



Labor Scarcity, Finance, and Innovation: Evidence from Antebellum America

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Overview and Summary of Results

- Analyzes the impact of access to financing on innovation (patenting activity) in antebellum America, using the entry of “free banks” as an exogenous shock to the supply of funds.
- Argues that labor scarcity is an important economic channel through which access to finance shapes innovation.
- Argues that access to finance encourages innovation that substitutes for labor in states with higher marginal cost of labor, that is states which had abolished slavery.
- Primarily an empirical analysis with a short motivating stylized model.
- I learned a lot about antebellum America and the about banking and the structure of the economy at that time.

Main Ideas and Thoughts



- There is no question about the link between finance and innovation.
 - Successful innovation leads to increased efficiency, increased productivity, increased profitability.
 - There is a lot of direct evidence on this in the literature:
 - Cetorelli, N., and P. E. Strahan. (2006). Finance as a barrier to entry: Bank competition and industry structure in local U.S. markets. *Journal of Finance* 61: 437–461.
 - Butler, A. W., and J. Cornaggia. (2011). Does access to external finance improve productivity? Evidence from a natural experiment. *Journal of Financial Economics* 99:184–203.
 - Krishnan, K., D. K. Nandy, and M. Puri. (2015). Does Financing Spur Small Business Productivity? Evidence from a Natural Experiment. *Review of Financial Studies*, 28 (6), pp. 1768 – 1809.

Main Ideas and Thoughts



- There is confusion in my mind though regarding the idea of interactions between “inputs” into the production process and the nature of innovation.
- Think of a 3-factor Cobb-Douglass production function
$$\ln(Y_{ijt}) = A_{jt} + \beta_{jt} \ln(K_{ijt}) + \gamma_{jt} \ln(L_{ijt}) + \delta_{jt} (M_{ijt}) + \varepsilon_{ijt}$$
- Inputs are: K , L , M . Technology parameter is A . If cost of L is lower, with same technology productivity would be higher.
- Innovation would naturally target the costliest input or bottleneck in the production process.
- In antebellum America, that was the lack of industrialization and competition from England.

Main Ideas and Thoughts



- Textile manufacturing and industrial revolution came to the East coast first since the merchants who brought it, lived in Boston, Philadelphia, New York.
 - Direct Shipping routes.
- Precision parts mass manufacturing also started here in order to support the growth of industrialization in New England.
- Comparative advantage of New England was distance from and trade with England; early innovation in industrialization; and industrial agglomeration.
- Comparative advantage of the South was much better weather suited for crops and cotton plantations.
- The primary supply of cotton to England came from India.



Industrial Revolution and Innovation in Textile Manufacturing



- Waltham, MA – the birthplace of Industrial Revolution in America – the power loom ~ 1813/1814.
 - Boston Manufacturing Company opened the first factory in America.
 - A series of innovations related to power transmission for more efficient use of water turbines.
 - Very profitable ~ employed around 300 women (mill girls).
 - Financing was through common shares.
- Replicated widely after this in MA and New England – Lowell, Lawrence, Manchester.....
- Labor was NOT scarce; it just wasn't free slave labor.
- Kenton Beerman, "The Beginning of a Revolution: Waltham and the Boston Manufacturing Company." *The Concord Review* (1994)

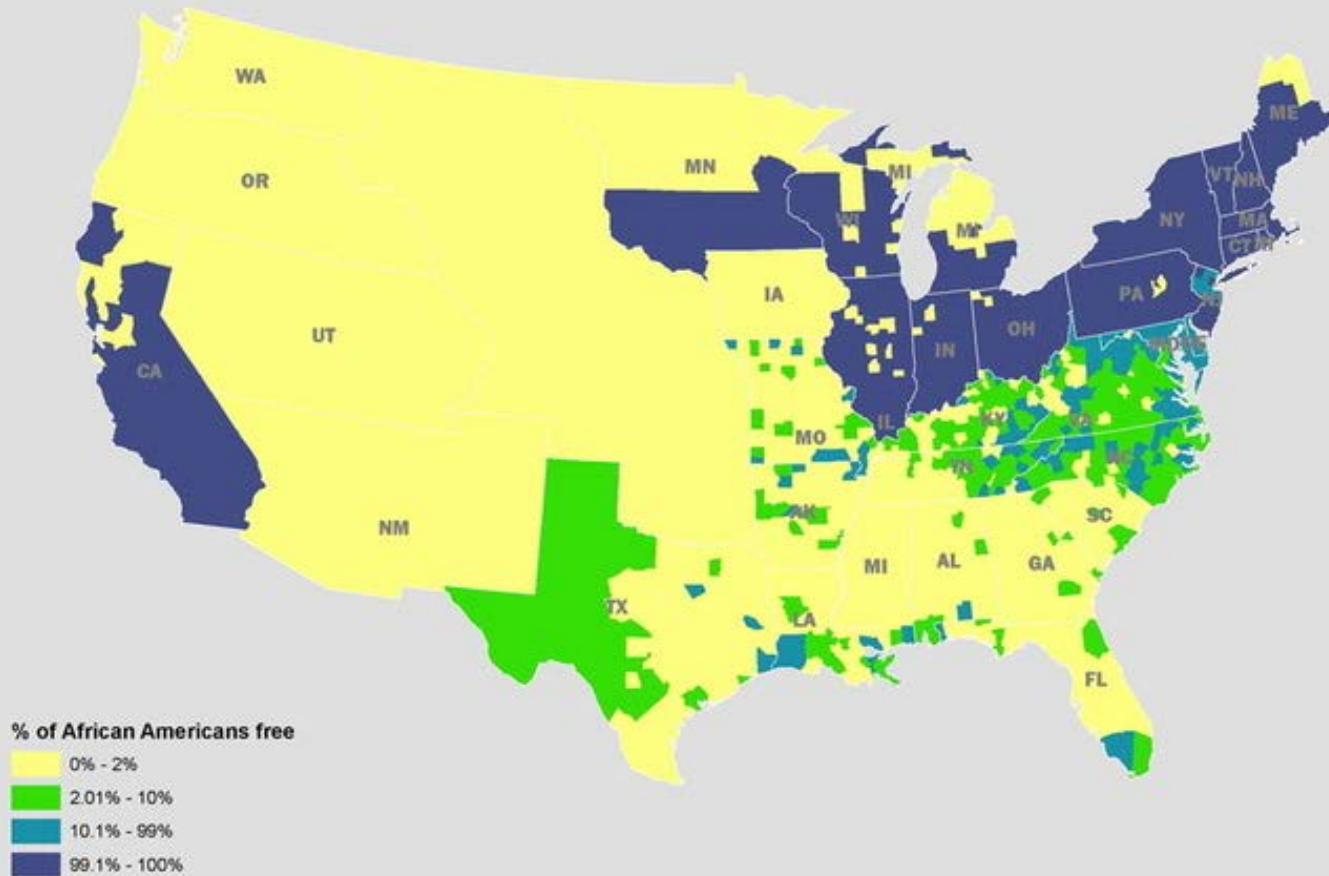


Manufacturing Employment in the Metropolitan Industrial Complexes of New York, Philadelphia, Boston, and Baltimore as a Percentage of National Manufacturing Employment in 1840

	Metropolis	Satellites	Complex
New York	4.1%	3.4%	7.4%
Philadelphia	3.9	2.9	6.7
Boston	0.5	6.6	7.1
Three Complexes	8.5	12.9	21.2
Baltimore	2.0	0.2	2.3

Source: U.S. Bureau of the Census, *Compendium of the Sixth Census, 1840* (Washington, D.C.: Blair and Rives, 1841).

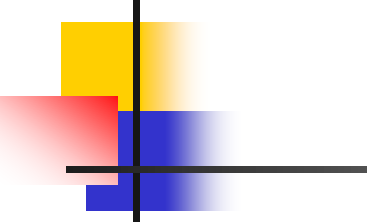
Free African-Americans as a Percent of All African Americans, 1850





Understanding Banking in antebellum America

- *A History of Banking in Antebellum America – Howard Bodenhorn*



A History of
Banking in
Antebellum
America

*Financial Markets and
Economic Development
in an Era of
Nation-Building*

Howard Bodenhorn



Understanding Banking in antebellum America

- *A History of Banking in Antebellum America – Howard Bodenhorn*
- Obtaining a legislative charter during this time was difficult to say the least.
 - Both federal as well as state charter processes were political
 - Corruption and bribery were commonplace in obtaining a charter and had little to do with competence in banking.
- Free banking emerged during this time with states starting to pass legislation from 1837 onwards.
- Anyone could operate a bank under the condition (among others) that all notes issued were backed by proper security.
- Thousands of different banknotes in circulation at different discount rates.
- Suffered from instability with several banking crisis during this time.

THOMPSON'S REPORTER.

Rules to be observed in referring to this Bank Note List.

- 1st. The States are placed in geographical order, commencing with the eastern.
- 2d. The number of the note is in full-faced type; the rate of discount is to the right of the Bank.
- 3d. If the letter (S) is found between the name of the Bank and the rate of discount, it is to be understood that the Bank is liable to full; if two n's, that it is quite doubtful. In the City and State of N. Y. the safety of the paper is designated by an (S)—and the free bank by an (F).
- 4th. The names of the present President and Cashier, are generally to be immediately under the name of the Bank, and the description of counter-foils, altered notes, &c., follow next.
- 5th. If a note is altered on a Bank, which cannot be found in this list, it is worthless. If a bank is dashed (S) its notes are worthless.
- 6th. Our first page is filled with money articles, tables, statistics, &c., except when specially used for Mercantile Cards.
- 7th. Our quotations are made to correspond with the rates of doing business at our Exchange Office, 64 Wall-street; where every branch of a Money and Stock Broker's business is done, upon fair and honorable principles.

INDEX.

Page.	Mississippi.	Page.	
Alabama.....	14	Missouri.....	15
Arkansas.....	15	New-Brunswick.....	15
Connecticut.....	5	New-Hampshire.....	15
Florida.....	15	New-Jersey.....	10
Delaware.....	12	New-York (City).....	6
District of Columbia.....	13	New-York (State).....	7
Florida.....	15	North Carolina.....	13
Georgia.....	13	North Carolina.....	13
Illinois.....	15	Ohio.....	14
Indiana.....	14	Pennsylvania.....	11
Kentucky.....	15	Rhode Island.....	4
Louisiana.....	14	South Carolina.....	13
Maine.....	9	Tennessee.....	15
Maryland.....	12	Tennessee.....	15
Massachusetts.....	3	Vermont.....	2
Michigan.....	9	Virginia.....	13

Prices of gold and silver, page 16

UNITED STATES.

Treasury Notes, Washington, per

MAINE.

- Androscoggin Bank,** Topsham, (Cbs. Thompson, Pres., John Coburn, Cash.) do
- Augusta Bank,** Augusta, (Thos. W. Smith, Pres., George W. Allen, Cash.) do
- 2's, lett. A., Jan. 1842, stereotype plate. Also 1's, 2's and 5's, altered from a broken bank.
- Bank of Bangor,** Bangor, do
- [Samuel Vezie, Pres., W. S. Bennett, Cash.]
- Beware of bills which resemble a broken bank.
- 2's, 5's, 10's, 20's, altered from a broken bank, detected by holding it to the light.
- Bangor Commercial Bank,** (Closed) do
- Belfast Bank,** Belfast, do
- [James White, Pres., N. H. Bradbury, Cash.]
- Beware of drafts of the Lunenburg Association on the bank, dated in New-York City.
- 1's, fraud, altered from some thin plaster, engraving (S).
- Brunswick Bank,** Brunswick, do
- [Richard W. Dunlap, Pres., A. C. Robbins, Cash.]
- 2's, this bank has redeemed all its genuine 5's.
- Calais Bank,** Calais, 103
- [G. Downie, Pres., J. A. Lee, Cash.]
- Canal Bank,** Portland, do
- [Chas. E. Barrett, Pres., J. B. Scott, Cash.]
- 4's, altered from a broken bank—signed Howard, cash.
- 20's, altered from a broken bank. Howard, cash.
- 20's, altered from 20s of some worthless bank—signature counterfeited, but awkwardly—the parts altered can be seen by holding in the light.
- 20's, altered from the paper of the broken Globe Bank. "CANALS" and "Portland" slightly defective—signature poor name.
- Cassco Bank,** Portland, do
- [Eliphlet Greeley, Pres., John Chute, Cash.]
- 2's, altered from the broken Citiz. Bk. Augusta.
- 2's, altered from some fraudulent institution.
- Central Bank,** Hallowell, (do) do
- Citizens' Bank,** Augusta, (fraud) do
- City Bank,** Portland, (Closed) do
- Commercial Bank,** Bath, do
- [J. Robinson, Pres., T. Hos. Agry, Cash.]
- Cumberland Bank of Portland,** do
- [Wm. Moulton, Pres., Samuel Small, Cash.]
- 2's, vig. a full and full with the head of Jackson on the right margin, and that of Van Buren on the left—well done.
- Danvers Bank,** Bangor, do
- [A. M. Roberts, Pres., W. H. Mills, Cash.]
- 2's, counterfeit, let. B.—badly done.
- Beware of drafts of the N. Y. Foreign and Domestic Exchange Co. payable at this bank.
- 2's, lett. A., May 4, 1839. Beware that the fine print is defective.
- 2's, altered from the Globe Bank of Bangor, signed Howard, cash. Curious, altered, some beyond, pres.
- Exchange Bank,** Portland, (Closing) —

- Franklin Bank,** Gardiner, do
- [Henry Pres., Hiram Stevens, Cash.]
- Fremont's Bank,** Bangor, do
- [Benj. Davis, Pres., Wm. Caldwell, Cash.]
- 2's, 5's and 10's, altered from broken Citizens' Bank of same place. Will calculate to deceive. The paper is white than the genuine bill.
- Freeport Bank,** Freeport, do
- [Samuel Wheeler, Pres., Edward Hildy, Cash.]
- 2's, 5's, altered from an unknown bank, well executed. Four counterfeit copies portably patron.
- Gardiner Bank,** Gardiner, do
- [Sam. C. Grant, Pres., Joseph Adams, Cash.]
- 2's, lett. A. altered, T. H. H. appear, particularly the end and the word "two."
- 2's, lett. A. various dates, Sam'l C. Grant, pres., Joseph Adams, cash. T. H. H. appear, altered.
- Georgia Lumber Co.,** Portland, (do) do
- 2's, 5's, concern has been recently re-constituted. We have no objection to its safety.
- Globe Bank,** Bangor, (fraud) do
- Groton Bank,** Augusta, do
- [Wm. Wear, Pres., Silas Leonard, Cash.]
- 2's, altered from broken Citiz. B., Augusta, Me.
- Kenduskenk Bank,** Bangor, do
- [John Williams, Pres., T. S. David, Cash.]
- 2's, lett. L., pay H. Clay, June 18, 1842.
- 2's, lett. L., pay to C. Carroll, dated Sep. 24, 1842, signed S. Dooly, Cash, and John Williams, Pres. Parts of the bill are pale, others dark.
- Lane Rock Bank,** Thomaston, do
- [Scott G. Bennett, Pres., E. M. Perry, Cash.]
- Lafayette Bank,** Bangor, (Closed) do
- Lincoln Bank,** Bath, do
- [Geo. P. Patten, Pres., John Shaw, Cash.]
- 2's, lett. L., on the bill, "Lafayette" letter.
- Manufacturers' Bank,** Saco, do
- [Wm. P. Haines, Pres., S. S. Fairbairn, Cash.]
- Mann and Traders' Bank,** Portland, do
- [Richard W. Smith, Pres., Geo. W. Cobb, Cash.]
- Mariners' Bank,** Wiscasset, do
- [Henry Clark, Pres., S. P. Baker, Cash.]
- Melrose Bank,** Wadsworth, do
- [James Covey, Pres., P. M. Cobb, Cash.]
- 2's, altered from the broken Citizens' Bank of Augusta, vig. on female, run machine and anchor.
- Meguntcook Bank,** Camden, do
- [Joseph Jones, Pres., Nathl. Dillingham, Cash.]
- Merrimack Bank,** Bangor, do
- Mercantile Bank,** Portland, do
- [Wm. Woodbury, Pres., W. W. Woodbury, Cash.]
- 2's, lett. A., June 8, 1839, H. Ellis, Cash, B. Bram, Pres. Engravers, Terry, Pelton & Co., Boston and Providence.
- New-Brunswick Bank,** Bangor, do
- [John Agry, Pres., W. M. Vaughan, Cash.]
- Old Town Bank of Orono,** (fraud) do
- Oxford Bank,** Fryeburgh, (fraud) do
- People's Bank,** Bangor, (closed) do
- Portland Bank of Portland,** (Closed) do
- Sagadahoc Bank,** Bath, do
- [Wm. Sewall, Pres., E. S. Baker, Cash.]
- St. Croix Bank,** Calais, (Closed) do
- Shewhegan Bank,** Bloomfield, do
- [Wm. Allen, Pres., E. W. G. Baker, Cash.]
- 2's, altered from a broken concern, with counterfeit signatures.
- South Berwick Bank,** South Berwick, do
- [W. A. Hayes, Pres., Chas. E. Norton, Cash.]
- Thomaston Bank,** Thomaston, do
- [Richard Robinson, Pres., J. D. Barnard, Cash.]
- Ticonic Bank,** Waterville, do
- [C. M. Boutelle, Pres., Wm. Perkins, Cash.]
- Union Bank,** Brunswick, (Closed) do
- [The time for releasing the notes of this bank expires June 1st, 1845.]
- Waldo Bank,** Belfast, do
- [James White, Cash.]
- 2's, altered from the broken Globe Bank, signed Howard, cashier.
- 2's, lett. L. dated Belfast, Oct. 1st, 1832, pay to C. Goldman, C. O. Alden, Cash., R. C. Johnson, Pres. General appearance light and coarse.
- Westbrook Bank of Westbrook,** (closed) do
- [S. Jordan, Pres., A. Fobes, Cash.]
- York Bank,** Saco, do
- [Jonathan King, Pres., H. D. Thatcher, Cash.]
- 2's, altered from the broken Globe Bank, signed Henry S. Thatcher, Cash, John King, Pres. Dark impression.
- 2's, lett. H., dated Belfast, Oct. 1st, 1832, pay to H. S. Perkins, Cash. Signed E. W. G. Baker, Cash. 12, 1832 patent check plate on the back—same office as the above.

NEW-HAMPSHIRE.

- Amherst Bank,** Keene, do
- [Sam'l Dixmoor, Pres., T. H. Leveret, Cash.]
- Cheshire Bank,** Keene, (New.) do
- [John Elyot, Pres., Geo. W. Chase, Cash.]
- 2's, The genuine bills of the old Bank are re-deemed in the new institution.
- Cincinnati Bank,** Concord, (closing) 10
- Concord Bank,** Concord, (closed) do
- Commercial Bank,** Portsmouth, (closed) do
- [Richard James, Pres., Jas. F. Shores, Cash.]
- Contra Costa Bank,** Portsmouth, do
- [Edw. Stevens, Pres., Geo. H. Scott, Cash.]
- 2's, lett. B., A. G. Brown, pres., P. Butler, cash.
- 2's, lett. B., A. G. Brown, pres., P. Butler, cash.
- 2's & 10's, altered—vig. a stream of water and saw mills on each side. E. P. Butler, cash.


- Derry Bank,** Derry, do
- [A. Tucker, Pres., Jas. Thom, Cash.]
- 2's, lett. A. appearance blurred; particularly the extreme ends.
- 2's, pay J. Jay, Nov. 2, 1842; the words "two" and "New Hampshire" badly done.
- Dover Bank,** Dover, do
- [Dan. M. Christie, Pres., John Damm, Cash.]
- 2's, lett. A.; Jona. Damm, A. Peirce, Pres.
- 2's, The charter of this Bank having expired it has ceased operations, except for the purpose of settling up its concerns.
- Eastern Bank,** (Closed) do
- [Benj. Abbott, Pres., Timothy Farrar, Cash.]
- 2's, lett. A. pay S. Martin, dated June 10, 1837.
- Farmers' Bank,** Dover, (closed) do
- [John Prentiss, Cash.]
- Franco Bank,** Exeter, do
- [John Harvey, Pres., James Burley, Cash.]
- 2's, altered from broken Citiz. B., Augusta, Me.
- 2's, vig. a steam ship—a female with a riddle. Paper white and thick, engraving good.
- Grafton Bk.,** (late Cross.) Haverhill, (closed) do
- Launceston Bank,** Launceston, do
- [Royal Joylin, Pres., Geo. A. Cossitt, Cash.]
- 2's, lett. A., altered from some broken bank. A. Peirce, Cash., Samuel Root, Pres. Others, signed Geo. Young, and A. Parker.
- Lebanon Bank of Lebanon,** do
- [Robert Kimball, Pres., J. H. Kendrick, Cash.]
- 2's, and 2's, counterfeit.
- 20's, pay G. Hall, dated June 15, 1839, James H. Kendrick, A. Smith, Pres. Vigette, farmer seated with sickle in hand. End pieces, stem-bush and rail round card by Boston Bank Note Co. Also, 5's, 10's and 20's.
- Manchester Bank,** Manchester, do
- [Jas. U. Parker, Pres., Ashah Parker, Cash.]
- 2's, lett. B. vig. a ship and Mercury—a steam boat in the offing—money figure—poor.
- 2's, lett. A. vig. a group of children. National Farmer, cash, J. W. Parker, pres.—Oct. 3, 1845.
- Manufacturers' Bank,** New-Ipswich, do
- [James M. Melville, Pres., G. Barrett, Cash.]
- 2's, Portland stereotype plate.
- Merrimack Bank,** Concord, do
- [J. M. Harner, Pres., Geo. Minot, Cash.]
- Mech. & Traders' Bank,** Portsmouth, do
- [Law Commercial.]
- Merrimack County Bank,** Concord, do
- [Marlow Harvey, Pres., S. Towse, Cash.]
- 2's & 10's, altered from Stillwater, worthless vig. a steam engine, mill-water—Butter, cash.
- Nashua Bank,** Nashua, do
- [Jesse Spaulding, Pres., John M. Hunt, Cash.]
- 2's, "vig. is No at the top of the bill is omitted; has "Five" on the left hand corner, genuine has "10" and is of an inch shorter than the genuine.
- N. H. Union Bk.,** Portsmouth, (Closing) do
- [John Rice, Cash.]
- 2's, lett. J. old plate, coarsely engraved. Signatures of Pres. and Cash same handwriting.
- Pease Bank,** Portsmouth, do
- [W. H. V. Hackett, Pres., Samuel Lott, Cash.]
- 2's, This was formerly the "Piscataquo Bank" do
- 2's, old plate of the old bank, but a specimen Letter A.
- Portsmouth Bank,** Portsmouth, (closing) do
- [R. Rice, Pres., J. M. Fredick, Cash.]
- Rockingham Bank,** Portsmouth, do
- [John Haven, Pres., J. S. Pickering, Cash.]
- Suffield Bank,** Dover, (Closing) do
- [Dan. Osborne, Pres., Wm. Woodman, Cash.]
- Winnepesaukee Bank,** Meredith, do
- [Eben. Cusick, Pres., John T. Collins, Cash.]

VERMONT.

- Bank of Orange County,** Chelsea, do
- [John Francis, Pres., Jason Stebbins, Cash.]
- 2's, lett. E., Jan. 20, 1841, pay to E. D. Studrott, Stebbins, Cash., Francis, Pres. Perkins stereotype plate—on the left side.
- 2's, lett. A. altered; Stebbins, cash. Francis, pres.
- 2's & 5's, lett. A. pay M. C. Hoy, June 4, 1841, Jason Stebbins, Cash., John Francis, Pres.
- 2's, lett. A., Jan. 25, 1841 and 1842, pay E. Blodgett, John Francis, Pres., Jason Stebbins, Cash.
- 2's, lett. A., E. B. Blodgett, Oct. 20, 1841.
- Bellefleur Falls Bank,** Rockingham, do
- [N. C. Fulton, Pres., Wm. Henry, Cash.]
- 2's, General appearance dark, paper thin, vignette.
- Bennington Bank,** Bennington, (broke) do
- Battleboro' Bk. of Battleboro',** do
- [E. Seymour, Pres., H. S. Noyes, Cash.]
- 2's, lett. A. pay J. Frost, dated June 7th, 1838. The counterfeits resemble Battleboro'—the genuine "BATTLEBORO'".
- Burlington Bank of Burlington,** do
- [E. T. Emphrey, Pres., R. G. Cole, Cash.]
- 2's, lett. B. vig. on right side heaver lives head of Franklin on the left—one of Franklin's eyes looks as if it had been lugged up.
- 2's, signed R. G. Cole, Cash., E. T. Inglesby, Pres., dated March 1, 1833. Coarsely engraved. The dies, in which are the figure 5's, on the top of the bill are circular, instead of elliptic, as in the true bills.
- Caledonia Bank of Danville,** do
- [Geo. B. Candler, Pres., J. A. Page, Cash.]
- Conners' Bank,** Orwell, do
- [A. L. Catin, Pres., Wm. B. Martin, Cash.]
- 2's, lett. B., dated Oct. 1st, 1837, signed H. L. Reed, Cash. D. Smith, Pres., both names in same hand writing.
- 2's, lett. A. dated Oct. 6th, 1837, pay J. Kellogg, signed P. M. Corbin, Cash., Ira Smith, second, Pres. Others, dated 15th Aug. 1837.

Thompson's Bank Note Reporter, issued in February 1846,

Banking in antebellum America



Year	No. Banks	Authorized Capital (in millions \$U.S.)	Estimated Assets (in millions \$U.S.)
1810	103	66.19	108.87
1811	118	76.29	142.65
1812	143	84.49	161.89
1813	147	87.00	187.23
1814	202	110.02	233.53
1815	212	115.23	197.16
1816	233	158.98	270.30
1817	263	172.84	316.47
1818	339	195.31	331.41
1819	342	195.98	349.66
1820	328	194.60	341.42
1821	274	181.23	345.93
1822	268	177.53	307.86
1823	275	173.67	283.10
1824	301	185.75	328.16
1825	331	191.08	347.65
1826	332	190.98	349.60
1827	334	192.51	379.03
1828	356	197.41	344.56
1829	370	201.06	349.72
1830	382	205.40	403.45

*Origins of
Commercial
Banking in the
United States
– Robert E.
Wright*



Main Comments and Questions

- Given the large heterogeneity in the quality of banks - need to understand better how the entry of free banks affected the availability of financing in different states.
- Alternate sources of financing – federal banks? equity financing?
 - Most large industrial/manufacturing companies that started followed the BMC model of raising capital to support innovation and growth.
- Alternative use of financing.
 - Building infrastructure – canals and railroads.
 - Communication – telegraph.
- Need to show a clear link between availability of financing and innovation.



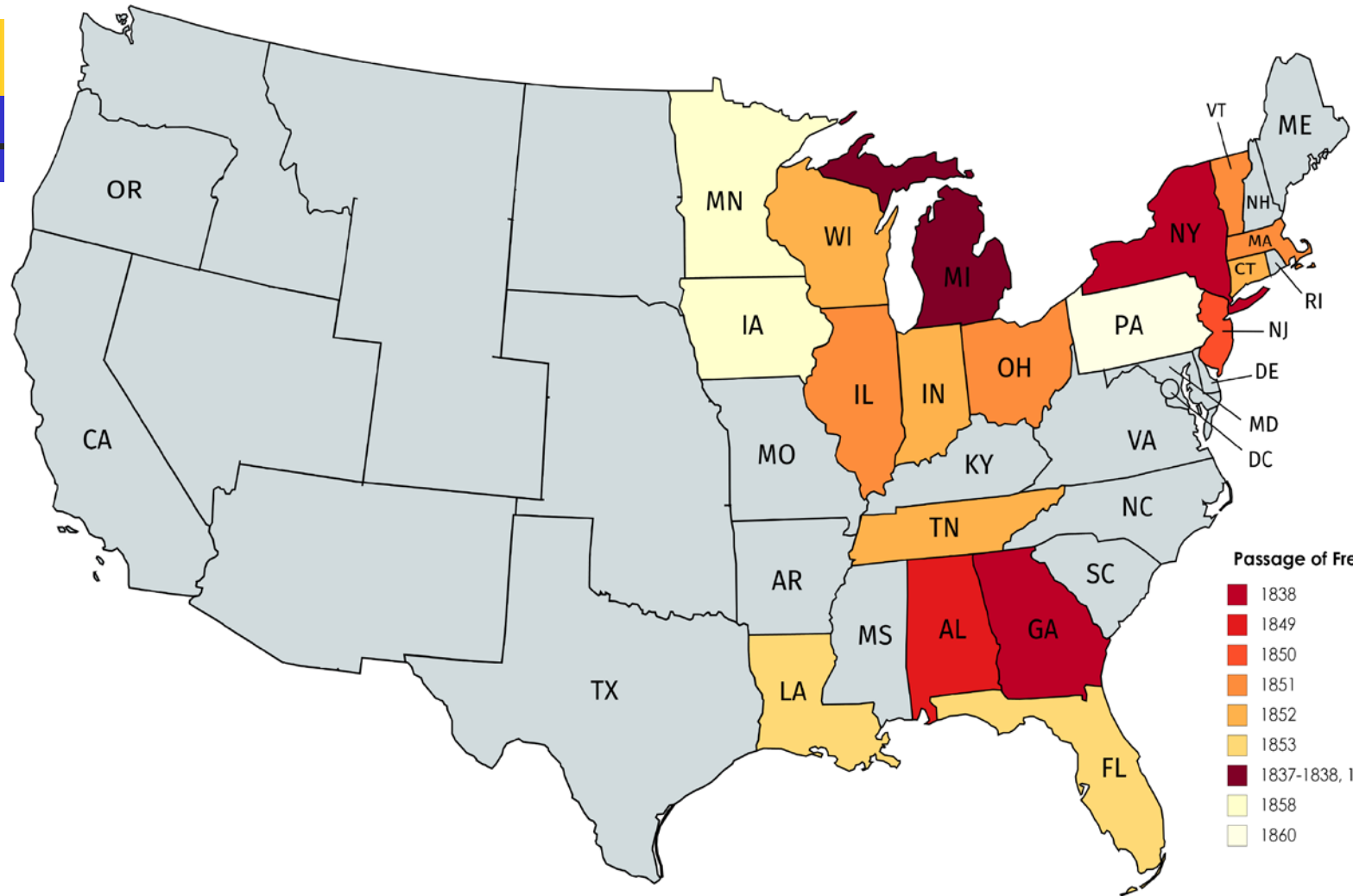
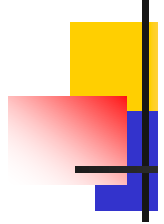
Main Comments and Questions

- Broad question: How does innovation develop?
 - Links to factors of production.
- Several other possibilities come to mind which may have a bigger policy impact.
 - Infrastructure development
 - Industry agglomeration
 - Demand conditions
- While financing is critical, they may be offset by lack of above conditions.



Main Comments and Questions

- Econometric issues:
 - Unbalanced panel with a lot of heterogeneity.
 - Look at Iowa: statehood in 1838; free banking in 1858.



Passage of Free Banking Laws

- 1838
- 1849
- 1850
- 1851
- 1852
- 1853
- 1857-1838, 1857-
- 1858
- 1860





Main Comments and Questions

■ Issues with panel construction:

- Unbalanced panel with a lot of heterogeneity. Need to be more clear on how you are treating these issues.
- Look at Iowa: statehood in 1838; free banking in 1858.
- State fixed effects are inadequate.

■ Prior trends:

- Show test for parallel trends in a simple picture.
- Current econometric specification is somewhat inadequate:
 - Include Before variable in main regression
 - Restrict Before variable to 5 years before free-banking given the huge heterogeneity within and across states both in quantity and quality of free banks.

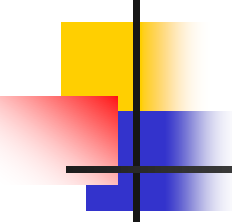
■ Clustering of SE: need to cluster at state or at the minimum state-year level.



Main Comments and Questions

- Interaction effects in regression:
 - Marginal vs. total effects

Table 5 of paper...



	Ln(Patents)		
	t+1	t+2	t+3
	(1)	(2)	(3)
<i>Free banking</i> × <i>Free state</i>	0.442*** (0.084)	0.469*** (0.148)	0.558*** (0.172)
<i>Free banking</i>	0.092 (0.090)	0.146 (0.087)	0.094 (0.095)
<i>Free state</i>	-1.509*** (0.361)	-1.215** (0.503)	-1.085** (0.500)



Main Comments and Questions

- Interaction effects in regression:
 - Marginal vs. total effects
- Need to focus on total effect and not the marginal.
- Split *Free-banking* into
 - *Free-banking*Free State*
 - *Free banking*Slave State*
 - Several papers you can look at including my own on “Access to Financing.....”



Final Thoughts

- Overall a very nice and interesting time in history to study for innovation.
- Brings to attention an interesting fact of how to think about the developmental process of innovation. What factors matter and how do these interact?
- I enjoyed reading it and I learned a lot about antebellum America!
- Look forward to the next iteration!