

Are They All Like Bill, Mark, and Steve? The Education Premium for Entrepreneurs

Claudio Michelacci
EIEF

Fabiano Schivardi
Bocconi & EIEF

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Introduction

Two questions:

- 1 **Do entrepreneurs with higher education get higher returns?**
- 2 **How have these differences evolved over time?**

Relation between skill premium of workers and entrepreneurs

The answer is not obvious.....



Quit School

Mark Zuckerberg



Quit School

Steve Jobs



Quit School

Bill Gates



Are They All Like Bill, Mark, and Steve?

- ① Their case is **all but exceptional**: John Rockefeller, Ray Kroc and Walt Disney did not even complete their high school studies.
- ② Many recent entrepreneurs **with postgraduate education**:
 - Sergey Brin and Larry Page, Elon Reeve Musk, Scott McNealy hold Master's degrees
 - The three leading biotechnology companies (Amgen, Gilead Sciences, and Celgene) founded by PhD graduates.
 - Even Peter Thiel who founded a fellowship program to encourage dropouts to startup businesses, holds a Juris Doctor degree from Stanford Law School.

In this paper

- An index to measure the **return from entrepreneurship** using the **Survey of Consumers Finances** over period 1989-2013
Expected yearly income from entrepreneurial venture due to labor income, dividend payments, and realized capital gains
- Issues with index and corrections
- Analyze evolution of return for different **educational groups**
- The **skill premium to post-graduate education** has increased substantially for entrepreneurs
- And particularly so in the **right tail** of the distribution of returns
- Test for possible explanations
- Note: we **do not identify causal effects** of education, just returns to skills *related to* higher education

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An index for the entrepreneurial return

- An infinitely lived, risk-neutral entrepreneur in continuous time τ who can run at most one business in his life.
- Entrepreneur makes **initial investment** k . Entrepreneurial income comes from: l : **labor income**; d : **dividend payments**; (income $y \equiv d + l$); and (realized) **capital gains**.
- The entrepreneur's discount rate is $\rho > r$; r is market rate.
- **With arrival rate** λ , the entrepreneur can sell the business at its market value $M = d/r$.
- The entrepreneur's human capital has value $W = \frac{w}{\rho}$

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Return from entrepreneurship

- The value to the entrepreneur of the business:

$$\rho U = y + \lambda(M + W - U)$$

- The net value of becoming entrepreneur is:

$$S = U - k - W$$

- The **excess return** from entrepreneurship ϕ (**Chisini mean**):

$$\frac{\phi}{\rho + \lambda} = S \quad \text{which yields} \quad \phi = \theta - w$$

where θ is the **total expected return**

$$\theta = d + l + \lambda(M - k) - \rho k$$

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Measurement

- Cross-sectional data in discrete time, $t = 1, 2, 3\dots$ with $t = \frac{\tau}{h}$
- Information on:
 - 1 Market value of business M :
 - 2 Per period income flow y (dividends dh plus labor income lh)
 - 3 Discretized age of (current) entrepreneurial experience t
 - 4 Initial investment k of the entrepreneur
 - 5 Exit rate λ is calculated using inflows and outflows
- The **total return from entrepreneurship** θ is measured by

$$\tilde{\theta} = d + l + \tilde{\lambda} (M - k) - \left[R(0, ht)^{\frac{1}{ht}} - 1 \right] k$$

Three extensions

- ① **Valuation bias:** Business fail, so $\lambda \equiv \delta + \mu$. Excess return is $\phi_v = \theta_v - w$ where

$$\theta_v = d + l + \lambda [\mathbb{E}_x(V) - k] - \rho k$$

- ② **Composition bias:** Heterogeneity in λ (due to μ or δ)

$$\theta^* = \sum_{i=1}^N \alpha_i \theta_i \quad \text{but we observe} \quad \tilde{\theta}^* = \sum_{i=1}^N \sigma_i \theta_i$$

where

$$\sigma_i = \frac{\frac{\alpha_i}{\lambda_i}}{\sum_{j=1}^n \frac{\alpha_j}{\lambda_j}}$$

- ③ **Recycling bias:** With probability ν they can recycle their entrepreneurial skills into a new venture. So $\phi_r = \varphi(\nu)\phi$ where

$$\varphi(\nu) = \frac{\rho + \lambda}{\rho + \lambda(1 - \nu)}$$

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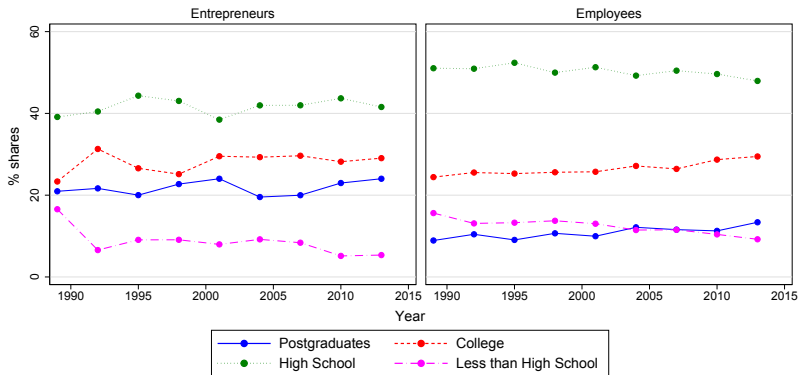
Key cross-sectional data from Survey of Consumer Finances

- **Entrepreneur:** An individual who, as a main job, **owns business** [X3103], which is **actively managed** [X3104]
- **Labour income:** “Earnings in main job” [X4112]
- **Dividend payments:** “Earnings from the business in addition to regular salary” [X4131]
- **Initial Investment:** “Original investment or value when received it (cost basis for tax purposes)” [X3130]
- **Firm’s value:** “What is the net worth of (your share of) this business?; Probe: If Respondent says the business is worth nothing, this is the cost to buy a similar asset” [X3129]
- **Firm age:** Current date minus date of initial investment
- **Entrepreneur’s opportunity cost of capital:** Real value of the S&P500 Total Return Index (with dividend payments)
- **Entry flows into entrepreneurship:** Census data from LBD

Survey of Consumer Finances (SCF)

- Representative triennial cross-sectional survey of around 4,000 households (6,000 in the last two waves)
- Period: 1989-2013
- Focus on head of household
- All statistics are weighted
- Multiple imputates to deal with measurement error

Educational attainments of employees and entrepreneurs

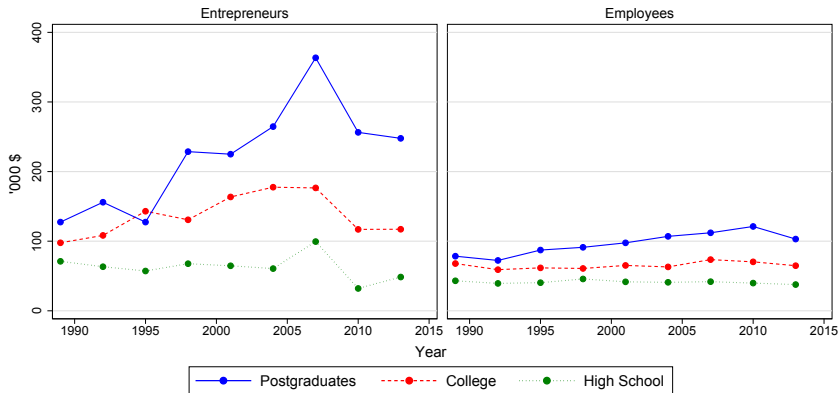


Descriptive stats: entrepreneurs by educational groups

Variable	High school graduates		College graduates		Postgraduates	
	mean	sd	mean	sd	mean	sd
θ	62.24	532.00	138.94	916.64	229.16	1059.82
d	35.84	264.38	71.61	453.27	146.45	605.93
l	26.20	59.13	50.32	146.41	79.77	217.40
M	532.48	3603.50	1149.18	6324.73	1274.85	7359.26
k	301.90	3349.39	551.25	6017.42	634.33	6086.35
$\lambda(M - k)$	19.36	317.67	52.54	488.33	44.63	500.13
$\lambda(M - k) - \rho k$	0.21	445.16	17.01	727.53	2.95	741.56
Unlimited liability	0.70	0.46	0.52	0.50	0.54	0.50
Agriculture	0.07	0.26	0.03	0.17	0.02	0.13
Mining and Construction	0.29	0.45	0.13	0.34	0.02	0.15
Manufacturing	0.09	0.29	0.09	0.29	0.04	0.20
Trade	0.16	0.37	0.19	0.39	0.07	0.25
Finance and Services	0.17	0.37	0.25	0.43	0.14	0.35
Transportation, Commun and Utilities	0.21	0.41	0.31	0.46	0.71	0.46

Note: Pooled SCF data over 1989-2013 period. Constant 2010 prices.

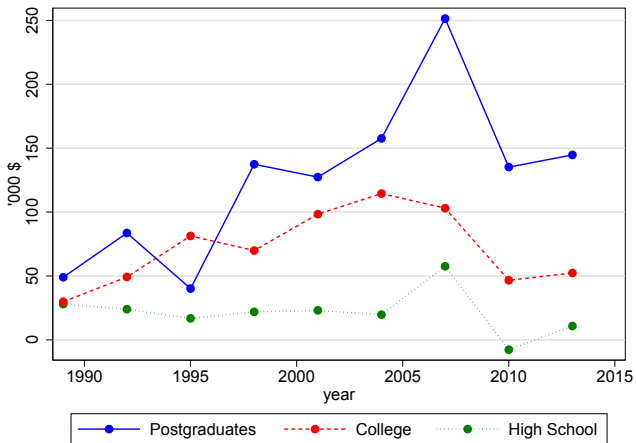
Return of Entrepreneurs θ and Employees w



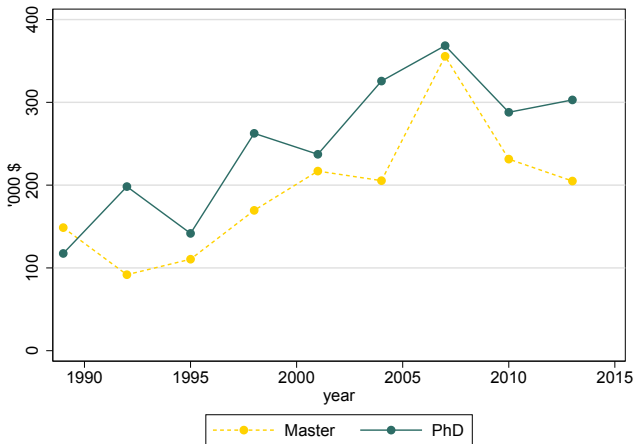
Time profile of returns by education

- Stable for high school graduates
- Similar in the beginning for college and post graduate, but now postgraduates earn 100,000\$ more than collage graduates
- Education premium has increased for employees as well, but less than for entrepreneurs
- Similar evolution for entrepreneurs with Master's (MA, MS, MBA) and those with PhD, MD, JD

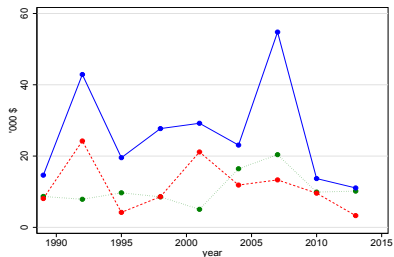
Excess Returns: $\phi = \theta - w$



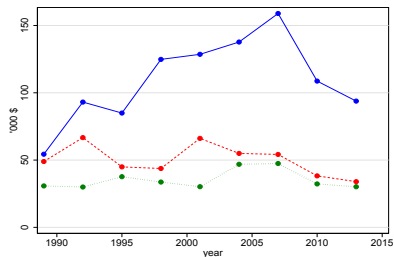
Entrepreneurs returns θ , Master's vs PhD



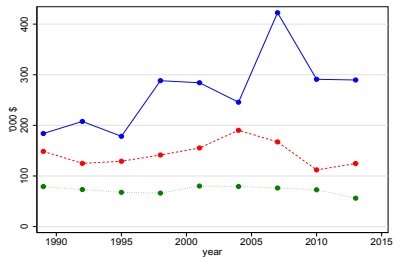
Total returns θ at different percentiles of the return distribution



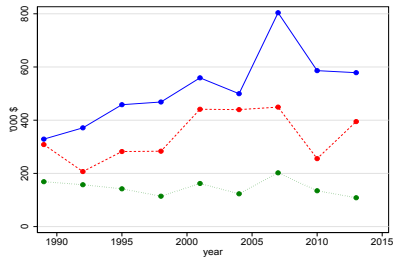
(a) p25



(b) p50



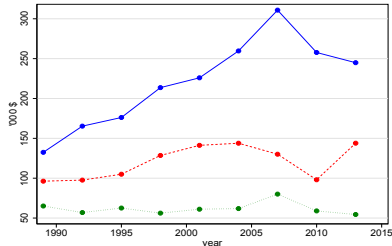
(c) p75



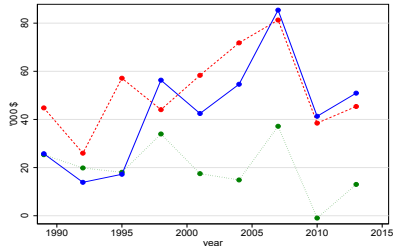
(d) p90

See regressions

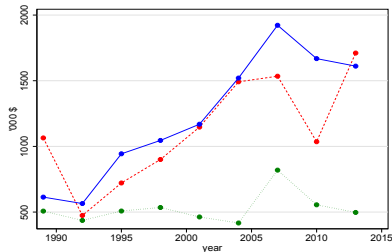
Decomposition of θ over time



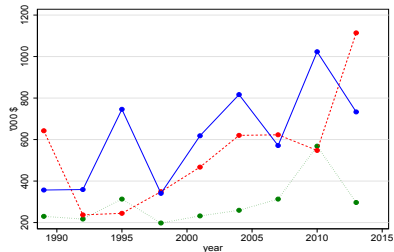
(a) Income, y



(b) GCG, $\lambda(M - k)$



(c) Business Value, M



(d) Initial investment, k

See Exit Rate λ and Net Capital Gains $\lambda(M - k) - \rho k$

Decomposition of total returns

- **Dividends plus labor income** drive most of the differences
- Both the **value of the business** and of **initial investment** increase for college and postgraduates, stable for no college
- Value upon exit is substantial
- Smaller effects of **gross capital gains** and **net capital gains**, also because **exit rate** has decreased

Regression analysis

- We check for statistical significance of the effects and investigate their potential sources
- Run:

$$\theta_{it} = \text{College}_{it} + \text{PostGR}_{it} + \text{Post}_{2000} + \text{Post}_{2000} \times \text{College}_{it} + \\ + \text{Post}_{2000} \times \text{PostGr}_{it} + \text{Controls}_{it} + \epsilon_{it}$$

- Also run with **time trends** and with **year dummies** interacted with education dummies
- Results extremely robust
- Increase not present at the **25th percentiles**, **stronger at higher percentiles**

Regression analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	θ	ϕ	$d+l$	M	k	GCG	NCG
College	56.2*** (12.7)	36.2*** (12.6)	50.4*** (8.3)	318.7*** (82.5)	154.9** (62.5)	18.2*** (7.0)	5.8 (9.3)
Postgraduates	94.4*** (17.2)	54.3*** (17.1)	107.3*** (10.7)	175.2* (100.2)	115.0 (91.6)	1.4 (9.3)	-12.9 (15.3)
College \times Post	26.8 (16.7)	19.5 (16.6)	11.8 (10.0)	477.8*** (115.5)	169.8* (92.9)	22.9** (9.8)	14.9 (13.3)
Postgraduates \times Post	112.7*** (24.2)	84.6*** (24.1)	82.7*** (16.8)	737.6*** (134.8)	216.6* (120.6)	34.5*** (11.6)	30.0* (18.2)
Age	16.7*** (2.6)	16.7*** (2.6)	10.3*** (1.0)	36.3*** (13.9)	-25.9 (18.8)	4.7*** (1.5)	6.4*** (2.3)
Age ²	-0.2*** (0.0)	-0.2*** (0.0)	-0.1*** (0.0)	-0.1 (0.1)	0.5** (0.2)	-0.0*** (0.0)	-0.1*** (0.0)
Female	-49.0*** (10.6)	-48.6*** (10.5)	-44.1*** (8.2)	-435.8*** (67.2)	-201.0*** (52.2)	-18.1*** (4.5)	-4.9 (6.3)
White	33.3*** (9.5)	33.2*** (9.5)	31.5*** (6.3)	161.2** (72.1)	86.4* (46.6)	6.0 (4.9)	1.8 (6.6)
Married	27.8*** (10.3)	28.2*** (10.3)	34.7*** (6.7)	354.1*** (63.6)	249.0*** (50.8)	9.1* (4.9)	-6.8 (6.7)
Obs.	7,250	7,250	7,250	7,250	7,250	7,250	7,250
H_0 : College \times Post = Postgrad \times Post							
F-stat	12.680	7.330	14.680	3.215	0.161	0.978	0.701
P-value	0.000	0.007	0.000	0.073	0.688	0.323	0.402

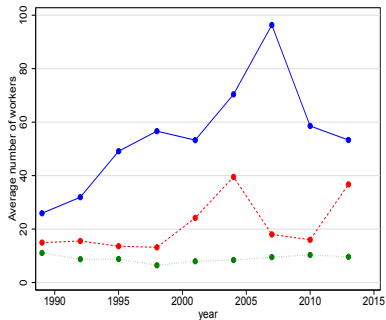
What explains the increase in returns to education?

- Increased not fully explained by:
 - ① **Valuation** *see*, **composition** *see*, and **recycling biases** *see*
 - ② **Sectoral composition**: sector dummies interacted with time dummies, *see* **regression** and **pattern**
 - ③ **Vintage effects**: cohort dummies at start-up date interacted with education dummies *see*
 - ④ **Financial constraints**: collateral dummies *see* and changes in dividends age profiles *see*
 - ⑤ **Intergenerational transmission of businesses**: *see*
 - ⑥ **Span of control**: firm employment size and number of business *see* **picture** and **regression**
 - ⑦ **Risk**: legal form *see*
- **We conclude** that more sophisticated skills associated with higher education **embodied in entrepreneur** have become increasingly important

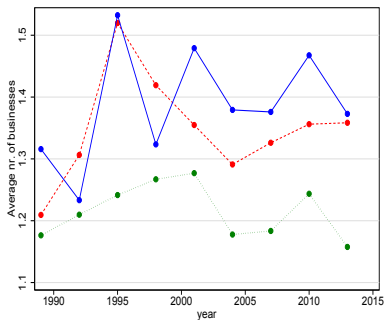
What explains the increase in returns to education?

- Increased not fully explained by:
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Span of Control



(a) Employment size



(b) Number of businesses

Summing up

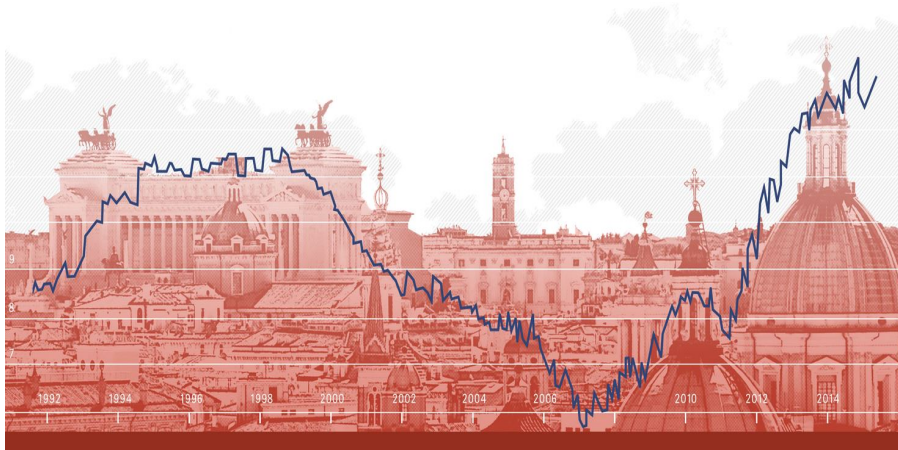
- The **return to postgraduate** education has increased for entrepreneurs: “Mark, Bill and Steve” have been exceptional
- Today an entrepreneur with a postgraduate degree earns **100k\$** more than one with a college degree, up from basically zero in the late eighties
- Education advantage comes from general effect of **entrepreneurial skills embodied in entrepreneur**, rather than specific channels (sectoral composition, vintage effects, access to finance...)
- We do not account for **selection**. But evidence suggest that skills of highly educated people have become more important
- There might be some indication that entrepreneurial skills associated with higher education have become **scarcer**. Why?

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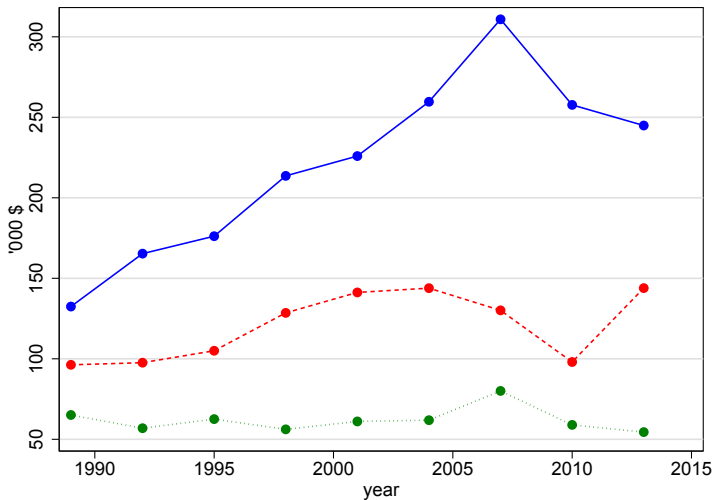
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Quantile Regressions

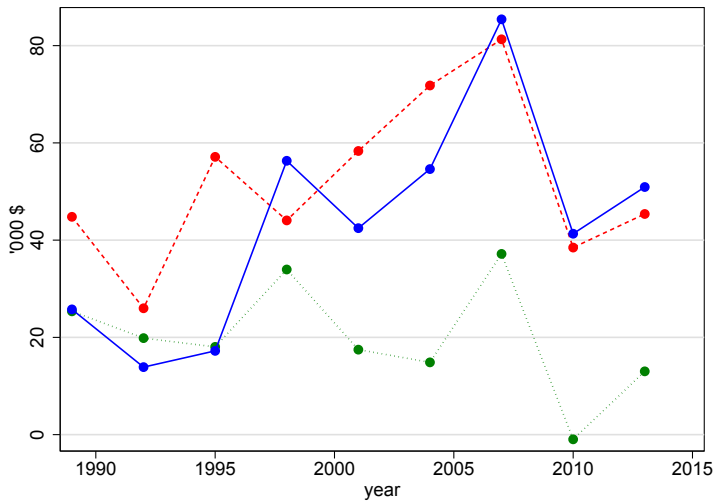
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	θ	ϕ	$d + l$	M	k	GCG	NCG
Panel A: Pre-Post specification							
25th pct							
College \times Post	-3.2 (4.4)	-5.6 (4.3)	-1.7 (5.0)	6.4 (5.3)	2.0 (1.7)	-0.1 (0.2)	-1.2 (1.0)
Postgrad \times Post	-8.7 (6.6)	-14.8** (7.0)	-8.6 (7.4)	13.9 (9.8)	1.3 (1.5)	0.0 (0.3)	3.7 (4.6)
50th pct							
College \times Post	-4.5 (6.5)	-10.0 (6.8)	2.6 (5.5)	35.6 (25.6)	16.5** (6.6)	-0.1 (1.0)	-0.6 (0.4)
Postgrad \times Post	32.6*** (12.6)	15.9 (11.8)	32.0** (13.0)	59.3* (34.7)	16.5 (13.6)	1.1 (1.0)	0.2 (0.5)
75th pct							
College \times Post	6.7 (16.0)	-1.9 (16.0)	9.6 (12.8)	86.7 (86.1)	71.2** (31.8)	0.9 (8.0)	0.0 (5.2)
Postgrad \times Post	66.1*** (25.1)	36.0 (22.5)	51.3** (21.1)	399.0*** (86.9)	141.2*** (52.6)	6.8 (4.3)	4.2 (4.2)
90th pct							
College \times Post	131.9*** (50.0)	117.7** (51.9)	42.4 (36.1)	1,452.4*** (355.0)	336.0** (169.7)	28.4 (26.9)	10.7 (24.9)
Postgrad \times Post	183.4*** (54.1)	128.6** (52.0)	153.2*** (52.7)	1,715.7*** (367.1)	566.0*** (137.4)	47.7** (22.5)	40.5** (16.6)

Dividends plus labor income



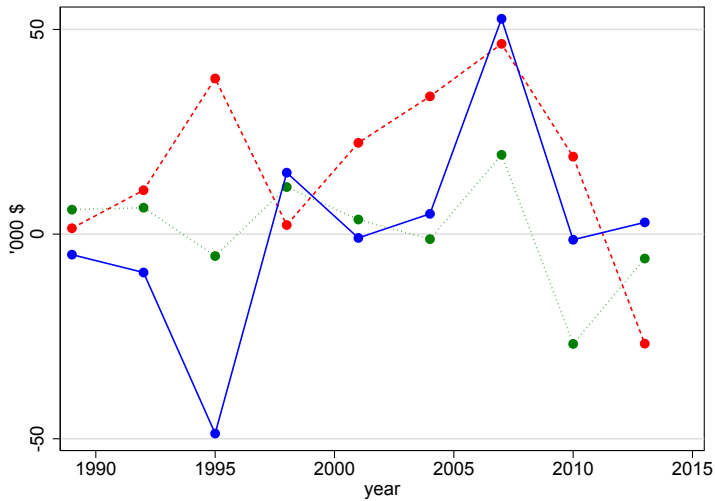
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Gross capital gains

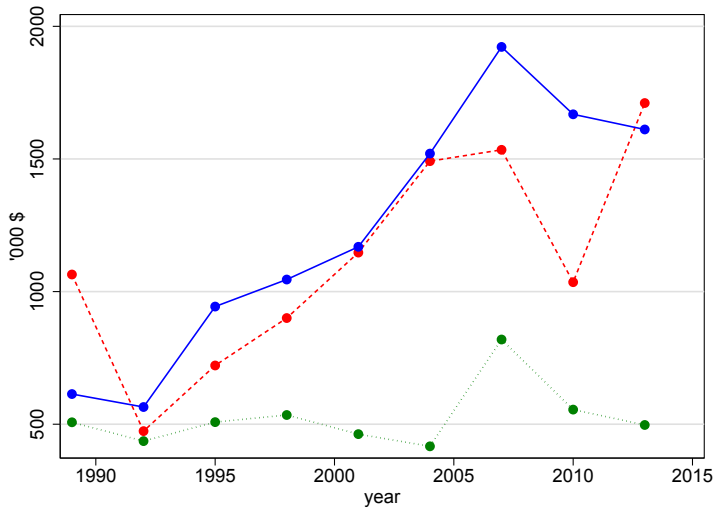


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Net capital gains

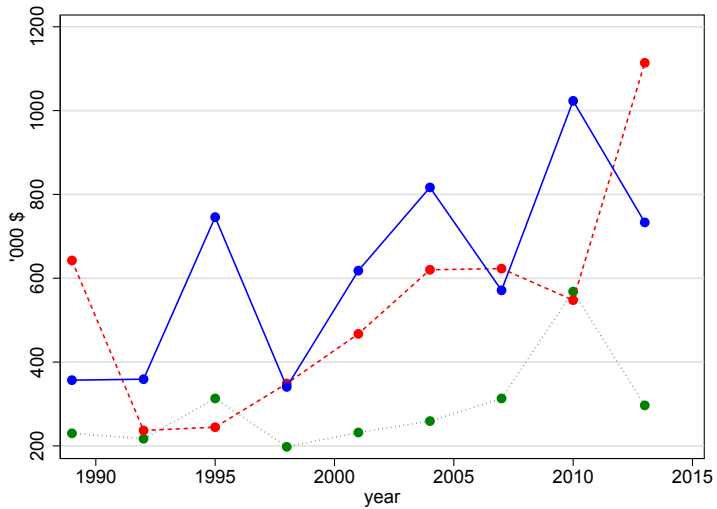


Value of business

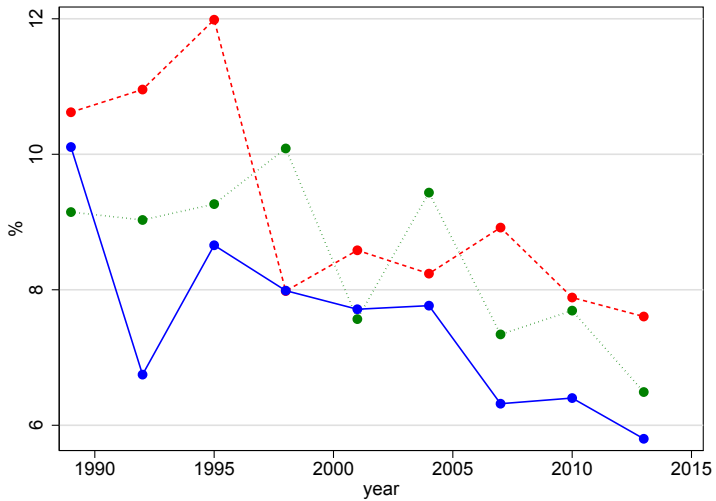


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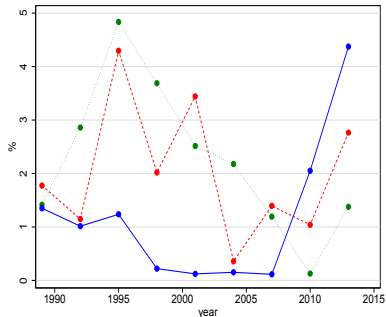
Initial investment

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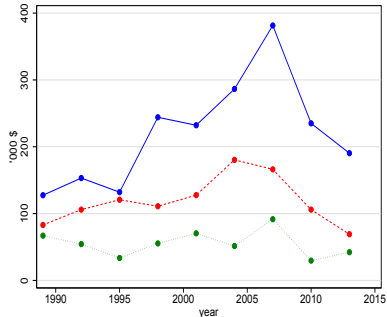
Exit rate λ



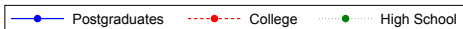
Valuation bias



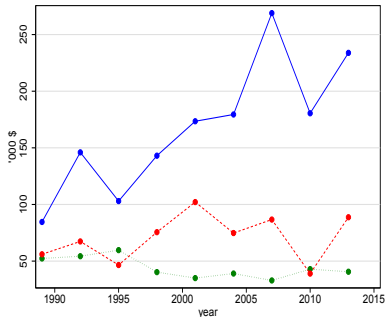
(a) Failure rates



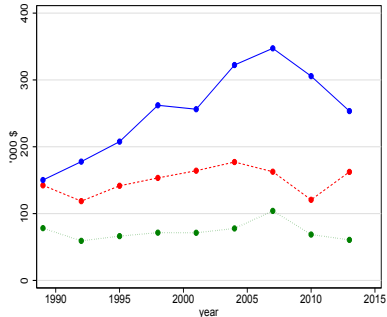
(b) Returns, θ_v



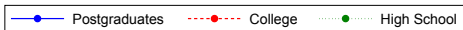
Composition bias



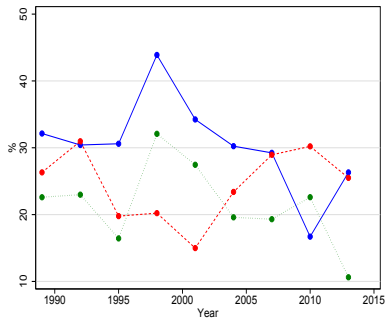
(a) Within 5 years since start



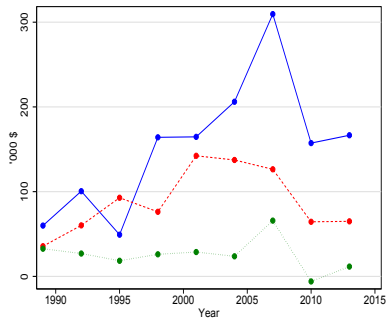
(b) More than 5 years since start



Recycling bias



(a) Recycling probability ν



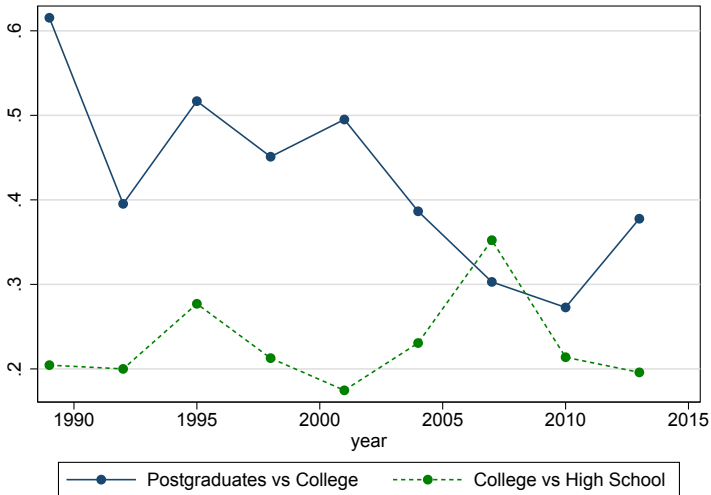
(b) Excess return, ϕ_r



Sectoral specialization and skill premium

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	θ	ϕ	$d + l$	M	k	GCG	NCG
College	52.9*** (13.7)	32.9** (13.6)	48.4*** (8.5)	296.6*** (85.9)	148.9** (69.1)	16.5** (7.8)	4.5 (10.6)
Postgraduate	93.6*** (16.6)	53.4*** (16.4)	97.6*** (12.0)	350.6*** (117.0)	153.3* (87.2)	13.7 (9.0)	-4.0 (13.1)
College \times Post	22.2 (18.3)	15.0 (18.3)	6.5 (10.2)	508.2*** (121.7)	182.6* (105.4)	24.6** (10.9)	15.7 (15.2)
Postgraduate \times Post	107.6*** (24.1)	79.6*** (23.9)	87.4*** (18.2)	865.4*** (158.7)	354.7*** (121.3)	31.1*** (11.8)	20.3 (16.9)
Agriculture \times Post	7.3 (38.2)	7.5 (38.2)	-32.3* (19.2)	-364.8** (161.8)	-384.8* (226.2)	8.9 (17.5)	39.6 (34.1)
Manufacturing \times Post	-38.2 (34.0)	-38.7 (34.0)	-4.7 (21.7)	-146.5 (252.7)	69.0 (134.3)	-29.1 (19.6)	-33.4 (21.7)
Trade \times Post	-26.7 (29.0)	-27.1 (29.0)	4.8 (11.7)	-77.8 (184.3)	169.9 (213.1)	-22.5 (17.5)	-31.5 (26.7)
Finance \times Post	55.9** (24.8)	55.2** (24.8)	52.8*** (13.8)	452.5*** (159.0)	255.8* (146.1)	10.6 (12.6)	3.1 (19.5)
TCU \times Post	-2.4 (21.0)	-2.8 (21.0)	-12.0 (12.5)	-391.0*** (134.5)	-286.9*** (108.1)	-4.9 (10.6)	9.6 (14.7)
Agriculture	-39.3 (32.5)	-39.4 (32.6)	12.3 (15.3)	69.5 (125.7)	279.0 (206.3)	-21.5 (14.5)	-51.6* (30.4)
Manufacturing	99.5*** (24.5)	100.1*** (24.4)	41.4*** (14.6)	658.2*** (180.8)	23.7 (87.1)	61.7*** (15.4)	58.0*** (16.9)
Trade	21.1 (16.2)	21.2 (16.1)	5.9 (8.2)	284.7** (115.5)	70.9 (95.0)	20.3* (10.7)	15.2 (14.5)
Finance	14.8 (15.8)	15.0 (15.8)	13.4 (9.0)	276.1*** (85.6)	131.2 (91.4)	14.2* (8.3)	1.5 (13.0)
TCU	20.3 (15.9)	20.5 (15.9)	29.0*** (9.0)	-133.9 (94.1)	-14.1 (79.1)	-10.0 (8.0)	-8.7 (11.4)

Differences in patterns of sectoral specialization $S(e_1, e_2)$



Financial constraints and the age profile of dividends

	(1)	(2)	(3)	(4)	(5)
	$d + l$	M	θ	d	$\frac{d}{M}$
College	23.4** (11.9)	100.3 (150.2)	54.1** (25.5)	11.3 (10.6)	-11.2 (8.5)
Postgraduate	104.9*** (14.9)	583.2*** (132.0)	96.0*** (23.5)	60.2*** (11.4)	-11.7 (8.3)
College \times Post	36.9** (14.9)	277.2 (199.7)	21.7 (31.3)	18.5 (12.4)	17.3 (15.5)
Postgraduate \times Post	72.9*** (21.6)	165.8 (192.6)	111.2*** (33.0)	56.0*** (17.0)	11.8 (7.8)
Age \times College	2.7** (1.1)	24.5 (17.8)	0.4 (2.9)	1.7** (0.8)	0.2 (0.2)
Age \times Postgrad	0.3 (0.9)	-30.7*** (11.7)	-0.3 (1.7)	0.5 (0.7)	0.2 (0.2)
Age \times College \times Post	-2.4** (1.1)	7.9 (19.3)	0.1 (3.3)	-1.1 (0.9)	-0.4 (0.5)
Age \times Postgrad \times Post	0.8 (1.2)	46.3*** (14.1)	0.4 (2.6)	0.8 (1.0)	-0.1 (0.2)
Age \times Post	0.8 (0.5)	-21.7** (10.1)	-2.3 (2.0)	0.7 (0.5)	0.2 (0.1)
Age	1.7*** (0.4)	40.2*** (9.3)	2.0 (1.3)	0.9** (0.4)	-0.2 (0.1)

Some explanations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	θ	ϕ	$d + l$	M	k	GCG	NCG
Panel A: Vintage Effects							
College \times Post	21.2 (21.4)	14.3 (21.4)	13.6 (11.4)	686.3*** (144.3)	326.1** (133.1)	28.5** (12.9)	7.6 (18.1)
Postgrad \times Post	110.1*** (29.6)	84.1*** (29.6)	97.5*** (19.6)	842.2*** (156.5)	375.3** (165.6)	31.8** (14.6)	12.7 (23.2)
Panel C: Collateral							
College \times Post	30.7* (17.8)	23.4 (17.8)	8.0 (9.8)	373.7*** (109.4)	63.8 (96.5)	23.3** (10.0)	22.7 (14.1)
Postgrad \times Post	115.2*** (24.4)	87.0*** (24.3)	80.3*** (16.7)	672.7*** (132.8)	150.2 (118.4)	34.8*** (11.6)	34.9* (18.0)
Collateral dummy	29.1 (19.9)	29.1 (19.9)	0.0 (7.4)	308.6*** (82.9)	9.0 (117.3)	26.1*** (9.2)	29.0* (17.2)
Value of collateral	-0.0 (0.0)	-0.0 (0.0)	0.0*** (0.0)	0.9*** (0.1)	0.8*** (0.2)	0.0 (0.0)	-0.0* (0.0)
Panel D: Legal Form							
College \times Post	23.7 (16.7)	16.5 (16.7)	9.7 (10.0)	439.1*** (112.7)	153.5* (93.2)	21.1** (9.7)	14.1 (13.3)
Postgrad \times Post	106.5*** (24.3)	78.4*** (24.2)	78.2*** (16.8)	658.1*** (137.2)	183.1 (123.0)	30.8*** (11.7)	28.3 (18.3)
Unlimited Liability	-86.0***	-85.8***	-62.0***	-1,103.6***	-464.0***	-52.0***	-23.9***
Panel E: Inherited							
College \times Post	27.6* (16.7)	20.3 (16.6)	12.5 (9.9)	494.3*** (112.8)	177.3* (92.7)	23.7** (9.7)	15.1 (13.3)
Postgrad \times Post	111.8*** (24.1)	83.6*** (24.0)	82.0*** (16.6)	719.5*** (132.5)	208.3* (119.3)	33.7*** (11.6)	29.8 (18.1)
Business inherited?	44.6 (28.1)	44.7 (28.0)	34.6* (17.9)	862.9*** (184.3)	392.0*** (120.3)	37.9*** (13.3)	10.0 (17.6)

Span of control

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	θ	ϕ	$d + l$	M	k	GCG	NCG
College \times Post	22.3 (16.9)	15.0 (16.9)	8.8 (10.0)	475.5*** (119.1)	179.8* (92.6)	22.0** (10.0)	13.5 (13.4)
Postgrad \times Post	98.4*** (24.2)	70.3*** (24.2)	69.4*** (16.0)	510.6*** (141.3)	92.1 (123.3)	26.0** (12.0)	29.1 (18.5)
Employment	0.5*** (0.1)	0.5*** (0.1)	0.4*** (0.1)	4.4*** (1.0)	1.7*** (0.4)	0.2*** (0.1)	0.1 (0.1)
Nr. of businesses	15.6 (11.4)	15.6 (11.4)	32.0*** (4.8)	1,344.4*** (118.9)	915.8*** (98.6)	36.2*** (6.9)	-16.4 (10.1)