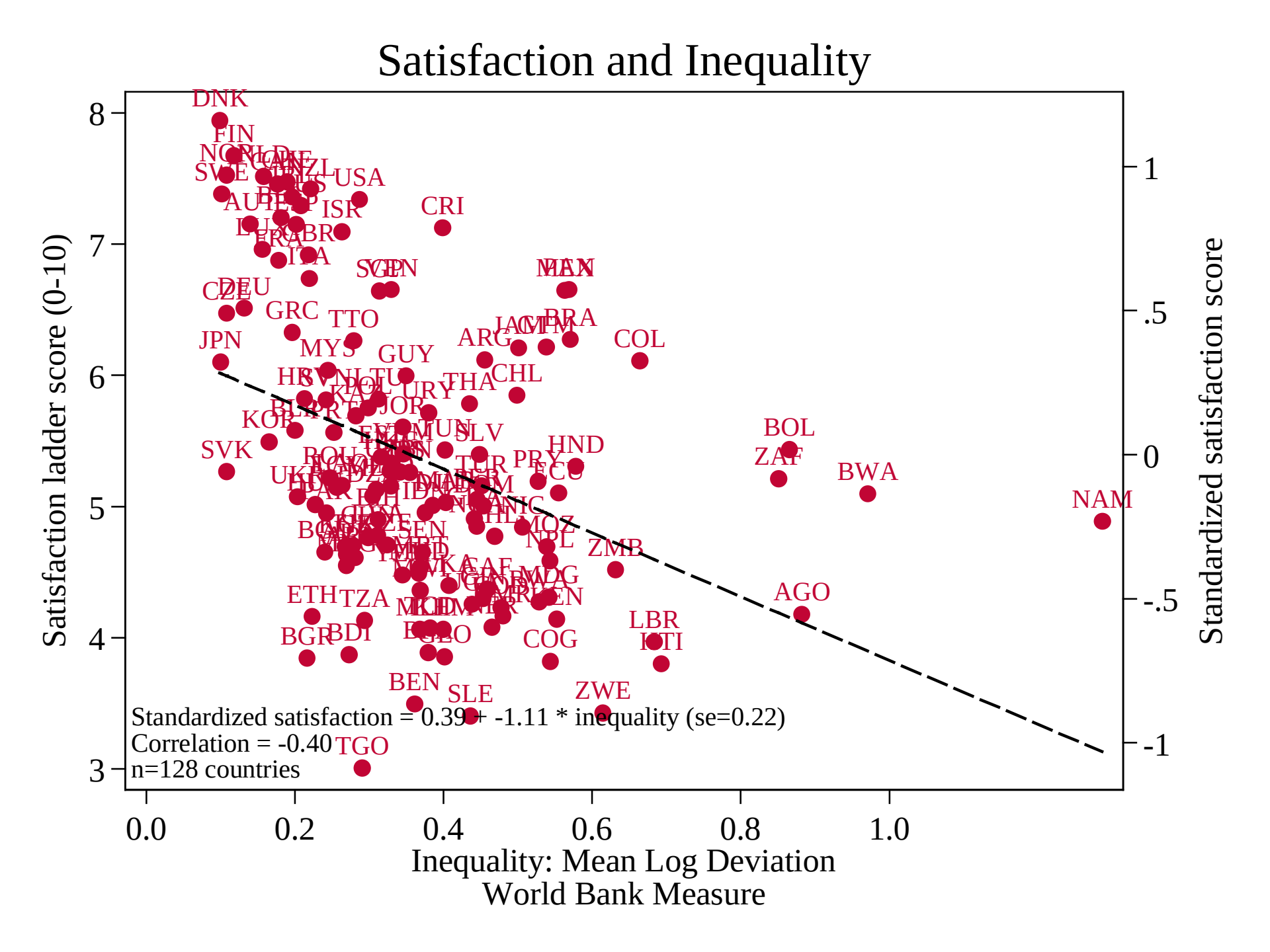
-1
-.5
0
.5
1


Satisfaction and Inequality
Satisfaction ladder score (0-10)
Standardized satisfaction score
Inequality: Mean Log Deviation
World Bank Measure
Standardized satisfaction = 0.39 + -1.11 * inequality (se=0.22)
Correlation = -0.40
n=128 countries
DNK
FIN
USA
CRI
ISR
DEU
GRC
TTO
JPN
MYS
GUY
ARG
COL
CHL
THA
JOR
SLV
HND
PRY
BOL
ZAF
BWA
NAM
SVK
ZMB
AGO
ETH
TZA
BGR
BDI
COG
LBR
BEN
SLE
ZWE
TGO
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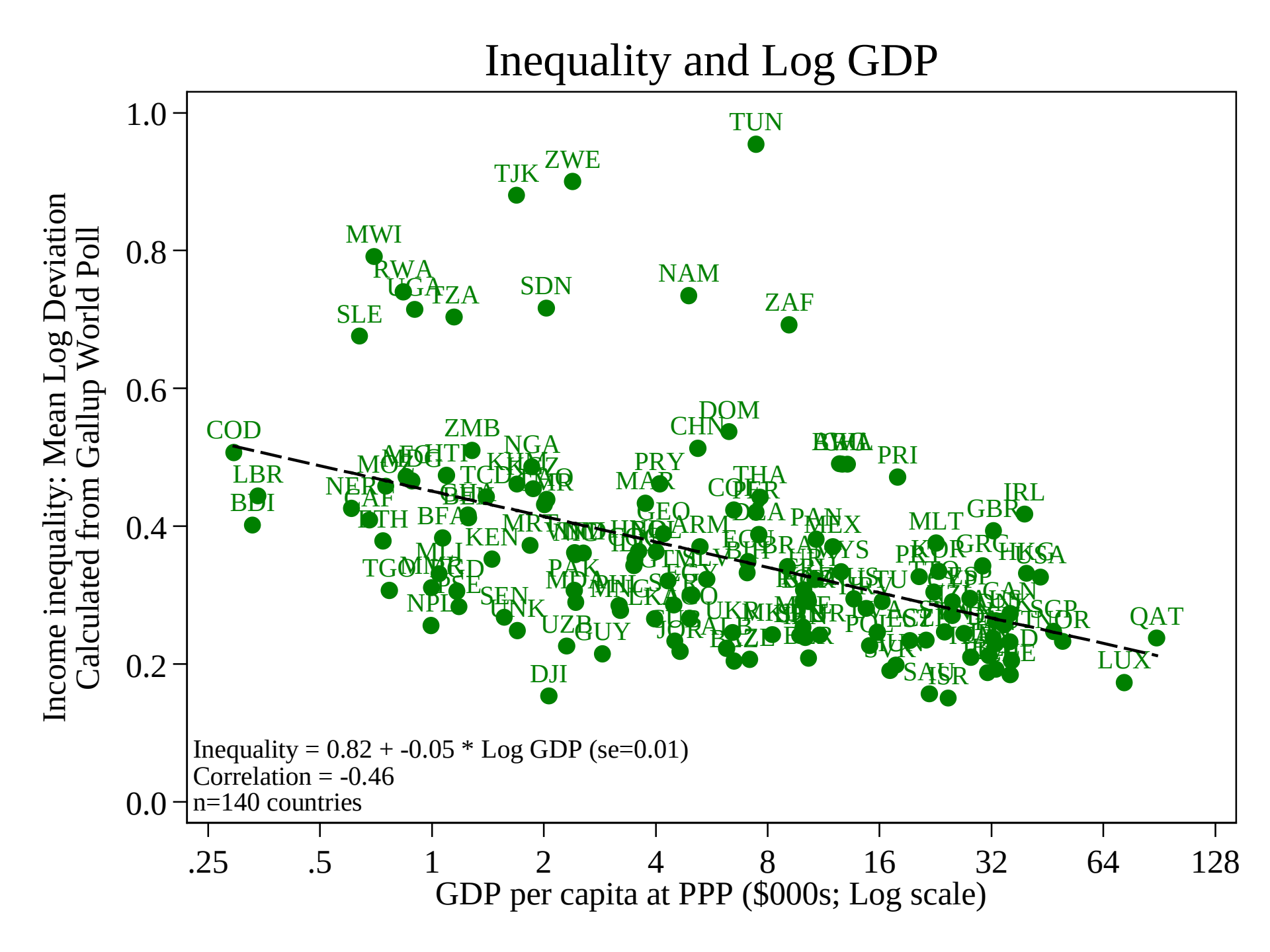
0.0
0.2
0.4
0.6
0.8
1.0


Inequality and Log GDP
Income inequality: Mean Log Deviation
Calculated from Gallup World Poll
1.0
0.8
0.6
0.4
0.2
0.0
.25
.5
1
2
4
8
16
32
64
128
GDP per capita at PPP ($000s; Log scale)
Inequality = 0.82 + -0.05 * Log GDP (se=0.01)
Correlation = -0.46
n=140 countries
TUN
ZWE
TJK
MWI
RWA
UGA
TZA
SDN
NAM
ZAF
SLE
DOM
CHN
COD
ZMB
NGA
PRY
PRI
LBR
BDI
MAR
THA
IRL
GBR
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MLI
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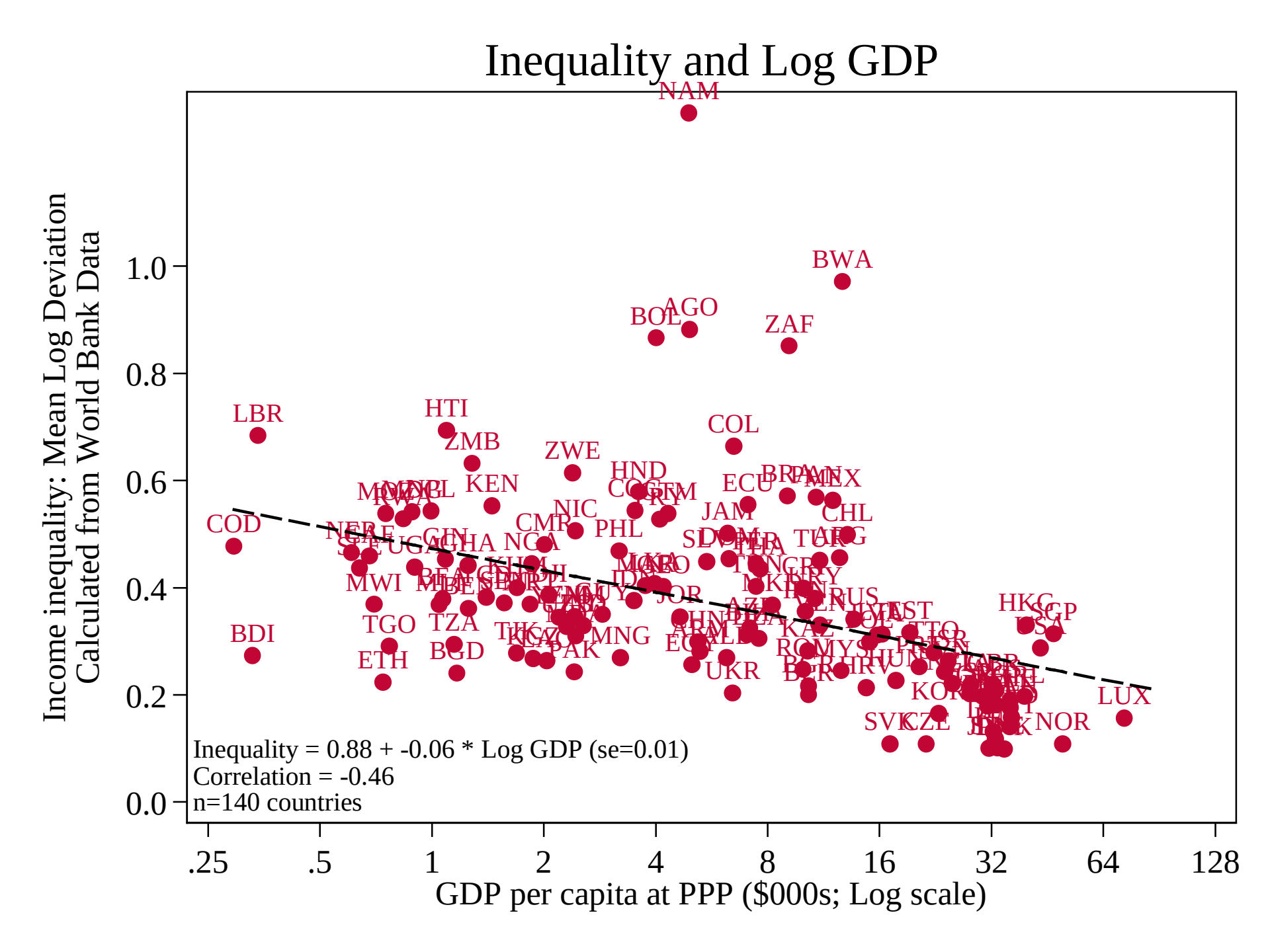
PAK
SEN
NPL
UZB
GUY
DJI
QAT
LUX


Inequality and Log GDP
Income inequality: Mean Log Deviation
Calculated from World Bank Data
GDP per capita at PPP ($000s; Log scale)
0.0
0.2
0.4
0.6
0.8
1.0
.25
.5
1
2
4
8
16
32
64
128
Inequality = 0.88 + -0.06 * Log GDP (se=0.01)
Correlation = -0.46
n=140 countries
NAM
BWA
AGO
BOL
ZAF
LBR
HTI
ZMB
COL
ZWE
HND
KEN
ECU
MEX
CHL
COD
NIC
CMR
PHL
JAM
NGA
MWI
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BDI
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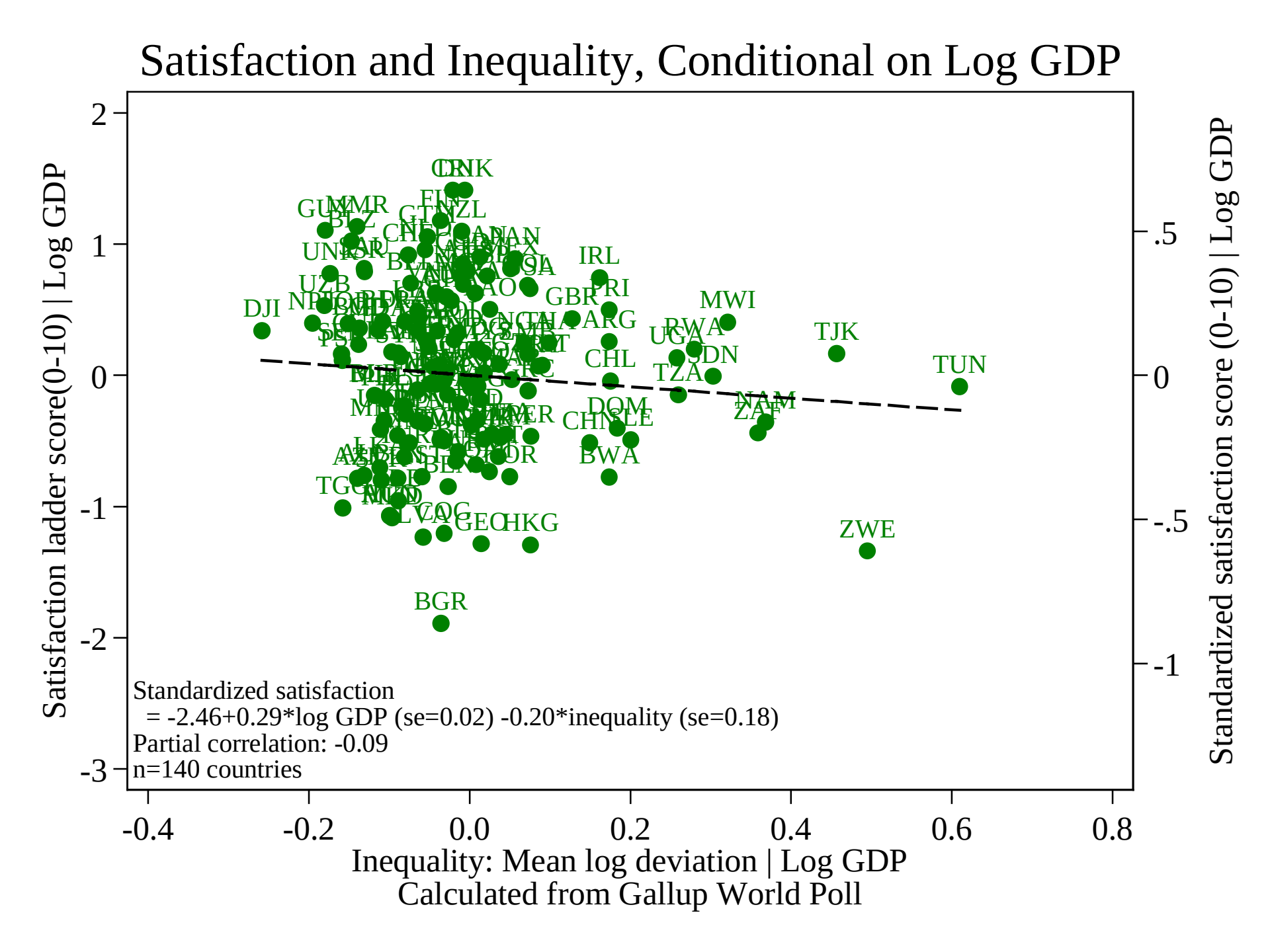
MNG
UKR
KOR
LUX
NOR
SVK
HKG
SGP


Satisfaction and Inequality, Conditional on Log GDP
Satisfaction ladder score(0-10) | Log GDP
Standardized satisfaction score (0-10) | Log GDP
Inequality: Mean log deviation | Log GDP
Calculated from Gallup World Poll
Standardized satisfaction
= -2.46+0.29*log GDP (se=0.02) -0.20*inequality (se=0.18)
Partial correlation: -0.09
n=140 countries
2
1
0
-1
-2
-3
.5
0
-.5
-1
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
DJI
IRL
GBR
ARG
MWI
RWA
UGA
TJK
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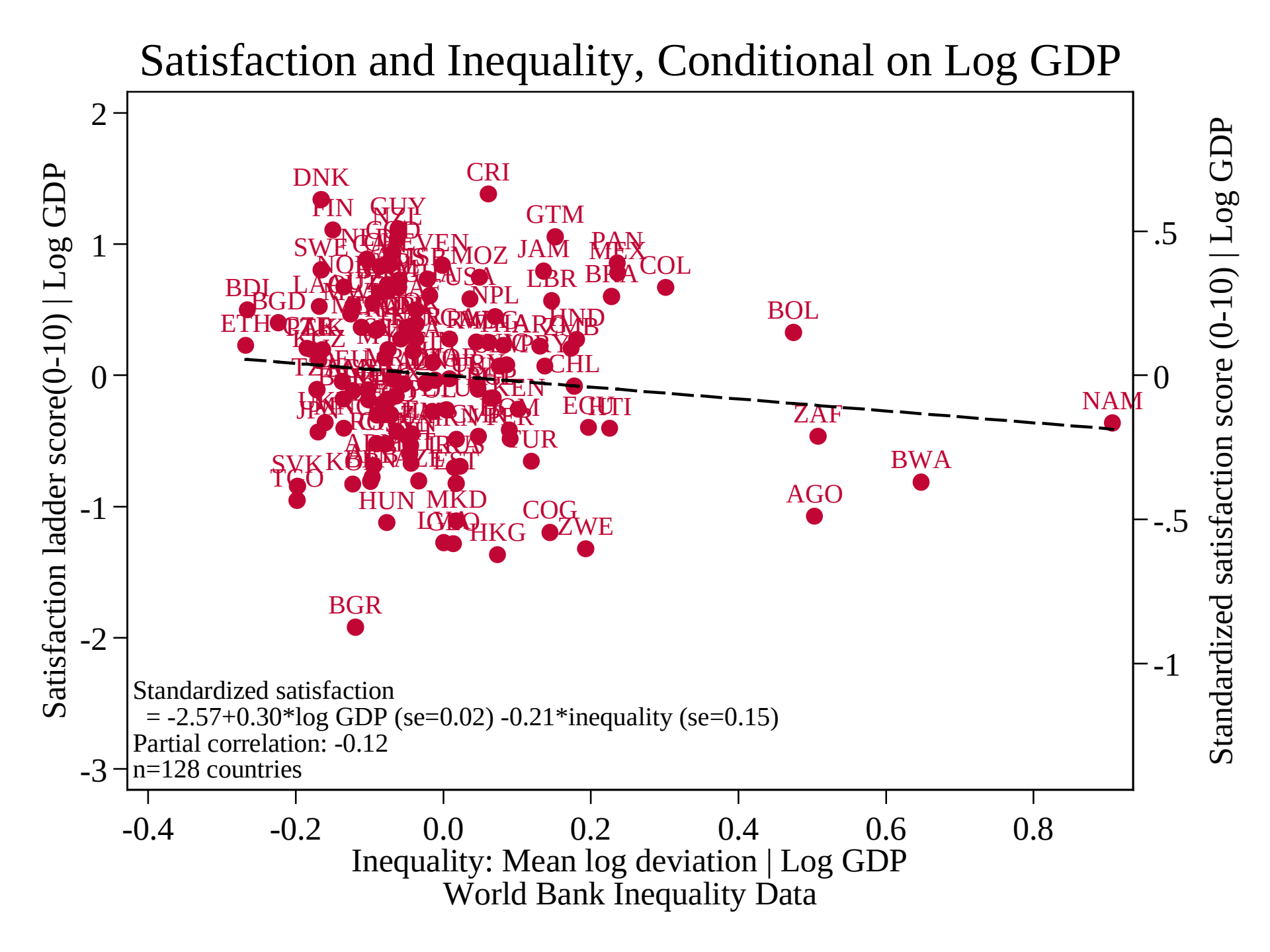
HKG
GEO


Satisfaction and Inequality, Conditional on Log GDP
Satisfaction ladder score(0-10) | Log GDP
Standardized satisfaction score (0-10) | Log GDP
Inequality: Mean log deviation | Log GDP
World Bank Inequality Data
Standardized satisfaction
= -2.57+0.30*log GDP (se=0.02) -0.21*inequality (se=0.15)
Partial correlation: -0.12
n=128 countries
DNK
CRI
FIN
GUY
GTM
JAM
PAN
MEX
COL
BRA
LBR
MOZ
BDI
BGD
NPL
BOL
HND
CHL
ECU
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HUN
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COG
ZWE
HKG
BGR
2
1
0
-1
-2
-3
.5
0
-.5
-1
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8

Life Satisfaction and Inequality

Dependent variable: Satisfaction ladder score (standardized)

	Simple Bivariate Relationship		Conditional on GDP	
MLD (Gallup)	-1.35*** (0.25)		-0.20 (0.18)	
MLD (World Bank)		-1.11*** (0.22)		-0.21 (0.15)
Log GDP			0.29*** (0.02)	0.30*** (0.02)
N	140	128	140	128
Adjusted R^2	0.17	0.16	0.65	0.67
H_0: $\beta_{inequality} = 0$	Reject	Reject	Accept	Accept
H_0 : $\beta_{inequality} = -\beta_{income}$			Accept F=0.22 (p=.64)	Accept F=0.36 (p=.55)

Conclusion: Data cannot falsify ANY interesting hypothesis

Subjective Well-Being and Inequality

Dependent variable: Satisfaction ladder score (standardized)

	(1)	(2)	(3)	(4)	(5)
MLD (Gallup)	-1.35*** (0.25)	-0.20 (0.18)	-0.20 (0.19)	-0.13 (0.20)	-0.06 (0.21)
Log GDP		0.29 (0.02)	0.27 (0.02)	0.24*** (0.04)	0.30*** (0.08)
Controls	None	+Log GDP	+Continent	+HDI indices	+% urban, %0-14; %0-65; %ag; %service; ln(π), C/Y; G/Y; M/Y; X/Y
N	140	140	140	137	127
Adjusted R^2	0.17	0.65	0.68	0.69	0.74
H_0: $\beta_{inequality} = 0$	Accept	Accept	Accept	Accept	Accept
H_0 : $\beta_{inequality} = -\beta_{income}$	Accept	Accept	Accept	Accept	Accept

Alternative Measures of Subjective Well-Being

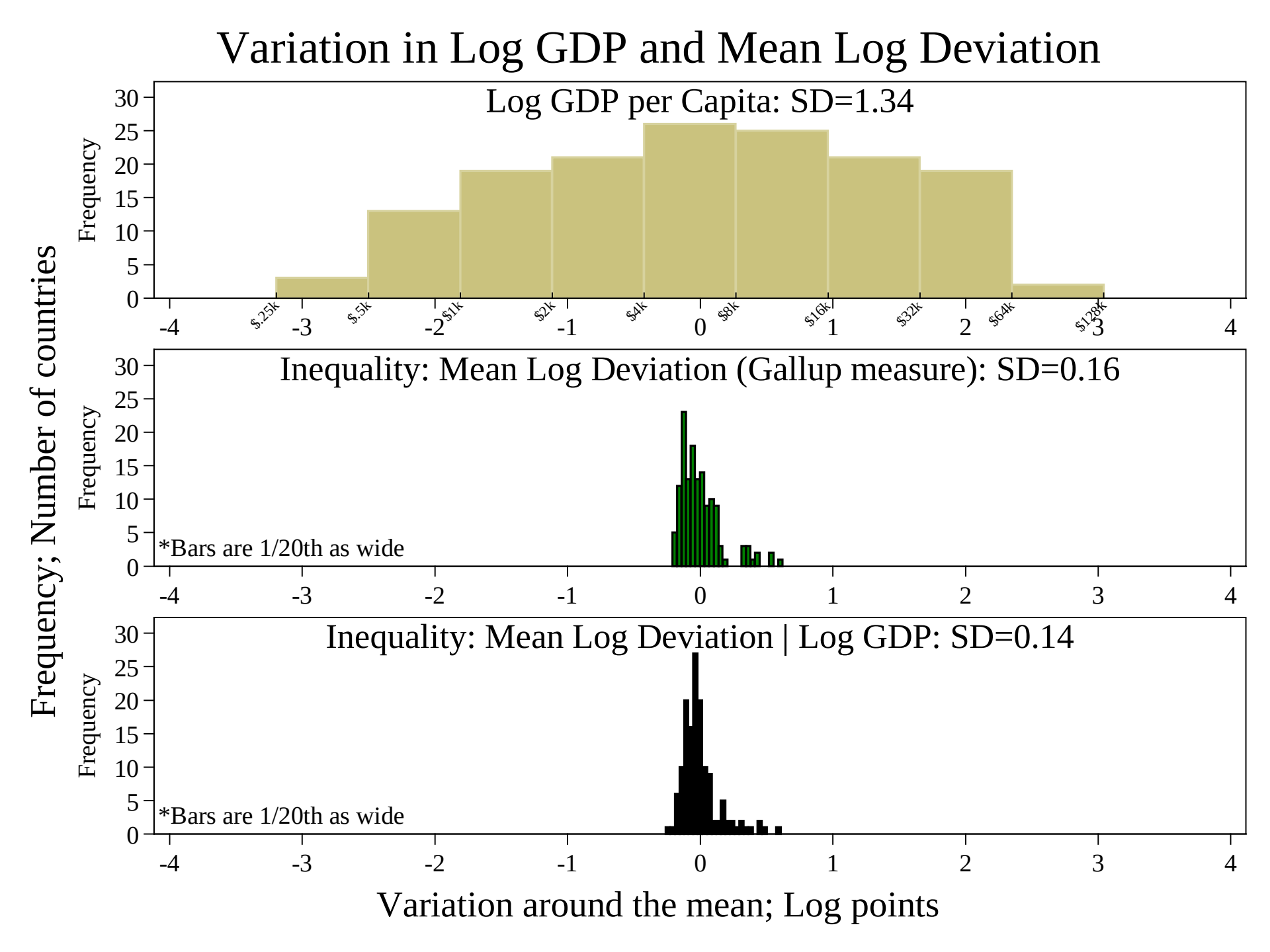
Dependent variable: Subjective Well-Being (standardized)

Survey:	Gallup World Poll		World Values Survey (2004-08)		Pew Global Attitudes, 2007	European Social Survey, 2006-07
Dependent var:	Satisfaction ladder	Life satisfaction	Life satisfaction	Happiness	Satisfaction ladder	Happiness
Inequality (MLD, Gallup)	-0.20 (0.18)	-0.28 (0.25)	0.44 (0.52)	0.47 (0.45)	-0.06 (0.37)	-0.19 (0.62)
Log GDP	0.29^{***} (0.02)	0.33^{***} (0.03)	0.27^{***} (0.05)	0.13^{***} (0.04)	0.23^{***} (0.04)	0.68^{***} (0.07)
N	140	113	54	54	43	23
Adjusted R^2	0.65	0.63	0.36	0.12	0.48	0.79
H_0: $\beta_{inequality} = 0$	Accept	Accept	Accept	Accept	Accept	Accept
H_0 : $\beta_{inequality} = -\beta_{income}$	Accept	Accept	Accept	Accept	Accept	Accept

Outline

- Research question:
  Does income inequality undermine subjective wellbeing?

1. Qualitative predictions: Diminishing marginal sensitivity
2. Quantitative predictions:
   - Well-being and log(income)
   - A simple framework
3. Measurement issues
   - Income inequality: Mean log deviation
   - Quantifying subjective well-being
4. Results
5. Statistical precision, redux

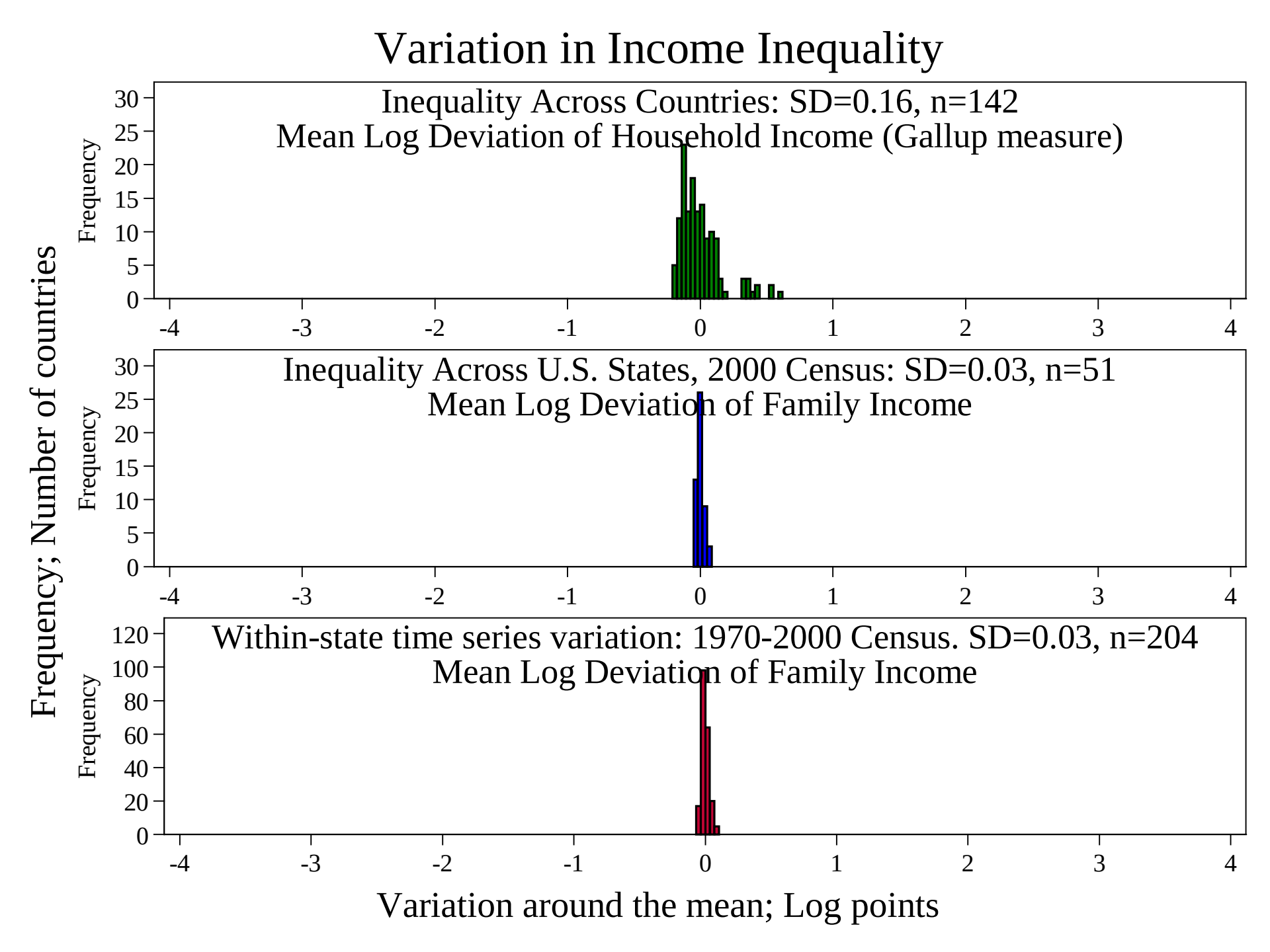

Variation in Log GDP and Mean Log Deviation
Log GDP per Capita: SD=1.34
Inequality: Mean Log Deviation (Gallup measure): SD=0.16
Inequality: Mean Log Deviation | Log GDP: SD=0.14
Frequency
*Bars are 1/20th as wide
$.25k
$.5k
$1k
$2k
$4k
$8k
$16k
$32k
$64k
$128k
Frequency; Number of countries
Variation around the mean; Log points

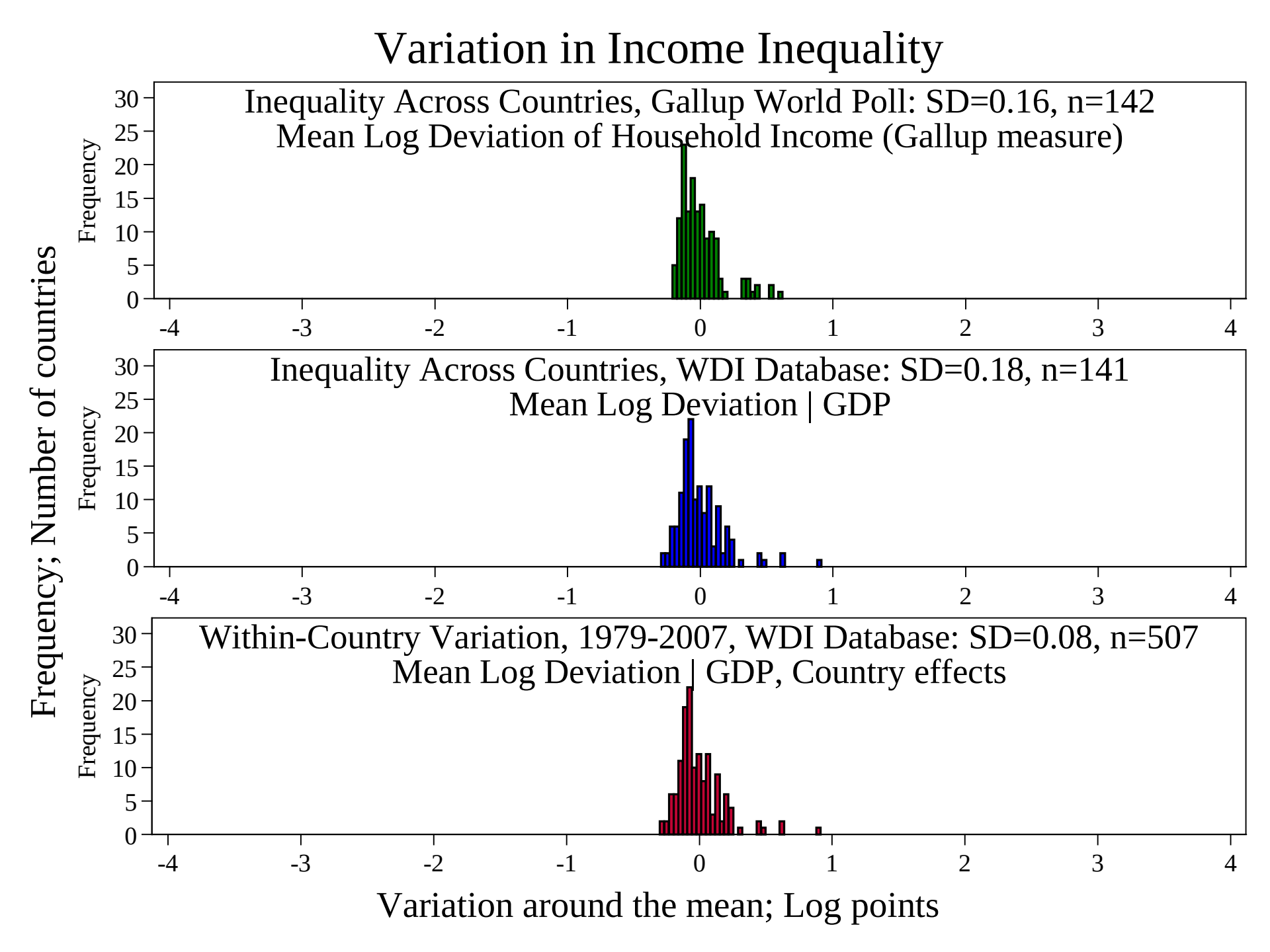
The Problem of Power

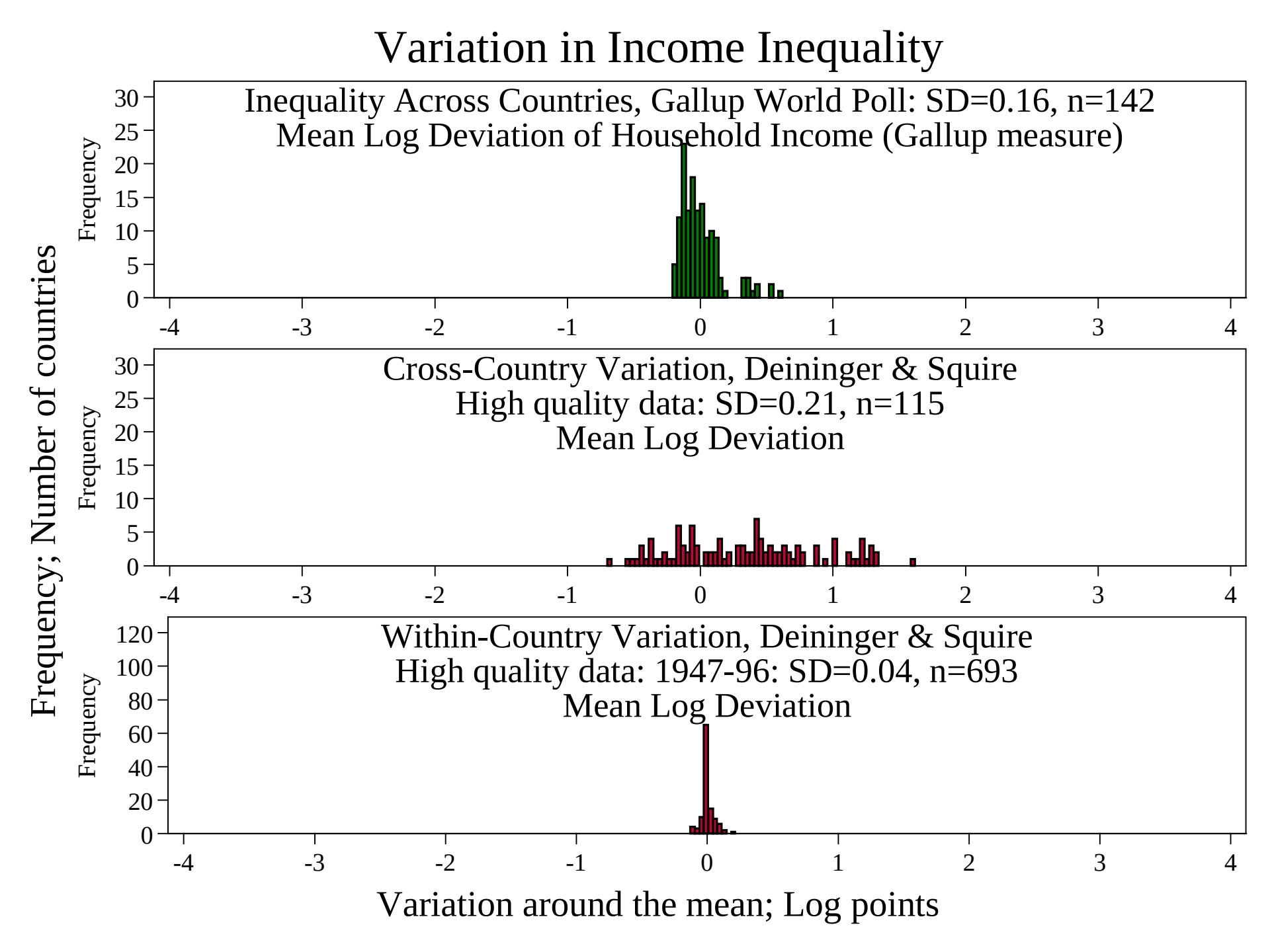
$$V(\beta) = \sigma(X'X)^{-1}$$

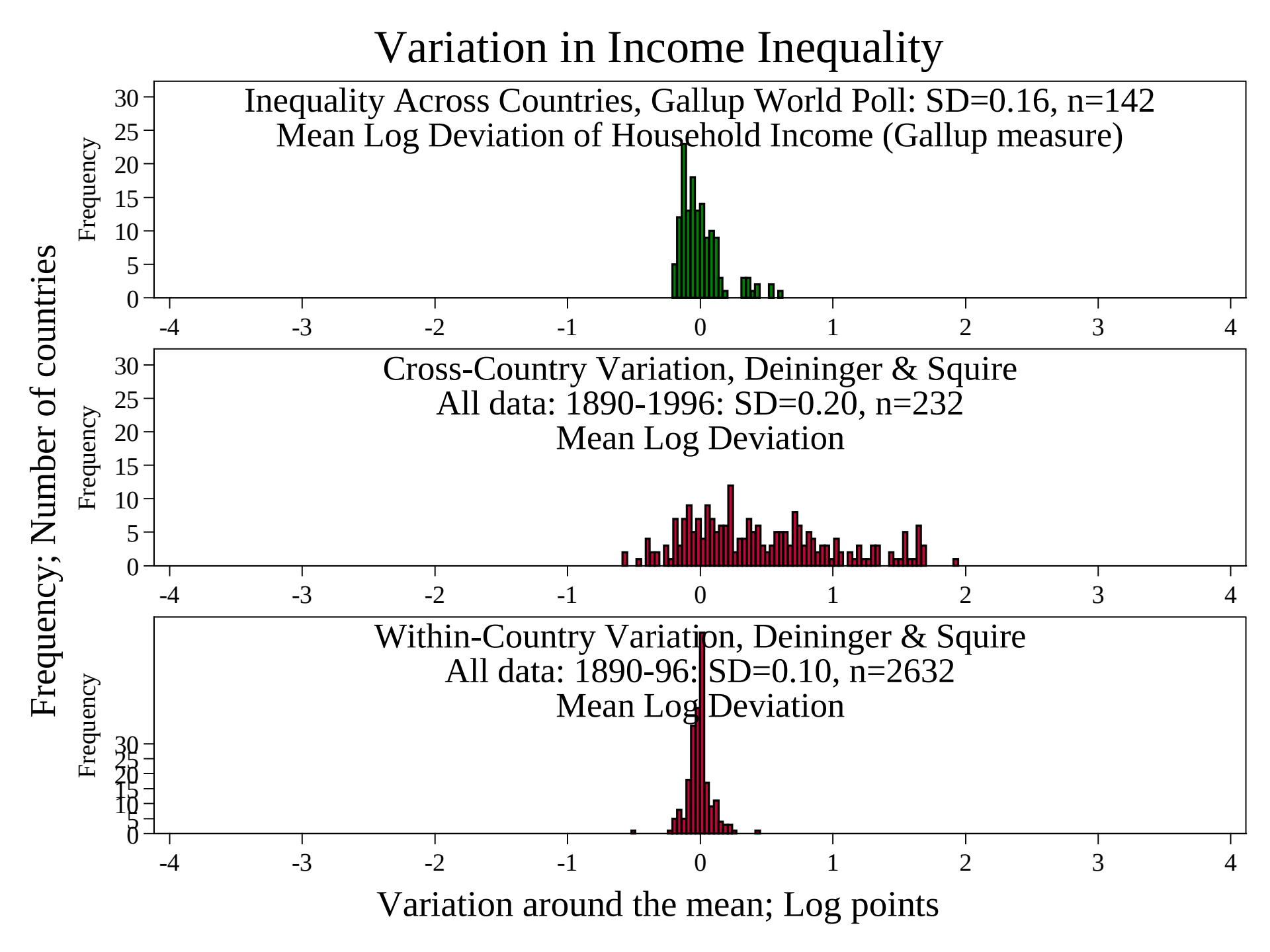
$$\text{Bivariate case}: \text{Standard error} = RMSE \Big/ \sigma_x \sqrt{n}$$

- In our dataset:
  - RMSE=0.29
  - $\sigma_{inequality}$ = 0.14
  - n=142 countries
  - Yielding $SE_{\beta inequality}$ =0.17
  - Compared to β_{income} =0.30 (se=.02)


Variation in Income Inequality
Inequality Across Countries: SD=0.16, n=142
Mean Log Deviation of Household Income (Gallup measure)
Inequality Across U.S. States, 2000 Census: SD=0.03, n=51
Mean Log Deviation of Family Income
Within-state time series variation: 1970-2000 Census. SD=0.03, n=204
Mean Log Deviation of Family Income
Frequency
Frequency; Number of countries
Variation around the mean; Log points


Variation in Income Inequality
Inequality Across Countries, Gallup World Poll: SD=0.16, n=142
Mean Log Deviation of Household Income (Gallup measure)
Inequality Across Countries, WDI Database: SD=0.18, n=141
Mean Log Deviation | GDP
Within-Country Variation, 1979-2007, WDI Database: SD=0.08, n=507
Mean Log Deviation | GDP, Country effects
Frequency
Frequency; Number of countries
Variation around the mean; Log points


Variation in Income Inequality
Inequality Across Countries, Gallup World Poll: SD=0.16, n=142
Mean Log Deviation of Household Income (Gallup measure)
Cross-Country Variation, Deininger & Squire
High quality data: SD=0.21, n=115
Mean Log Deviation
Within-Country Variation, Deininger & Squire
High quality data: 1947-96: SD=0.04, n=693
Mean Log Deviation
Frequency
Frequency; Number of countries
Variation around the mean; Log points


Variation in Income Inequality
Inequality Across Countries, Gallup World Poll: SD=0.16, n=142
Mean Log Deviation of Household Income (Gallup measure)
Cross-Country Variation, Deininger & Squire
All data: 1890-1996: SD=0.20, n=232
Mean Log Deviation
Within-Country Variation, Deininger & Squire
All data: 1890-96: SD=0.10, n=2632
Mean Log Deviation
Frequency
Frequency; Number of countries
0
5
10
15
20
25
30
-4
-3
-2
-1
0
1
2
3
4
Variation around the mean; Log points

Conclusion

Does inequality undermine average levels of subjective well-being?

- Subjective well-being exhibits diminishing marginal sensitivity to income
- Framework suggests that coefficient on inequality (measured as mean log deviation) should be equal and opposite to that on log(GDP)
  - Or bigger for relative income comparisons
- Cross-country findings:
  - Inequality negatively correlated with subjective well-being
  - But, conditional on GDP:
    - This relationship is statistically insignificant
    - Yet still quantitatively important
- The problem: Statistical power
  - Too little variation in inequality across countries or through time
  - Data cannot convincingly falsify most reasonable views about the quantitative link between happiness and inequality
  - Unlikely to accumulate sufficient data to resolve the happiness-inequality link.