Discussion of
"The Birth of American Ingenuity: Innovation and Inventors of the Golden Age"

Ben Jones, Northwestern & NBER

NBER Economic Growth Meeting

July 15, 2016

Overview

- Data
  - Integrates U.S. Census and U.S. patent records, 1980-1940 (and beyond)
- Analysis
  - Part I: Patenting and Economic Growth
  - Part II: Regional Characteristics that Predict Patenting
  - Part III: Inventor and Family Characteristics that Predict Patenting
  - Part IV: Individual Income of Inventors
  - Part V: Regional Inequality and Inventiveness

Data & Matching

- Complete count census data for 1880-1940
- Match to patents granted (decennial years)
  - Last name, first name, state; then refine using county, middle initial
- Find match for 46% of U.S. patentees
  - 1880: 62%, 1920: 34% (why?)
- Does decennial matching select on especially prolific inventors?
  - People with patents every year more likely to be found. May bias up inventor income measures.

Part I: Patenting and Economic Growth

Figure 5: INNOVATION AND LONG-RUN GROWTH: US STATES BETWEEN 1900-2000

Growth = 0.000 + 0.066 * Patents
Slope coefficient statistically significant at 1% level
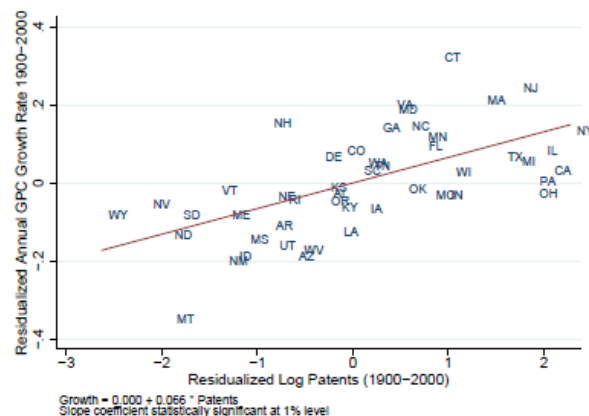
- 100% ↑ in patenting predicts 15% ↑ in Y/L

Comment 1: What does Correlation Between Y/L and Patenting Tell Us?

- At state level, is it a test of (a) how innovation affects growth, or (b) degree of spillovers?
- If spillovers were complete, then would see zero correlation at state level, even if patenting drove all national growth
- Regression mixes (at least) these two forces. It doesn't tell us overall effect of innovation on growth but rather local gains that aren't dissipated to other states.

Comment 1: What does Correlation Between Y/L and Patenting Tell Us?

Figure 1: LONG-RUN HISTORY OF TOTAL PATENTS FILED IN THE USPTO
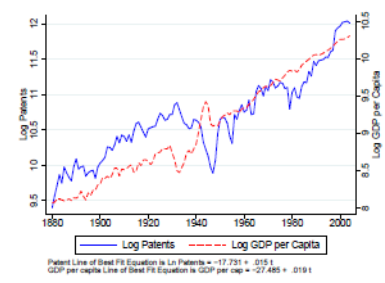
Aggregate

$$\Delta\ln(y) = \Delta\ln(patents)$$

State

$$\Delta\ln(y) = \frac{1}{7}\Delta\ln(patents)$$

- Theory suggests $\Delta\ln(y) = \Delta\ln(A)$. If we take patent counts seriously, then can reconcile above via large spillovers, which seems natural.

7/18/2016

3

Part I: Patenting and Economic Growth – It is Causative?

	Annualized Growth Rate		
	OLS	OLS	IV
	(1)	(2)	(3)
Log Patents	0.14***	0.11***	0.14***
	(0.04)	(0.04)	(0.05)
Initial Log GDP per Capita	-1.68***	-1.78***	-1.84***
	(0.23)	(0.23)	(0.25)
Population Density		1.40**	1.24**
		(0.65)	(0.58)
Observations	48	48	48
Mean Growth	2.50	2.50	2.50
Std. Dev. of Growth	0.44	0.44	0.44

- Instrument: WW2 Office of Scientific Research & Development (OSRD) contracts

Comment 2: Is It Causative?

- OSRD funding is not randomly assigned
- Can it be treated as exogenous?
- Not obvious…
  - Paper tells us that 50% of contracts went to three states: NY (30%), MA (13%), PA (11%)
  - MIT got the most contracts and most money
- One imagines OSRD picked places with high innovative capacity, esp. given wartime needs

Comment 2: Is It Causative?

Table 4: PLACEBO TESTS

Dependent Variable:	1947-87 GDP Growth Rate		Contracts	
	(1)	(2)	(3)	(4)
Log Patents 1935-1940	0.115	0.006		
	(0.189)	(0.009)		
1935-1940 GDP Growth			0.098	
			(0.161)	
1935-1940 GDP DHS Growth				2.107
				(3.386)
1940 GDP per Capita	0.389	0.018	3.129***	3.129***
	(0.802)	(0.038)	(1.002)	(1.002)
Population Density	-6.731**	-0.318**	12.582**	12.587**
	(3.248)	(0.154)	(5.438)	(5.438)
Growth Rate	Annual	DHS	Annual	DHS
Observations	48	48	48	48

- Placebo tests could use more normal periods (1935-1940 is during Great Depression)
- Can storytelling identify plausibly exogenous shock, perhaps as one OSRD component? Or link today's specific patent classes to OSRD local technology target?
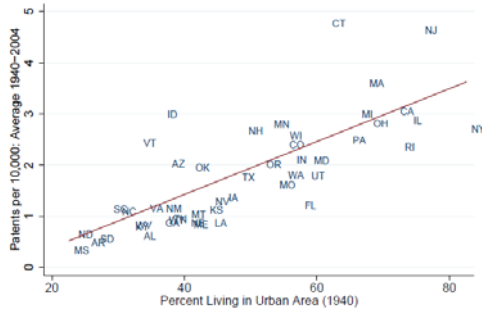
Parts II-V

- Many interesting and striking facts
- Example: Tertiary education predictive of inventors (not uneducated "tinkerers") even in 1880-1940.
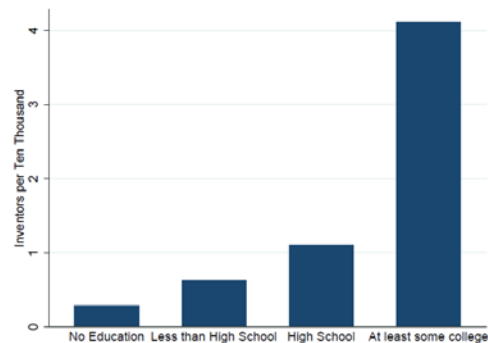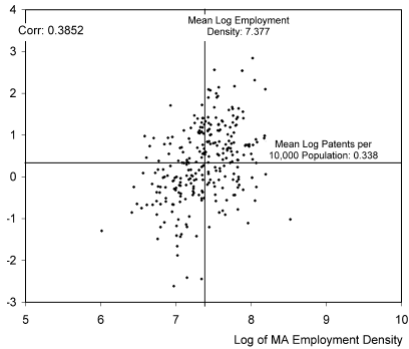
Part II: Regional Characteristics

- Population density

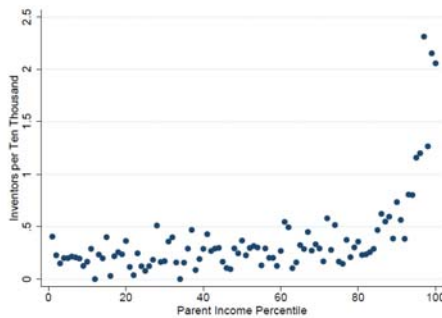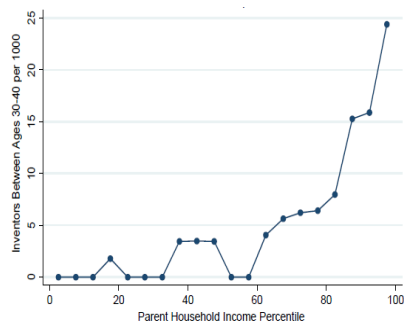Akcigit et al (2016)   Carlino et al (2007)

Similarly, upward slope today...consistent with Marshallian agglomeration advantages

Is invention advantage as strong in 1880-1940?

Part III: Characteristics of Inventors

- High income parents
- Striking durability of this fact
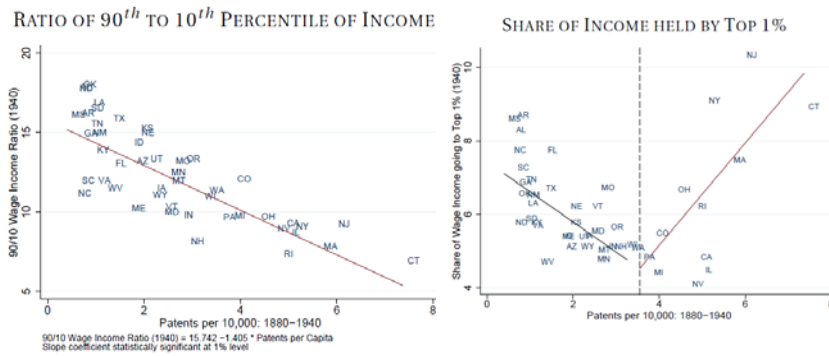

Akcigit et al (2016)   Bell et al (2016)

early 20th century   early 21st century
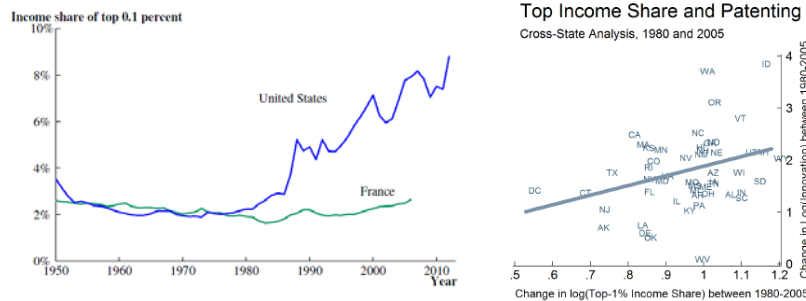
1880-1940 is extremely similar!

Part V: Inventiveness and Inequality

- Historical lens on a hot topic
- Negative correlation then, mostly

RATIO OF 90ᵗʰ TO 10ᵗʰ PERCENTILE OF INCOME

SHARE OF INCOME HELD BY TOP 1%

- But here 1880-1940 does look different…

Part V: Inventiveness and Inequality

- Theory:
  - Aghion et al. (2015): innovation raises inequality (sustains markups / escapes imitators)
  - Jones and Kim (2015): innovation reduces inequality (creative destruction / new entry undercuts leaders)
- Why are 1980-2010 and 1880-1940 different?

Part V: Inventiveness and Inequality

Possibilities include:

- Scale Effects
  - e.g., digitization & globalization
  - 1 big tournament, huge share to winners
- Patent Institutions
  - Strengthening property rights
  - New strategies: Increasingly used to foreclose entry as opposed to reward innovation?
  - Allow larger markups and corporate income?
- More evidence to sort out, advance theory

Concluding comments

- Great new dataset
- Very interesting facts emerging
- More intersection with theory/literature and existing facts
  - Are facts contrary or consistent?
  - Do facts support/reject theories?
- The "historical test" is great agenda
- May require narrower paper(s)

Thank You