Health and development during the 20th century

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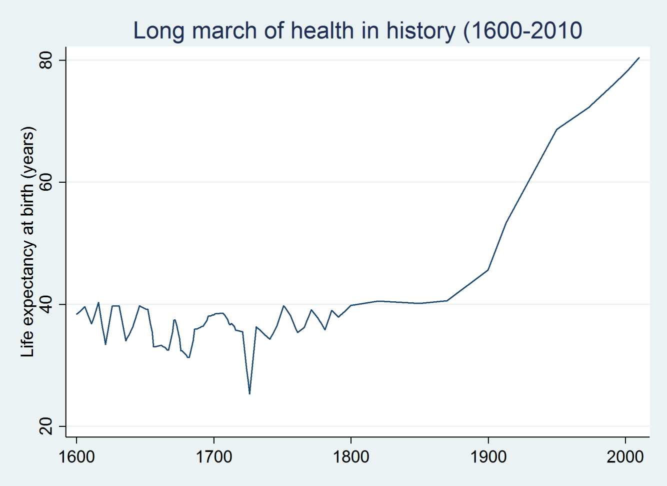
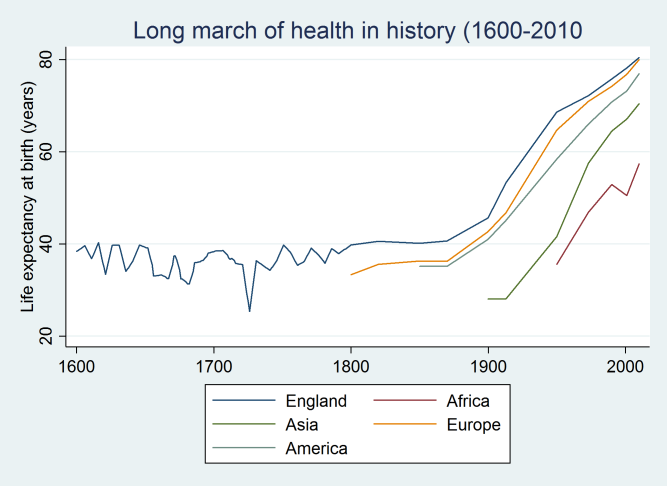
Groningen Growth and Development Center
25th Anniversary Conference

29-06-2017

Outline

Outline


Long march of health in history (1600-2010
Life expectancy at birth (years)
20
40
60
80
1600
1700
1800
1900
2000



Long march of health in history (1600-2010
Life expectancy at birth (years)
20
40
60
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1600
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1900
2000
England
Africa
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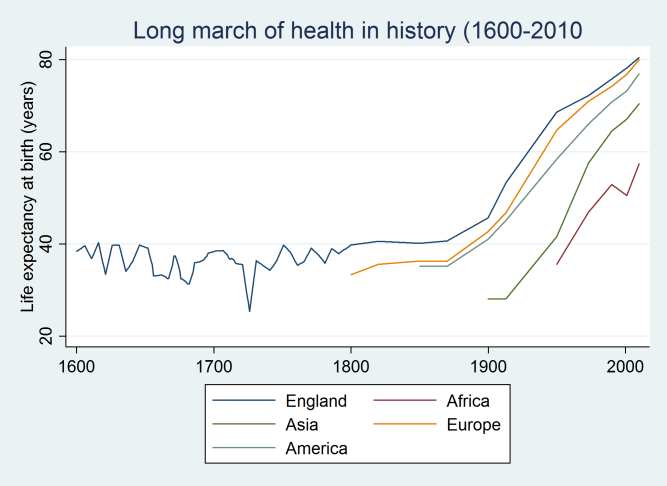
Europe
America



RQ: What is the impact of health on economic growth?

Outline

Health and economic growth in the 20th century

- Cross-country growth regressions (post-1940 period)
  1. Bloom, Canning, and Sevilla (2004); Acemoglu and Johnson (2007); Cervellati and Sunde (2001)
  2. Most studies find a positive effect of health on economic growth
- Long-term analyses
  1. Fogel (1994); Arora (2001); Floud et al. (2011)
  2. Positive correlation between health and economic growth. Health improvements increased the pace of growth around 30 percent

Health and economic growth in the 20th century

- Cross-country growth regressions (post-1940 period)
  1. Bloom, Canning, and Sevilla (2004); Acemoglu and Johnson (2007); Cervellati and Sunde (2001)
  2. Positive effect of health on economic growth
  3. **Estimates may be biased if IV approaches do not fully tackle endogeneity concerns (Weil, 2007)**
  4. **Focus on post-1950 period**
- Long-term analyses
  1. Fogel (1994); Arora (2001), Floud et al. (2011)
  2. Health improvements increased the pace of growth around 30 percent
  3. **Small sample of developed countries**

Contribution to the literature

This study uses a level accounting framework that includes health (Weil, 2007)

Contribution to the literature:

- Cross-country regression studies
  1. Provide unbiased country-level estimates of the importance of health for income levels
  2. Consider longer time span to fully cover the health transition
- Economic history studies
  1. Consider many more countries (especially less-developed ones)
  2. Focus on GDP levels during the 20th century

Contribution to the literature

- Level and growth accounting literature
  1. I created a new dataset of physical capital stocks for 40 countries
  2. Test the framework proposed in Weil (2007) with new data, further benchmarks and alternative measures of health
  3. Examine the role of proximate determinants of income in the past (Hall and Jones, 1999; Caselli, 2005; Hsieh and Klenow, 2010)

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Health in the production function

$$Y_i = A_i K_i^{\alpha} (H_i)^{1-\alpha} \tag{1}$$

where A is productivity, K is capital per worker, H is human capital and α is the elasticity of output with respect to capital.

$$H_i = h_i v_i L_i \tag{2}$$

where L is the number of workers, h is human capital in the form of education and v is human capital in the form of health.

Success measure based on Caselli (2005)

Consider that $y_{kh} = k^{\alpha} h^{1-\alpha}$ and $y_{khv} = k^{\alpha} h^{1-\alpha} v^{1-\alpha}$:

$$Success_{Caselli\_excl.health} = \frac{var[log(y_{kh})]}{var[log(y)]} \tag{3}$$

$$Success_{Caselli\_incl.health} = \frac{var[log(y_{khv})]}{var[log(y)]} \tag{4}$$

$$Success_{Caselli\_based} = Success_{Caselli\_incl.health} - Success_{Caselli\_excl.health} \tag{5}$$

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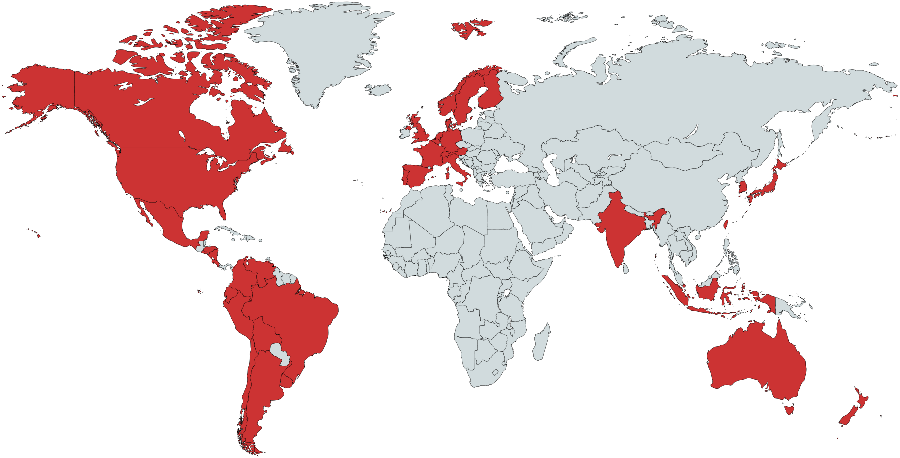
Data sources

Data for six benchmark years (and 36 countries): 1900, 1929, 1955, 1973, 1990 and 2008

- Income per capita: Bolt and van Zanden (2014) and PWT 9.0
- Physical capital: own data and PWT 9.0
- Life expectancy: World Population Prospects (United Nations), World Development Indicators (World Bank) and Clio Infra Database (Riley, 2005)
- Years of education: Clio Infra database and Barro and Lee (2013)
- Returns to schooling and health (Weil, 2007)

A new dataset of historical physical capital

- Methodology: perpetual inventory method to convert investment flows into stocks for structures and machinery and equipment
- I take into account changes in the relative price of structures and machinery over time
- Sources are the work of economic historians, statistical offices and historical national accounts from every analysed country
- The information is put together, corrected by extraordinary events (e.g. wars) and constructed in a homogeneous way



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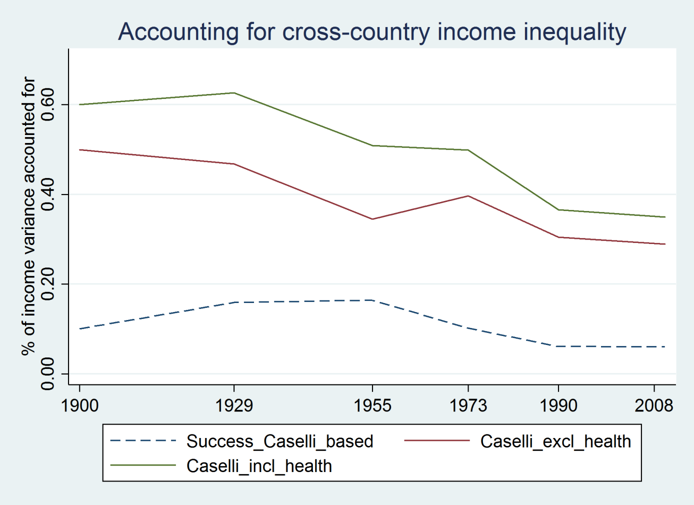
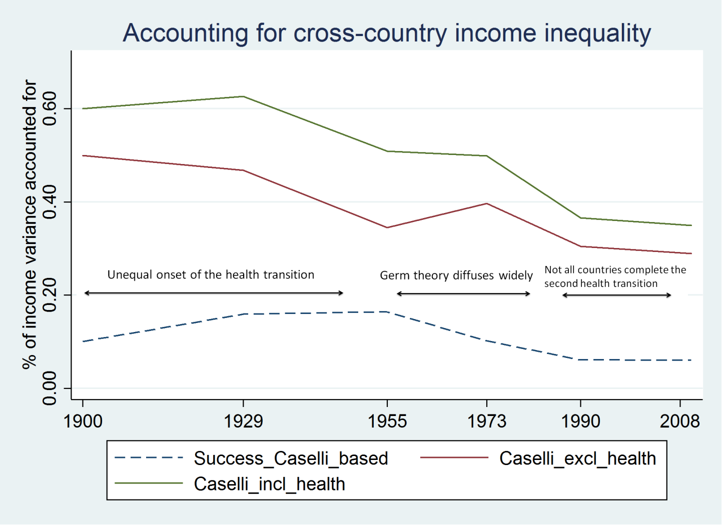
Success measure based on Caselli



Success measure based on Caselli



Success measure based on Klenow and Rodriguez-Claire

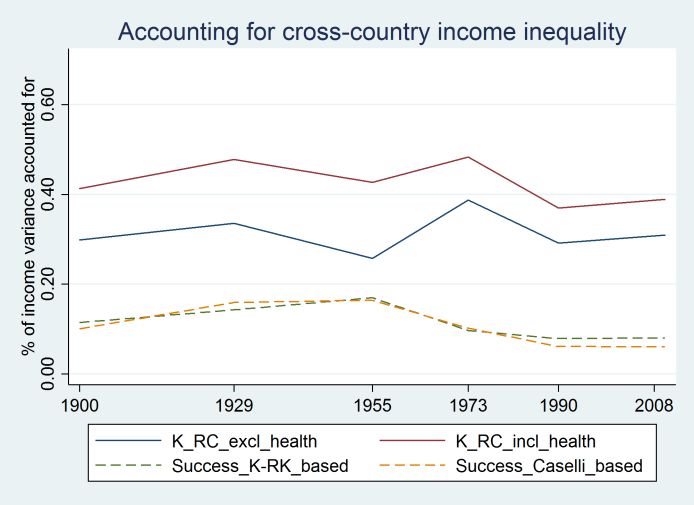
Consider that $y = \frac{K}{Y}^{\frac{\alpha}{1-\alpha}} hA^{\frac{1}{1-\alpha}}$; $y_{kh} = (\frac{K}{Y})^{\frac{\alpha}{1-\alpha}} h$ and $y_{khv} = (\frac{K}{Y})^{\frac{\alpha}{1-\alpha}} hv$:

$$Success_{K-RC\_excl.health} = \frac{var[log(y_{kh})] + cov[log(A), log(y_{kh})]}{var[log(y)]} \quad (6)$$

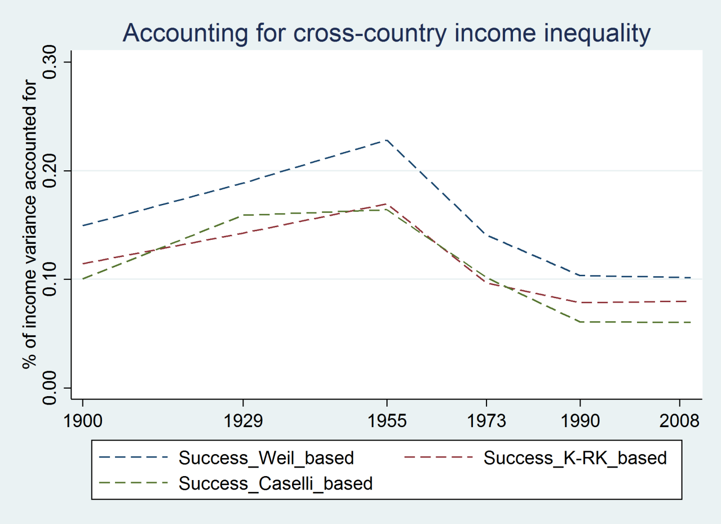
$$Success_{K-RC\_incl.health} = \frac{var[log(y_{khv})] + cov[log(A), log(y_{khv})]}{var[log(y)]} \quad (7)$$

$$Success_{K-RC\_based} = Success_{K-RC\_incl.health} - Success_{K-RC\_excl.health} \quad (8)$$

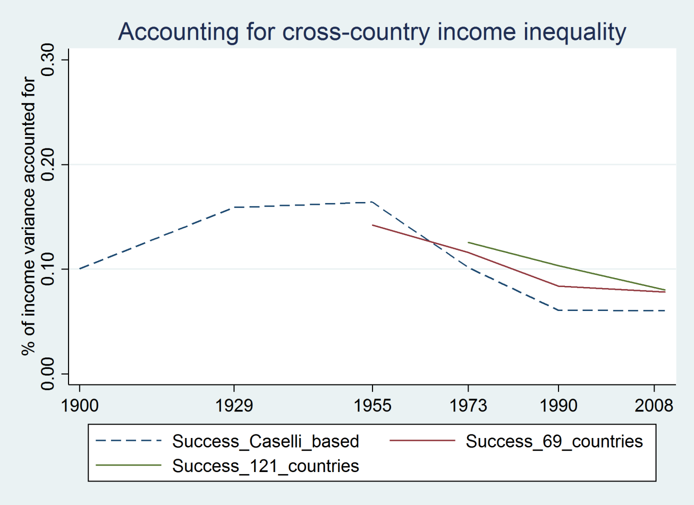
Success measure based on Klenow and Rodriguez-Claire



All success measures



Using larger samples



Using ASR instead of life expectancy

	1955	1973	1990	2008
Benchmark sample				
Caselli-based measure	0.11	0.06	0.04	0.05
K-RC-based measure	0.13	0.07	0.05	0.05
Weil-based measure	0.16	0.09	0.07	0.07
69-country sample				
Caselli-based measure	0.09	0.06	0.06	0.06
K-RC-based measure	0.10	0.06	0.07	0.09
Weil-based measure	0.12	0.08	0.09	0.12
121-country sample				
Caselli-based measure	n.d.	0.07	0.06	0.05
K-RC-based measure	n.d.	0.07	0.07	0.06
Weil-based measure	n.d.	0.10	0.09	0.08

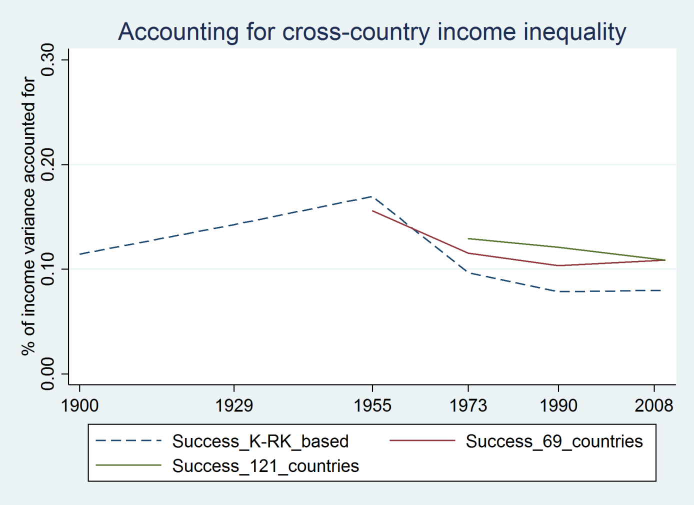
Outline

Conclusions

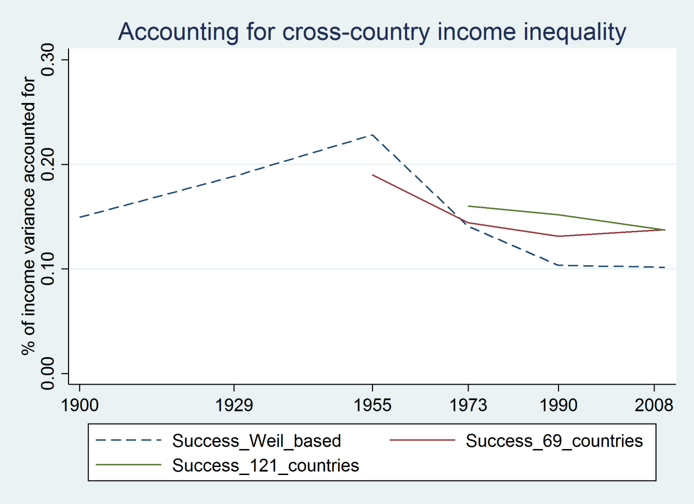
- Analysis of the explanatory power of health in accounting for cross-country income inequality since 1900
- Main findings
  1. The role of health accounting for income differences across countries increases during the period 1900-1950 due to the unequal onset of the health transition
  2. Between 1955 and 1990, the fraction of income variance attributable to health decreases due to significant progress in developing economies
  3. After 1990, cross-country health differences do not decline and the explanatory power of health in accounting for income variance stays constant

Thanks for your attention!

Using larger samples



Using larger samples



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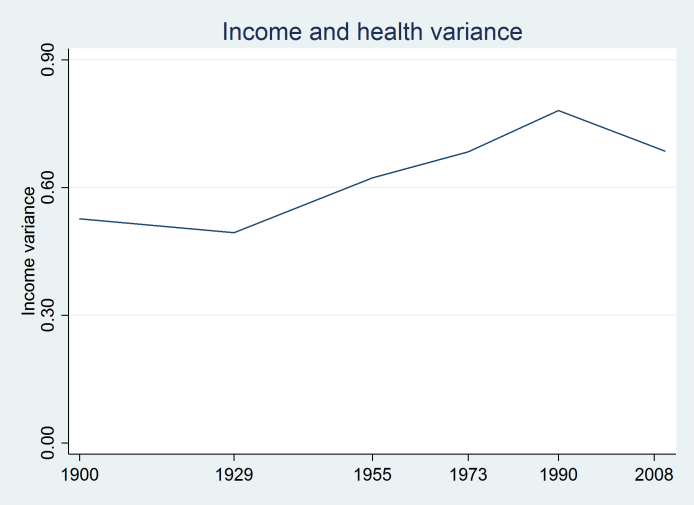

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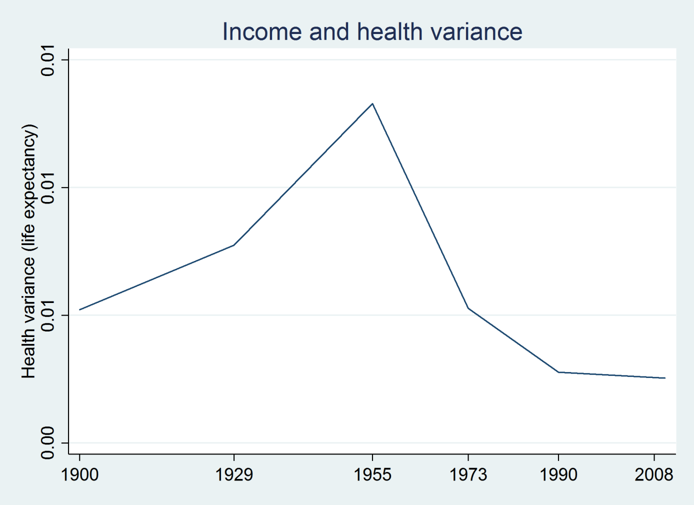

Education and health wage returns

	Schooling (in %)	Height (in %)
Source:		
Psacharopoulos (1994)	13.4, 10.1 & 6.8	
Bleakley et al. (2014)	8.4 & 6.33	0.4-1.2
Schultz (2002)		7-10
Fogel (1994)		7.3
Behrman and Rosenzweig (2004)		3.3
Black et al. (2007)		3.3

Model performance (II)

	1900	1929	1955	1970	2000
PWT 66 (108)					
var y			0.8	0.9 (1)	1.4 (1.8)
var k / var y			20	23 (22)	15 (14)
var h / var y			2	2 (2)	1 (1)
var v / var y			2	1 (1)	0.7 (1)
var h+v / var y			8	6 (6)	3 (4)
var k+h+v / var y			47	48 (48)	30 (30)

Health and productivity (I)

$$I_j = constant + \gamma_I z_j + \epsilon_{I,j} \tag{9}$$

$$ln(v_j) = constant + \gamma_v z_j + \epsilon_{v,j} \tag{10}$$

where I is an observable health outcome (e.g. body height or life expectancy) and z is a latent measure of health.

Health and productivity (II)

Consider two workers (1 and 2) with the same human capital in terms of education but different levels of health.

$$ln(w_2) - ln(w_1) = \gamma_v(z_2 - z_1) \tag{11}$$

$$I_2 - I_1 = \gamma_I(z_2 - z_1) \tag{12}$$

Then, the difference in wages is defined by:

$$ln(w_2) - ln(w_1) = \frac{\gamma_v}{\gamma_I}(I_2 - I_1) \tag{13}$$

Returns to health (I)

$$\frac{\gamma_v}{\gamma_{LE}} = \frac{\gamma_v}{\gamma_{height}} \frac{\gamma_{height}}{\gamma_{LE}} \tag{14}$$

$$height_{i,t} = constant + \gamma_{height} z_{i,t} + \epsilon_{i,t} \tag{15}$$

$$LE_{i,t} = constant + \gamma_{LE} z_{i,t} + \mu_{i,t} \tag{16}$$

Rearrange:

$$height_{i,t} = constant + \frac{\gamma_{height}}{\gamma_{LE}} LE_{i,t} + \epsilon_{i,t} + \frac{\gamma_{height}}{\gamma_{LE}} \mu_{i,t} \tag{17}$$

Returns to health (II)

- Life expectancy
  1. Sample 1: from 1850 onward for 15 countries
  2. Sample 2: decadal data from 1900 to 2000 (up to 95 countries per benchmark)
- Adult Survival Rates
  1. Sample 1: from 1850 onward for 15 countries
  2. Sample 2: decadal data from 1950 to 2000 (up to 87 countries per benchmark)

Choosing a different benchmark

Reduced sample	1955	1960
Variation in:		
var y	0.20	0.17
var k / var y	0.21	0.21
var h / var y	0.034	0.039
var v / var y	0.051	0.054
var h+v / var y	0.122	0.129
var k+h+v / var y	0.585	0.581

Comparison with other studies

Article	% of var (y) accounted for A
Caselli (2005)	40 (1996)
Weil (2007)	48 (1996)
Own results	48 (1955)

Regression coefficient for LE returns (Time Series)

	(1) Height	(2) Height	(3) Height	(4) Height
LE	0.346***	0.337***	0.185***	0.255***
	(30.08)	(53.20)	(6.55)	(10.10)
Year			0.0514***	-0.0310**
			(5.48)	(-2.51)
Year_LE				-0.00152***
				(-8.69)
_cons	152.2***	153.9***	63.29***	222.0***
	(221.30)	(253.92)	(3.82)	(9.65)
City FE	No	Yes	Yes	Yes
TE	No	No	No	No
N	202	202	202	202

Regression coefficient for LE returns (Cross Section)

	(1) Height	(2) Height	(3) Height	(4) Height
LE	0.202***	0.205***	0.208***	0.208***
	(16.99)	(14.97)	(9.95)	(8.77)
Year		-0.00326	-0.00773	-0.0121
		(-0.47)	(-0.31)	(-0.42)
Year_LE			-0.0000861	-0.0000913
			(-0.19)	(-0.16)
_cons	157.9***	164.1***	172.9***	181.4**
	(230.31)	(12.33)	(3.54)	(3.20)
City FE	No	No	No	No
TE	No	No	No	Yes
N	654	654	654	654

Regression coefficient for ASR returns (Time Series)

	(1) Height	(2) Height	(3) Height	(4) Height
ASR	0.0350***	0.0361***	0.0158***	0.0259***
	(23.94)	(48.65)	(5.15)	(9.56)
Year			0.0641***	-0.0689***
			(6.78)	(-4.36)
Year_ASR				-0.000181***
				(-9.63)
_cons	146.2***	146.6***	37.86**	292.9***
	(132.57)	(188.47)	(2.36)	(9.92)
City FE	No	Yes	Yes	Yes
TE	No	No	No	No
N	197	197	197	197

Regression coefficient for ASR returns (Cross section)

	(1)	(2)	(3)	(4)
	Height	Height	Height	Height
ASR	0.0162***	0.0151***	0.0164***	0.0166***
	(10.70)	(9.84)	(6.64)	(6.69)
Year		0.0435***	0.00696	-0.00534
		(3.78)	(0.13)	(-0.10)
Year_ASR			-0.0000536	-0.0000675
			(-0.68)	(-0.84)
_cons	158.7***	73.55**	145.8	169.8
	(149.25)	(3.26)	(1.33)	(1.53)
City FE	No	No	No	No
TE	No	No	No	Yes
N	495	495	495	495