Innovation and Top Income Inequality

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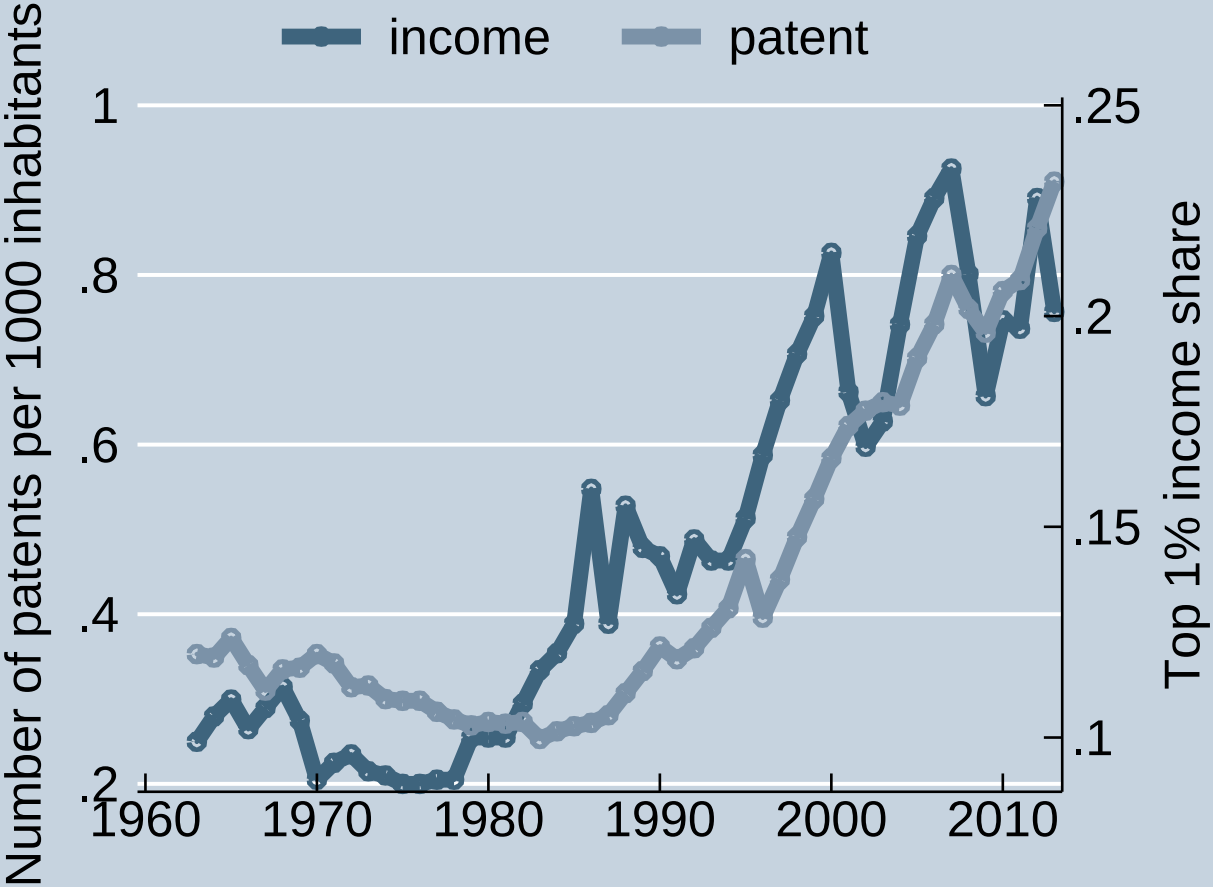
Introduction

- Past decades have witnessed a sharp increase in top income inequality worldwide and particularly in developed countries
- However no consensus has been reached as to the main underlying factors behind this surge in top income inequality
- In this presentation we argue that innovation is certainly one such factor and that it also affects social mobility

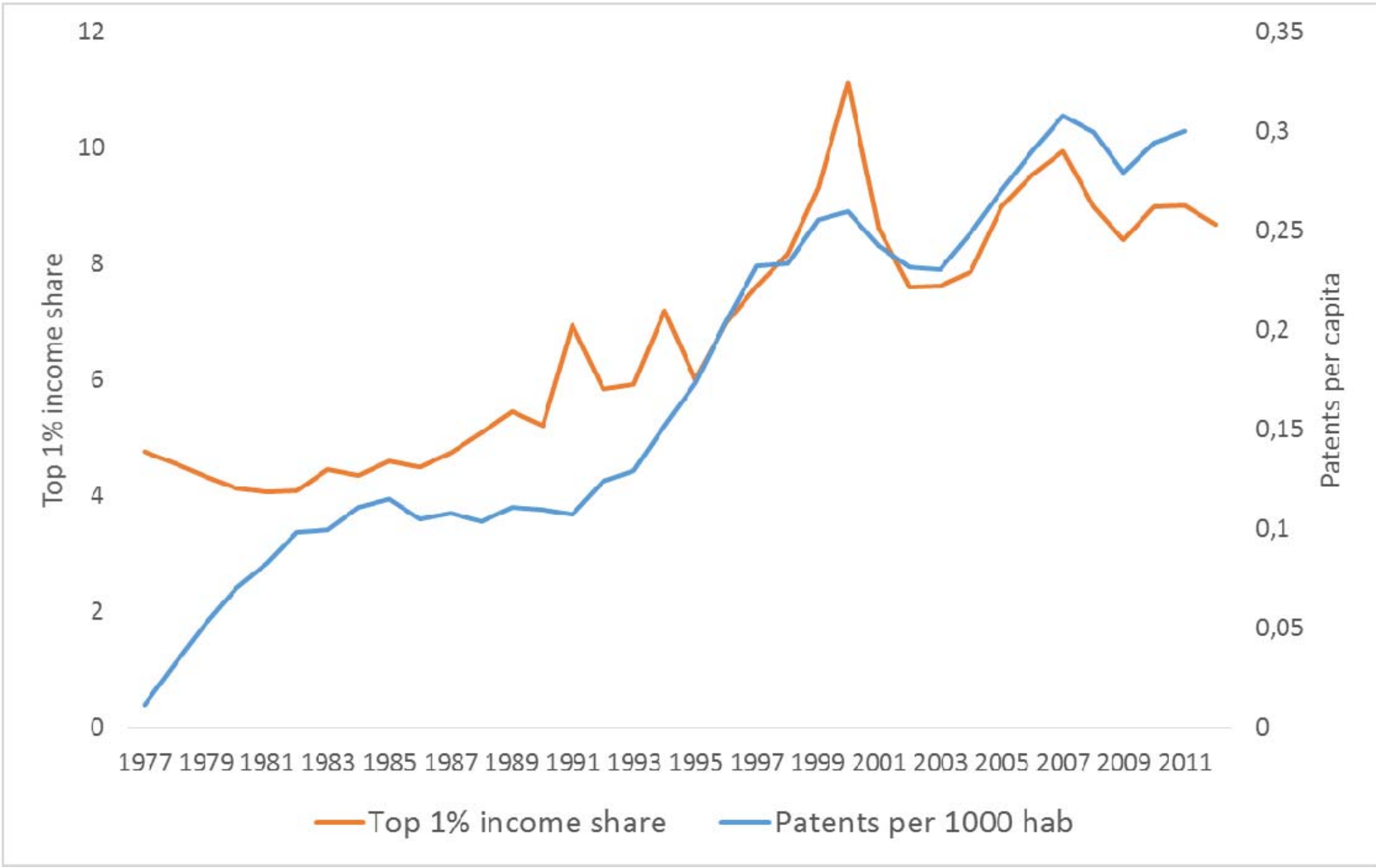
Top Income Share and Patenting

United States, 1963-2013

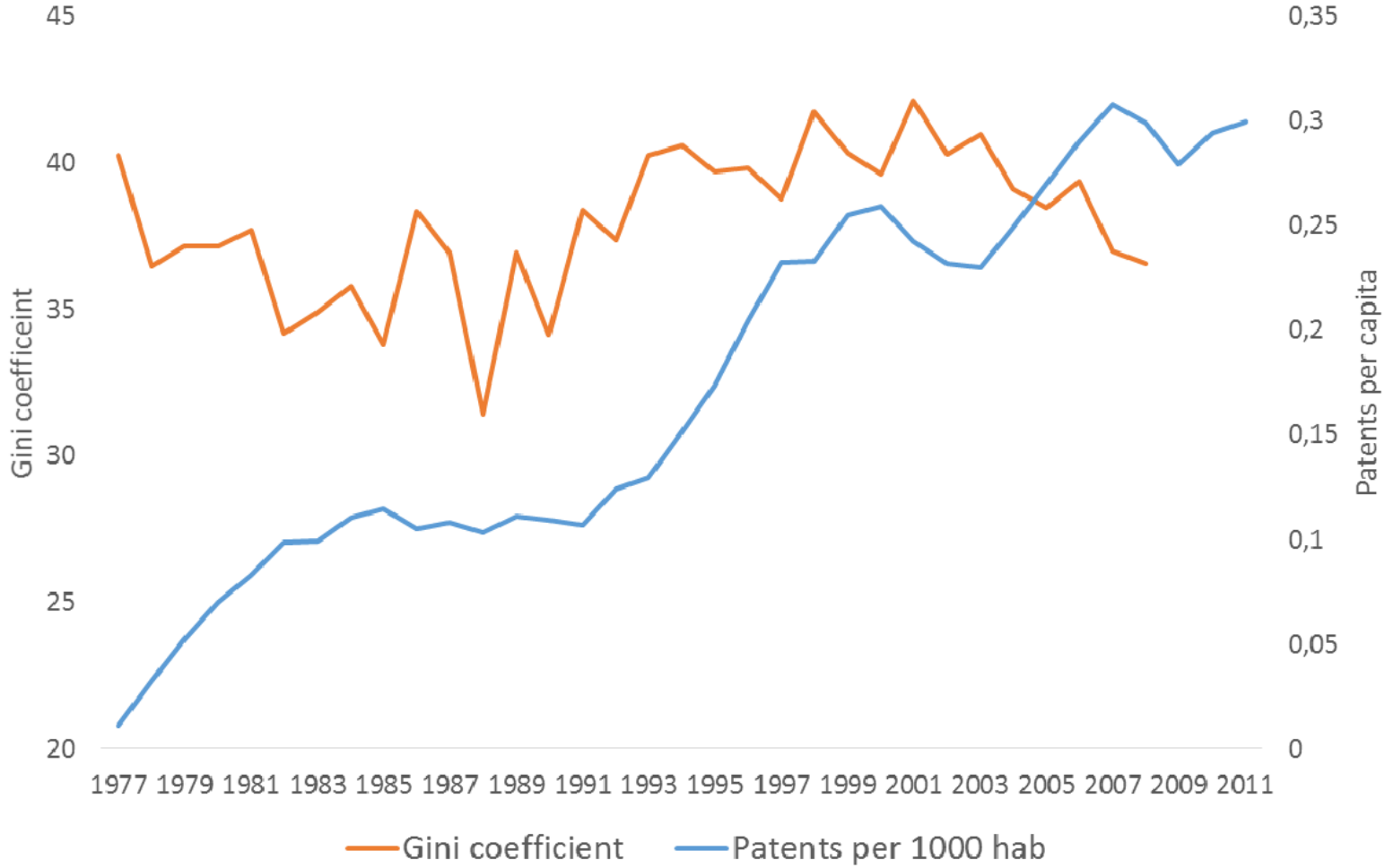


Source: Aghion et. al. (2015).

Top 1% income share VS innovation



Gini coefficient VS innovation



Theory and predictions (1)

- Simple Schumpeterian growth model where:
  1. Growth results from quality-improving innovations by incumbents and potential entrants.
  2. Innovations allow firms to increase their mark-ups, while reducing their labor demand

  $\longrightarrow$ **Prediction 1**: *Innovation increases the entrepreneurial share of income at the expense of workers' share*
- Incumbents can block entrant innovations through lobbying
  $\longrightarrow$ **Prediction 2**: *Entrant innovation increases top income inequality, but less so in high-lobbying states*

Theory and predictions (2)

- A successful entrant replace the incumbent who inherited a firm from her parent
  $\longrightarrow$ then the incumbent becomes a worker and the entrant becomes an entrepreneur
  $\longrightarrow$ **Prediction 3**: *Entrant innovation enhances social mobility but less so in high-lobbying states*

Empirical strategy

- Our core empirical analysis is carried out at the US state level
- Our dataset covers the period 1975-2010, a time range imposed upon us by the availability of patent data
- Regressing top income inequality on innovativeness:

$$\log(y_{it}) = A + B_i + B_t + \beta_1 \log(innov_{i(t-1)}) + \beta_2 X_{it} + \varepsilon_{it}$$

Inequality data

- Data on share of income owned by the top 1% and the top 10% of income distribution are drawn from the US State-Level Income Inequality Database (Frank, 2009).

Innovation data

- The US patent office (USPTO) provides complete statistics for patents granted between the years 1975 and 2010.
  - Information on the state of residence of the patent inventor, the date of application of the patent and a link to every citing patents granted before 2010.
  - We correct for truncation bias in patent count and patent citations following Jaffe, Hall and Trajtenberg (2001).
- We use several measure of innovativeness
  1. *number of patents*
  2. *3, 4 and 5 year windows citations counter*
  3. *is the patent among the 5% most cited in the year by 2010?*
  4. *total corrected citation counter*
  5. *has the patent been renewed?*

Control variables

- Output gap to control for the business cycle
- Share of state GDP accounted for by the financial sector
- Size of the government sector
- GDP per capita
- Growth of total population

OLS regressions: top 1% and innovation

Measure of Inequality Innovation	**(1)** Top 1% patent_pc	**(2)** Top 1% 3YWindow	**(3)** Top 1 % 4YWindow	**(4)** Top 1% 5YWindow	**(5)** Top 1% Citations	**(6)** Top 1% Share5	**(7)** Top 1% Renew
Innovation	0.027*	0.029***	0.042***	0.041***	0.048***	0.024***	0.032***
	(1.89)	(3.47)	(4.58)	(4.24)	(5.78)	(4.84)	(3.15)
Gdppc	-0.060	-0.062	-0.068	-0.055	-0.091*	-0.067	-0.144**
	(-0.52)	(-1.13)	(-1.21)	(-0.94)	(-1.66)	(-1.25)	(-2.06)
Popgrowth	0.280	0.450	0.024	-0.174	0.068	0.007	1.018
	(0.37)	(0.71)	(0.04)	(-0.24)	(0.10)	(0.01)	(1.36)
Sharefinance	0.013	0.020	0.024*	0.026*	0.024*	0.022*	0.018
	(0.57)	(1.48)	(1.74)	(1.76)	(1.87)	(1.72)	(1.28)
Outputgap	-1.954	-2.648**	-2.302	-2.143	-2.115	-2.149	-3.308**
	(-1.37)	(-2.01)	(-1.64)	(-1.46)	(-1.53)	(-1.53)	(-1.98)
Gvtsize	-0.070	-0.091**	-0.109**	-0.139***	-0.090**	-0.098**	-0.058
	(-0.76)	(-2.13)	(-2.51)	(-3.09)	(-2.16)	(-2.32)	(-1.14)
R^2	0.920	0.922	0.916	0.908	0.921	0.921	0.885
N	1785	1632	1581	1530	1632	1632	1435

Instrumentation

First instrument

- Following Aghion et al (2004), we consider the time-varying State composition of the appropriation committees of the Senate and the House of Representatives.
- A Committee member often push towards subsidizing research education in her State, in order to increase her chances of reelection in that State.
  $\longrightarrow$ a state with one of its congressmen seating on the committee is likely to receive more funding for research education, which should increase its innovativeness in following years

IV regressions with first instrument (Appropriation Committee)

	(1)	(2)	(3)	(4)	(5)	(6)
Measure of Inequality	Top 1%	Top 1%	Top 1 %	Top 1%	Top 1%	Top 1%
Measure of Innovation	patent_pc	patent_pc	patent_pc	3YWindow	3YWindow	3YWindow
Innovation	0.166**	0.183**	0.177**	0.145**	0.139**	0.160**
	(2.12)	(2.04)	(1.99)	(2.23)	(2.32)	(2.01)
Gdppc	-0.122	-0.135	-0.130	-0.153	-0.147*	-0.168*
	(-1.52)	(-1.61)	(-1.59)	(-1.63)	(-1.76)	(-1.67)
Popgrowth	0.728	0.778	0.758	0.735	0.703	0.813
	(1.07)	(1.15)	(1.10)	(0.99)	(0.97)	(1.03)
Sharefinance	0.022	0.024	0.023	0.041**	0.039**	0.044**
	(1.52)	(1.57)	(1.59)	(2.08)	(2.15)	(2.12)
Outputgap	-2.408*	-2.451*	-2.434*	-1.947	-1.942	-1.961
	(-1.70)	(-1.74)	(-1.68)	(-1.23)	(-1.24)	(-1.21)
Gvtsize	-0.100**	-0.098**	-0.099**	-0.084	-0.087	-0.076
	(-2.20)	(-2.12)	(-2.20)	(-1.44)	(-1.58)	(-1.27)
Highways	0.028***	0.029***	0.029***	0.027***	0.026***	0.028***
	(3.15)	(3.11)	(2.98)	(3.02)	(3.09)	(2.80)
Military	0.008**	0.008**	0.008*	0.011**	0.010**	0.011**
	(2.03)	(2.06)	(1.95)	(2.43)	(2.44)	(2.28)
Lag of instrument	2 years	1 year	3 years	2 years	1 year	3 years
R^2	0.913	0.910	0.912	0.913	0.914	0.911
First stage F stat	27.10	21.98	21.54	18.84	21.78	13.92
N	1748	1748	1748	1598	1598	1598

Notes: $***pvalue < 0.01$. $**pvalue < 0.05$. $*pvalue < 0.10$.
t/z statistics in brackets, computed with robust standard errors

Instrumentation

Second instrument

- Second instrument based on knowledge spillovers
  $\longrightarrow$ The idea is to instrument innovation in a state by the sum of innovation intensities in other states weighted by the relative innovation spillovers from these other states

IV regressions with second instrument (Spillover)

	(1)	(2)	(3)	(4)	(5)	(6)
Measure of Inequality	Top 1%	Top 1%	Top 1 %	Top 1%	Top 1%	Top 1%
Measure of Innovation	patent_pc	3YWindow	4YWindow	5YWindow	Citations	Share5
Innovation	0.162**	0.124**	0.136***	0.147***	0.201***	0.297**
	(2.24)	(2.53)	(2.59)	(2.69)	(2.81)	(2.14)
Gdppc	-0.169*	-0.206**	-0.176*	-0.184*	-0.245**	-0.280*
	(-1.80)	(-2.00)	(-1.79)	(-1.74)	(-2.23)	(-1.80)
Popgrowth	0.773	0.653	0.480	0.365	0.285	0.812
	(1.12)	(0.92)	(0.67)	(0.46)	(0.42)	(0.74)
Sharefinance	0.026*	0.043**	0.043**	0.050**	0.054***	0.092**
	(1.82)	(2.46)	(2.39)	(2.49)	(2.74)	(2.21)
Outputgap	-2.427*	-2.000	-2.738*	-2.265	-2.105	-2.772
	(-1.68)	(-1.27)	(-1.78)	(-1.44)	(-1.47)	(-1.31)
Gvtsize	-0.038	-0.015	-0.035	-0.058	-0.032	0.007
	(-0.79)	(-0.24)	(-0.54)	(-0.84)	(-0.55)	(0.08)
Spill_Gdppc	0.050	0.307	0.436	0.413	0.092	0.356
	(0.11)	(0.61)	(0.86)	(0.83)	(0.20)	(0.45)
R^2	0.909	0.911	0.907	0.897	0.903	0.740
First stage F stat	20.93	25.49	23.78	22.63	18.11	4.93
N	1785	1632	1581	1530	1632	1559

Notes: $***pvalue < 0.01$. $**pvalue < 0.05$. $*pvalue < 0.10$.
t/z statistics in brackets, computed with robust standard errors

Magnitude of the effects

- When measured by the number of patent per capita, innovativeness accounts on average for about 17% of the total increase in the top 1% income share between 1975 and 2010 according to either IV regression

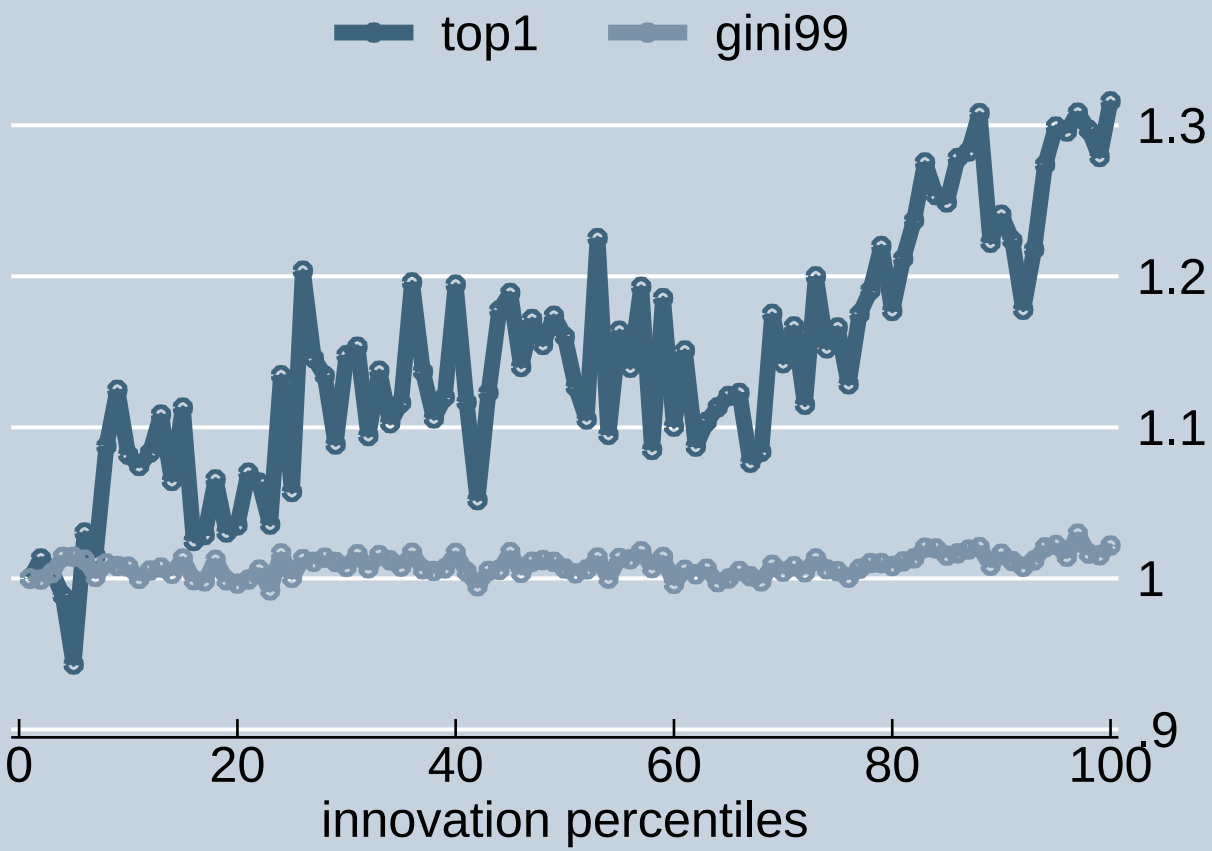
IV regressions of innovation on various measure of inequality (2 instruments)

Measure of Inequality Measure of Innovation	(1) Top 1% 3YWindow	(2) Avgtop 3YWindow	(3) Top 10 % 3YWindow	(4) Overall Gini 3YWindow	(5) G99 3YWindow	(6) Atkin 3YWindow	(7) Theil 3YWindow
Innovation	0.168***	-0.037*	0.014	-0.003	-0.021	0.025	0.012
	(3.65)	(-1.81)	(1.12)	(-0.21)	(-1.43)	(1.39)	(0.34)
Gdppc	-0.148*	0.086***	0.054**	-0.041*	-0.055**	0.125***	0.400***
	(-1.74)	(2.70)	(2.33)	(-1.81)	(-2.14)	(3.66)	(5.80)
Popgrowth	0.121	-0.454**	-0.037	-0.439***	-0.641***	0.220	2.136***
	(0.18)	(-1.97)	(-0.23)	(-2.77)	(-3.59)	(0.87)	(3.91)
Sharefinance	0.039**	-0.008	0.006	-0.000	-0.008	0.018**	-0.000
	(2.50)	(-1.05)	(1.17)	(-0.01)	(-1.28)	(2.07)	(-0.02)
Outputgap	-2.065	-0.616	-0.482	-0.012	0.003	0.102	0.130
	(-1.46)	(-1.35)	(-1.46)	(-0.03)	(0.01)	(0.18)	(0.12)
Gvtsize	-0.124**	-0.034	-0.077***	0.035**	0.073***	-0.119***	-0.289***
	(-2.49)	(-1.42)	(-4.59)	(2.03)	(3.53)	(-4.65)	(-5.83)
Highways	0.028***	-0.006	0.004	0.009***	0.010***	0.003	-0.002
	(3.14)	(-1.56)	(1.45)	(3.18)	(3.06)	(0.61)	(-0.23)
Military	0.011***	-0.002	0.002	-0.001	-0.002	0.000	0.003
	(2.75)	(-1.24)	(1.44)	(-0.88)	(-1.53)	(0.23)	(0.95)
Spill_Gdppc	0.153	0.810***	0.388***	0.704***	0.881***	0.268	-0.250
	(0.35)	(4.37)	(2.75)	(4.98)	(5.59)	(1.33)	(-0.62)
R^2	0.914	0.544	0.950	0.884	0.758	0.930	0.927
First stage F stat	25.58	25.58	25.58	25.58	25.58	25.58	25.58
N	1598	1598	1598	1598	1598	1598	1598

Notes: $***pvalue < 0.01$. $**pvalue < 0.05$. $*pvalue < 0.10$.
t/z statistics in brackets, computed with robust standard errors

Innovation and Inequality

Top 1% Share and Bottom 99% Gini



Source: Aghion et. al. (2015).

IV regressions of innovation on top 1% at various lag (2 instruments)

	(1)	(2)	(3)	(4)	(5)
Measure of Inequality	top 1%	top1%	top 1%	top1%	top 1%
Measure of innovation	patent_pc	patent_pc	patent_pc	patent_pc	patent_pc
Lag of innovativeness	1 year	2 years	3 years	4 years	5 years
Innovation	0.184***	0.194***	0.216***	0.207***	0.199***
	(3.37)	(3.00)	(3.10)	(2.97)	(2.91)
Gdppc	-0.143*	-0.160*	-0.202**	-0.226***	-0.245***
	(-1.81)	(-1.92)	(-2.44)	(-2.60)	(-2.67)
Popgrowth	0.792	0.908	1.121	1.396	1.839**
	(1.16)	(1.18)	(1.39)	(1.64)	(2.09)
Sharefinance	0.024*	0.027*	0.030*	0.028*	0.024
	(1.70)	(1.86)	(1.94)	(1.78)	(1.53)
Outputgap	-2.520*	-2.740*	-3.025**	-3.708**	-4.507***
	(-1.76)	(-1.78)	(-2.03)	(-2.32)	(-2.70)
Gvtsize	-0.094**	-0.064	-0.029	-0.009	-0.011
	(-2.00)	(-1.30)	(-0.53)	(-0.16)	(-0.19)
Highways	0.029***	0.025***	0.023**	0.017*	0.015
	(3.33)	(2.67)	(2.44)	(1.75)	(1.63)
Military	0.009**	0.009**	0.010**	0.009**	0.007
	(2.08)	(2.20)	(2.28)	(2.06)	(1.50)
Spill_Gdppc	0.220	-0.039	-0.018	0.057	0.199
	(0.48)	(-0.09)	(-0.04)	(0.11)	(0.38)
R^2	0.910	0.902	0.891	0.883	0.872
First stage F stat	25.48	20.59	18.12	17.59	20.10
N	1748	1698	1648	1598	1548

Notes: $***pvalue < 0.01$. $**pvalue < 0.05$. $*pvalue < 0.10$.
t/z statistics in brackets, computed with robust standard errors

Robustness checks

- Use assignee instead of inventor to determine patent's location
- Remove patentors who patented in different state last time
- Additional controls for financial sector (average remuneration of financial employees, remove financial patents, remove states with large financial sectors)
- Allow for state specific time trends
- Control for education
- Control for oil and natural resources
- Control for the size of the computer sector or removing the associated patents
- Control for the size of the pharmaceutical sector or removing the associated patents
- Control for state marginal tax rates

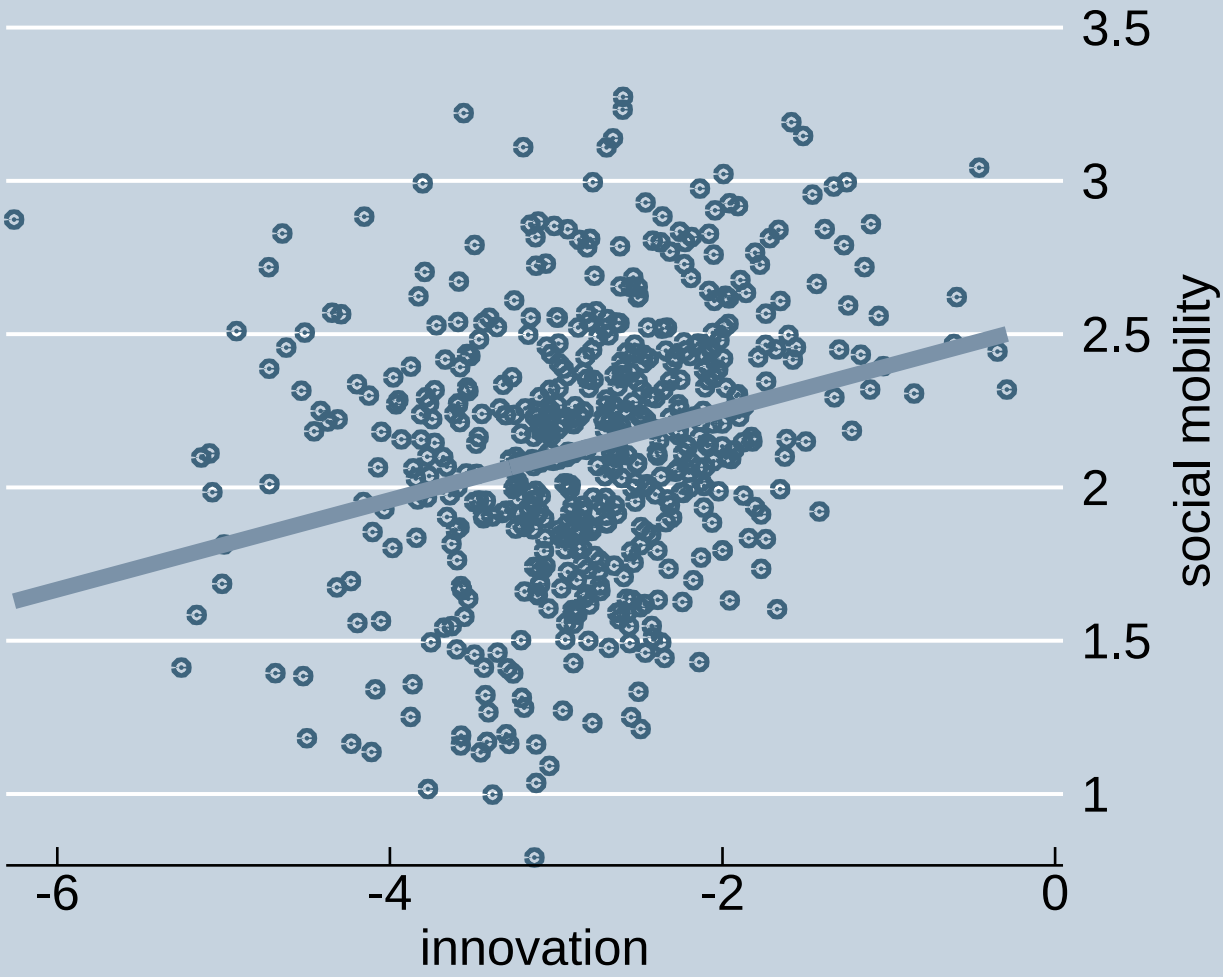
Extensions

- The effect of innovativeness on social mobility
- Entrant versus incumbent innovation
- Lobbying as a dampening factor

Mobility and top 1% income share. CZ level

Measure of Mobility Innovation	**(1)** AM25 patent_pc	**(2)** P1-5 patent_pc	**(3)** P2-5 patent_pc	**(4)** AM25 patent_pc	**(5)** P1-5 patent_pc	**(6)** P2-5 patent_pc	**(7)** P5 patent_pc
Innovation	0.024***	0.108***	0.063***	0.019**	0.073**	0.046*	0.022
	(3.07)	(3.13)	(2.70)	(2.40)	(2.10)	(1.76)	(1.17)
Gdppc	-0.094*	-0.225	-0.204	-0.139***	-0.384*	-0.356**	-0.271**
	(-1.81)	(-1.09)	(-1.48)	(-3.33)	(-1.84)	(-2.39)	(-2.31)
Popgrowth	0.177	0.603	0.711	0.236	0.588	0.731	0.611
	(0.61)	(0.55)	(0.87)	(0.76)	(0.48)	(0.84)	(0.89)
Gvtsize	0.000	0.002	0.001	0.000	-0.000	-0.001	-0.000
	(1.43)	(1.30)	(0.84)	(0.06)	(-0.19)	(-0.77)	(-0.37)
Participation Rate	0.600***	1.356**	1.274**	0.726***	2.067***	1.692***	1.087**
	(3.76)	(2.19)	(2.45)	(4.50)	(3.22)	(3.14)	(2.55)
School Expenditure	0.116**	0.550**	0.349**	0.096*	0.417**	0.298*	0.153
	(2.07)	(2.65)	(2.20)	(1.81)	(2.05)	(1.91)	(1.36)
College per capita				0.081	0.075	0.081	0.119
				(1.52)	(0.35)	(0.49)	(0.98)
Employment Manuf				-0.333***	-1.566***	-1.273***	-0.677***
				(-3.43)	(-4.27)	(-4.18)	(-2.86)
R^2	0.201	0.182	0.163	0.243	0.215	0.211	0.160
N	637	645	645	546	546	546	546

Innovation and Social Mobility



Source: Aghion et. al. (2015).

Entrant vs Incumbent innovation and social mobility

Measure of Mobility	(1) AM25	(2) P1-5	(3) P2-5	(4) AM25	(5) P1-5	(6) P2-5	(7) AM25
Innovation	patent_pc	patent_pc	patent_pc	patent_pc	patent_pc	patent_pc	patent_pc
Innovation from Entrants	0.016**	0.058**	0.038**				0.018**
	(2.61)	(2.39)	(2.11)				(2.61)
Innovation from Incumbent				0.007	0.032	0.020	-0.006
				(0.87)	(0.97)	(0.75)	(-0.64)
Gdppc	-0.136***	-0.381*	-0.330**	-0.136***	-0.405*	-0.340**	-0.128***
	(-3.08)	(-1.78)	(-2.11)	(-2.96)	(-1.87)	(-2.14)	(-2.83)
Popgrowth	0.287	0.757	0.827	0.272	0.708	0.792	0.290
	(1.00)	(0.66)	(0.98)	(0.92)	(0.61)	(0.93)	(1.02)
Gvtsize	0.000	-0.000	-0.001	0.000	-0.000	-0.001	0.000
	(0.04)	(-0.22)	(-0.80)	(0.08)	(-0.21)	(-0.76)	(0.07)
Participation Rate	0.785***	2.291***	1.815***	0.758***	2.180***	1.743***	0.799***
	(4.61)	(3.44)	(3.25)	(4.48)	(3.30)	(3.14)	(4.71)
School Expenditure	0.109**	0.467**	0.322**	0.102*	0.442**	0.306*	0.111**
	(2.09)	(2.38)	(2.04)	(1.95)	(2.24)	(1.95)	(2.10)
College per capita	0.081*	0.068	0.090	0.075	0.036	0.071	0.084*
	(1.70)	(0.36)	(0.57)	(1.57)	(0.19)	(0.44)	(1.81)
Employment Manuf	-0.312***	-1.508***	-1.212***	-0.366***	-1.705***	-1.341***	-0.307***
	(-3.16)	(-4.12)	(-3.95)	(-3.70)	(-4.54)	(-4.34)	(-3.04)
R^2	0.260	0.233	0.221	0.243	0.217	0.209	0.261
N	541	541	541	541	541	541	541

Innovation, Lobbying, Inequality and Mobility (State and CZ level)

Measure of	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Inequality	top 1%	top1%	top 1%	-	-	-	-
Mobility	-	-	-	AM25	AM25	AM25	AM25
Innovation	3YWindow	3YWindow	3YWindow	patent_pc	patent_pc	patent_pc	patent_pc
Innovation	0.059***		0.153***				
	(6.06)		(3.81)				
from Entrants		0.020***		0.012	0.028***		
		(3.71)		(1.28)	(2.72)		
from Incumbents		0.012*				0.005	0.014
		(1.87)				(0.73)	(1.46)
*Lobbying*Innovation*	-0.060***		-0.074***				
	(-9.48)		(-10.01)				
from Entrants		-0.034***					
		(-6.79)					
from Incumbents		-0.004					
		(-0.65)					
Gdppc	-0.093*	-0.071	-0.200**	0.044	0.030	0.046	0.028
	(-1.65)	(-1.33)	(-2.20)	(1.66)	(0.94)	(1.68)	(0.81)
Popgrowth	0.445	0.097	1.229*	0.002	0.000	0.003	0.000
	(0.71)	(0.15)	(1.72)	(1.47)	(0.16)	(1.64)	(0.16)
Sharefinance	0.016	0.009	0.024	0.000	-0.003***	0.000	-0.003**
	(1.21)	(0.64)	(1.58)	(0.15)	(-2.82)	(0.40)	(-2.19)
Outputgap	-1.930	-2.201	-2.550				
	(-1.36)	(-1.61)	(-1.57)				
Gvtsize	0.008	-0.044	0.064	-0.001	0.001	-0.001	0.001
	(0.19)	(-1.04)	(1.12)	(-0.41)	(0.78)	(-0.47)	(0.86)
Highways			0.032***				
			(3.80)				
Military			0.005				
			(0.99)				
Spill_Gdppc			0.983**				
			(2.01)				
R^2	0.925	0.925	0.922	0.107	0.079	0.100	0.049
1^{st} stage F-stat	-	-	11.79	-	-	-	-
N	1632	1632	1598	176	176	176	176

Conclusion (1)

- We have analyzed the effect of innovation-led growth on top incomes and on social mobility
- We found positive and significant correlations between (entrant) innovation, top income shares and social mobility
- We found no significant effect of innovation on broader measures of inequality
- Our instrumentation at cross-state level suggested a causality from innovativeness to top income shares

Conclusion (2)

- Our findings suggest avenues for further research on (innovation-led) growth, inequality and social mobility.
  1. Use individual fiscal and patenting data to look at social mobility of inventors
  2. Revisit tax policy design, factoring in *innovation*
  3. Go deeper into how institutions affect the relationship between innovation, top income inequality, and social mobility.

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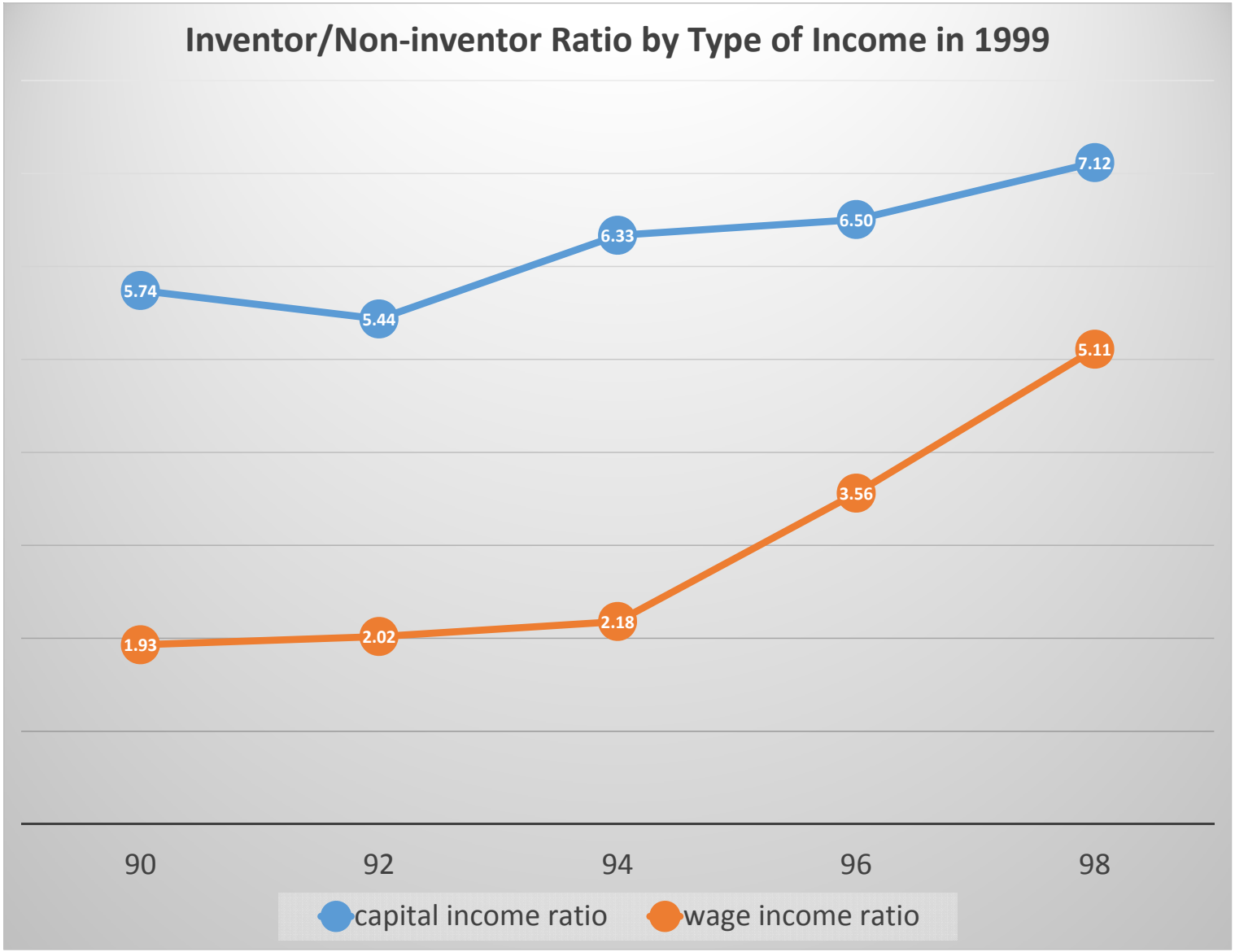
- Probability of upward mobility is significantly higher for inventors than for non-inventors
- Upward mobility of inventors increases significantly:
  1. With citation count
  2. With own education
  3. If firm size is smaller

Wage Income Growth (1)

Wage Income Growth (2)

Capital vs Labor Income in 1999



Transition Matrix

Table 1: Transitions 1991 to 1999

non-inventors			
1991 / 1999	top-10=0	top-10=1	Conditional Prob.
top-10=0	88.05	4.17	4.51
top-10=1	2.34	5.45	69.96

inventors			
1991 / 1999	top-10=0	top-10=1	Conditional Prob.
top-10=0	41.95	19.61	31.86
top-10=1	7.60	30.84	80.23

Transition Matrix by Father's Education

Table 2: Transitions 1991 to 1999 conditional on father's education

Father's education < 12 years							
non-inventors				inventors			
91 / 99	top10=0	top10=1	C/Pr	91 / 99	top10=0	top10=1	C/Pr
top10=0	86.55	5.13	5.60	top10=0	44.81	19.10	29.88
top10=1	2.41	5.91	71.03	top10=1	6.84	29.25	81.07
Father's education ≥ 12 years							
91 / 99	0	1	C/Pr	91 / 99	top-10=0	top-10=1	C/Pr
top10=0	88.24	4.05	4.39	top10=0	39.24	20.85	34.70
top10=1	2.36	5.35	69.30	top10=1	8.07	31.84	79.78

Transition Matrix by Gender

Table 3: Transitions 1991 to 1999 conditional on gender

Female							
non-inventors				inventors			
91 / 99	0	1	Con Pr	91 / 99	top-10=0	top-10=1	Con Pr
top10=0	95.73	2.02	2.07	top-10=0	67.78	11.11	14.08
top10=1	0.87	1.38	61.33	top-10=1	1.11	20.00	94.74
Male							
91 / 99	0	1	Con Pr	91 / 99	top-10=0	top-10=1	Con Pr
top10=0	84.37	5.22	5.83	top-10=0	39.37	20.76	34.53
top10=1	3.07	7.34	70.51	top-10=1	8.35	31.52	79.06

Transition Matrix by Age

Table 4: Transitions 1991 to 1999 by age (inventors only)

$<$ median age			
1991 / 1999	top-10=0	top-10=1	Conditional Prob.
top-10=0	47.19	26.53	35.99
top-10=1	5.10	21.17	80.56

$>$ median age			
1991 / 1999	top-10=0	top-10=1	Conditional Prob.
top-10=0	38.98	14.29	26.83
top-10=1	9.39	37.35	79.93

Transition Matrix by Innovation Quality

Table 5: Transitions 1991 to 1999 by quality of invention

$<$ 20 citations			
1991 / 1999	top-10=0	top-10=1	Conditional Prob.
top-10=0	43.60	17.08	28.15
top-10=1	8.15	31.18	79.29

$\geq$20 citations			
1991/1999	top-10=0	top-10=1	Conditional Prob.
top-10=0	35.78	38.53	51.85
top-10=1	2.75	22.94	89.30

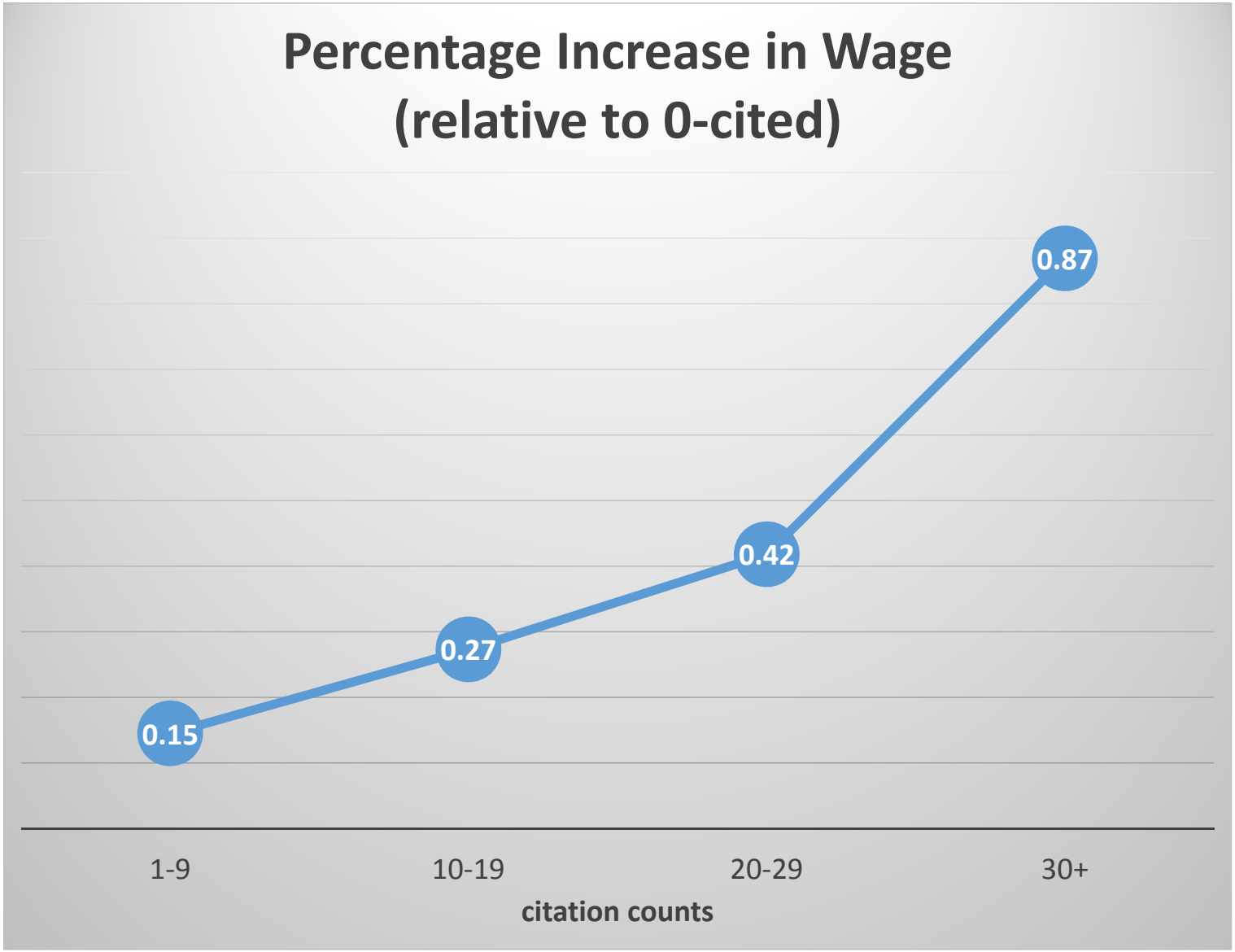
Labor Income in 1999

Table 6: Ln(wage) in 1999

	Logwage		top-10% in 1999
	(1)	(2)	(3)
patent count	-0.1132	-0.0516	-0.0331
	0.0438	0.0326	0.0244
	0.0098	0.1135	0.1745
citations 1-9	0.1456	0.0594	0.0987
	0.0664	0.0581	0.0388
	0.0284	0.307	0.0109
citations 10-19	0.2725	0.2375	0.1803
	0.1358	0.1658	0.0629
	0.0448	0.152	0.0042
citations 20-29	0.4176	0.3975	0.2304
	0.1483	0.1538	0.0803
	0.0049	0.0098	0.0041
citations 30-	0.869	0.7862	0.3313
	0.1913	0.2038	0.0993
	0.000	0.0001	0.0008
polynomial in Ln(wage) in 1991	3	3	3
controls	YES	YES	YES
father's educ.	NO	YES	NO
nobs	75233	13634	75262
R-sq.	0.40	0.39	0.42

NOTES: numbers presented are coefficient, robust s.e., and p-value.
Controls include third order polynomial in age; a gender dummy;
a dummy for having Finnish as mother tounge; 45 field and level of educ dummies;
a dummy for being an entrepreneur in 1991; and tenure in current job in 1991.
father's educ. = 45 field and level of education dummies for the father.

Labor Income in 1999



Transition Matrix by Own Education

Table 6: Transitions 1991 to 1999 conditional on own education

education in 1991 $<$ 16 years							
non-inventors				inventors			
1991/1999	top-10=0	top-10=1	Con Pr	1991/1999	0	1	Con Pr
top-10=0	95.87	1.57	1.61	0	77.05	9.84	11.32
top-10=1	1.28	1.28	50.00	1	4.10	9.02	68.80
education in 1991$\geq$ 16 years							
1991/1999	0	1	Con Pr	1991/1999	0	1	Con Pr
top-10=0	71.91	9.57	11.75	0	37.11	21.32	36.49
top-10=1	4.60	13.92	75.16	1	8.03	33.55	80.69

Transition Matrix by Firm Size

Table: Transitions 1991 to 1999 conditional on firm size

firm size in 1991 $<$ median firm size in 1991							
non-inventors				inventors			
1991/1999	top-10=0	top-10=1	Con Pr	1991/1999	0	1	Con Pr
top-10=0	84.76	4.36	4.89	0	35.03	23.73	40.38
top-10=1	3.21	7.67	60.50	1	5.08	36.16	87.68
firm size in 1991 $\geq$ median firm in size1991							
1991/1999	top-10=0	top-10=1	Con Pr	1991/1999	0	1	Con Pr
top-10=0	89.11	4.14	4.44	0	44.54	18.72	29.59
top-10=1	2.08	4.67	69.19	1	8.09	28.65	77.98