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The property tax as a coordinating device: Financing Indiana's Mammoth Internal Improvement System, 1835–1842[☆]

John Joseph Wallis*

*Department of Economics, University of Maryland, Room 3105, Tydings Hall, College Park,
MD 20742-7211, USA*

National Bureau of Economic Research, 1050 Massachusetts Ave., Cambridge, MA 02138

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Abstract

In 1836, the state of Indiana set out to build a Mammoth system of canals, railroads, and turnpikes following a decade of intense debate in which sectional rivalries prevented any state action. This paper investigates the role played by the adoption of an *ad valorem* property tax in ameliorating the sectional rivalries and coordinating the costs of financing the transportation system with the taxes levied to finance it. It also traces the rise and fall of land values in the state between 1835 and 1842, estimating the effect of internal improvement projects on land values.

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1. Introduction

At the end of the War of 1812, America possessed a seemingly inexhaustible amount of land available for settlement in the west. The land's full potential could

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* Corresponding author. Fax: 1-301-405-3542.

E-mail address: wallis@econ.bsos.umd.edu.

only be realized by building a transportation network linking the fertile Ohio and Mississippi valleys with the rapidly developing economies of the eastern seaboard. Sectional rivalries repeatedly frustrated federal government efforts to build a national system of “internal improvements.”¹ With few exceptions, Congress was unable to forge an agreement between sections of the country on where improvements should go and how they would be paid for.² Crossing the Appalachian barrier was left to the states. New York’s bold and enterprising construction of the Erie Canal, begun in 1817, inaugurated the state canal era, followed by Ohio, Pennsylvania, and Maryland in the 1820s. Indiana, Illinois, and Michigan began work on canals and railroads in the mid 1830s, even as New York and Ohio expanded their canal systems and Massachusetts and Georgia were working on railroads.

It might appear that states, with their smaller land areas and relatively more homogenous populations, were able to avoid the geographic conflicts that plagued the national government. Such was not the case. Americans struggled to implement a vision of democracy in which the government played a positive role in promoting economic development, at the same time that the government did not unduly burden one group to benefit another. Canals were, by nature, geographically specific enterprises. Construction of a canal unavoidably privileged some geographic areas while creating potential or actual tax liabilities for everyone else. One apparent solution was to build canals (or railroads) everywhere at once, a solution often credited for overburdening transportation systems in Pennsylvania, Indiana, and Illinois. Log-rolling, however, was only an apparent solution. States could not build canals to every county. Some way had to be found to reconcile and coordinate the disparate interest of taxpayers and the promoters and supporters of internal improvements.³

Conditions were unique in every state, but in the central tier of states through which the major east/west transportation routes ultimately ran—New York, Ohio, and Indiana—states reconciled geographic competition over canals in the same way. Each state altered their existing property taxes to more carefully bring the costs of financing internal improvements into line with the geographic distribution of ben-

¹ As Larson (2001, 1987) and Goodrich (1960, 1948), explain, the federal government was unable to support a national system of canals and/or railroads before the Civil War because of concerns over national power and sectional rivalries. Larson and Goodrich are excellent histories of the internal improvement movement in the 1820s, 1830s, and 1840s, and provide a background for the Indiana experience studied in this paper.

² What might seem to be the major exception, Congress’s passage of the Bonus Bill in 1817 allocating the bonus paid by the Second Bank of the United States to a fund to support internal improvements, is the exception that proves the rule. The Bonus Bill did not specify any projects, indeed it could not have passed had it done so. Calhoun, the bill’s sponsor, admitted a bill specifying projects in detail could not be passed: “The enemies to any possible system in detail and those who are opposed in principle, would unite and defeat it.” *Annals of Congress*, 14th Congress, 2nd session, pp. 852–858 (As quoted in Larson, 2001, p. 66). Instead, the Bonus Bill allocated money between the states on the basis of population, insuring that no major projects would be built in any state(s). See Larson’s discussion of the Bonus Bill, pp. 64–67.

³ “Internal improvements” encompasses transportation improvements of all types. Railroads were just coming on the scene in the late 1820s and early 1830s. From the standpoint of state investment, canals and railroads were very close substitutes. “Canals” are often used in the text where “canals and railroads” would be equally appropriate.

efits. The essential element in the new tax systems was tying the benefits of canal construction realized in higher land prices to the taxes that individual citizens paid. In New York, in 1817, the state created a special “canal tax” to be levied on counties on the canal if it became necessary to raise additional funds to service state bonds. In Ohio in 1826 and Indiana in 1836, new *ad valorem* property taxes on land and other personal property were created to shift the burden of state taxation from agricultural land assessed on a per acre basis to a more equitable base of farm lands, town lands, and personal property. Miller’s *Enterprise of a Free People* and Scheiber’s *Ohio Canal Era* show how important tax changes were in New York and Ohio. Indiana’s story has yet to be told (cf. Miller, 1962; Scheiber, 1969).

In 1830, much of Indiana was wilderness: Indians still held claim to the north west quarter of the state. Except for long settled southern counties along the Ohio river, a natural highway to the Mississippi and eastern markets, Hoosiers were far removed from the transportation necessary to bring their agricultural goods to market. Without better transportation, Indiana land was worth little more than the \$1.25 an acre it brought at public auction, a lack acutely appreciated by the farming land speculators that made up the electorate. After a decade of debate, in 1836 the Indiana legislature enacted a new *ad valorem* property tax and authorized the commissioners of the state’s Board of Internal Improvement to borrow up to \$10 million dollars, at an interest rate of no higher than 5%, to survey and construct a network of canals, roads, and railroads spanning the state.⁴ At the time, Indiana had a population of 600,000 people and annual tax revenues of about \$50,000. Financial difficulties forced the state to suspend construction on canals and railroads in 1839. By 1841, the state was in default on over \$12,000,000 in state debts, none of the canals or railroads were completed, and Indiana and the nation were in the grip of the deepest depression of the 19th century.⁵

The major obstacle to internal improvements in Indiana before 1836 was sectional, just as it was in the nation.⁶ A closer look at the historical record illuminates how the shift to *ad valorem* taxation placated section rivalries, made the enactment of the “Mammoth” system of internal improvements possible, and reveals a hidden treasure. Not leaving the geographic distribution of taxes to chance, in 1835 Indiana commissioned the state Auditor to prepare a report detailing how the proposed

⁴ “An Act to provide for a general system of Internal Improvements.” Indiana Laws, Chapter II, Indiana General Assembly, 20th session, p. 5. The history of the Indiana canals is told in Fatout (1972), Carmony (1998) and Esarey (1912a,b, 1918).

⁵ The best source on history of state borrowing and the debt crisis is McGrane (1935). Ratchford (1941) provides additional information. For more recent studies of the debt crisis see English (1996), Sylla and Wallis (1998), and Wallis et al. (1997).

⁶ Peculiarities in the history and administration of the property tax in New York and Ohio make it impossible to duplicate this analysis in those states. For more than a decade from the 1820s to the 1830s New York suspended its state property tax entirely, and the state stopped collecting information on assessed values and property taxes in the counties. Ohio was notorious for not reassessing land values. Once entered on the books property values would remain unchanged for years, rendering problematic variations in land values over short periods of time.

ad valorem property tax would affect each county in the state. That report forms the basis for a statistical inquiry into the effects the *ad valorem* tax on the incidence of the property tax and, subsequently, the effect of internal improvement construction on land values throughout Indiana. The majority of Indiana counties expected to pay a lower share of state taxes under the *ad valorem* system than under the old per acre land tax. Towns, with their urban land and larger holdings of personal property, bore significantly higher tax burdens under the *ad valorem* system. It was, of course, those very same towns that expected to receive the lion's share of gains from the construction of canals and railroads. By switching to the *ad valorem* tax, canal proponents agreed to shoulder a larger share of the future taxes necessary to finance the transportation system.

The sectional compromise reached in 1836 not only redistributed the existing taxes, it anticipated that land values would rise in internal improvement counties so that counties with canals or railroads would pay a higher share of future taxes. Indiana land values are tracked through the boom and bust cycle using Auditor's Reports for 1835, 1837, and 1842. Internal improvement counties did realize the largest gains in land values between 1835 and 1837. The terms of the bargain reached in 1836 were fulfilled. Unfortunately, Indiana land values collapsed after 1839 when construction on the internal improvement system stopped, and the collapse can also be used to estimate the effect of canals and railroads on property values.

2. Geography and history

When Indiana entered the Union in 1816, its population was concentrated in a narrow band of counties along the Ohio river.⁷ Indians controlled roughly two-thirds of the state until the "New Purchase" of 1818. In a treaty signed at St. Mary's Ohio, the Delaware, Weas, Kickapoos, Pottawattomie, and Miami tribes agreed to cede territory and withdraw to the north side of the Wabash river. The tribes continued to hold this land until another round of cessions and treaties in the late 1820s and early 1830s. The Wabash river rises in north-eastern Indiana and flows west toward Lafayette, where the river turns south. Below Terre Haute the river forms the southern portion of the boundary between Indiana and Illinois, before it empties into the Ohio river in the southwest corner of the state (Fig. 1). In the northeast, the Wabash passes about 30 miles southwest of Fort Wayne, where a short portage connects the Wabash with the Maumee river. The Maumee runs northeast, through the northwest corner of Ohio and into Lake Erie. The Wabash held out the hope of an all water route from the Ohio river to Lake Erie, offering cheap and reliable transportation to much of central Indiana. The Wabash was the highway along which settlers

⁷ For the geography of Indiana counties see Pence and Armstrong (1933). I have also relied on the maps in Esarey (1918).

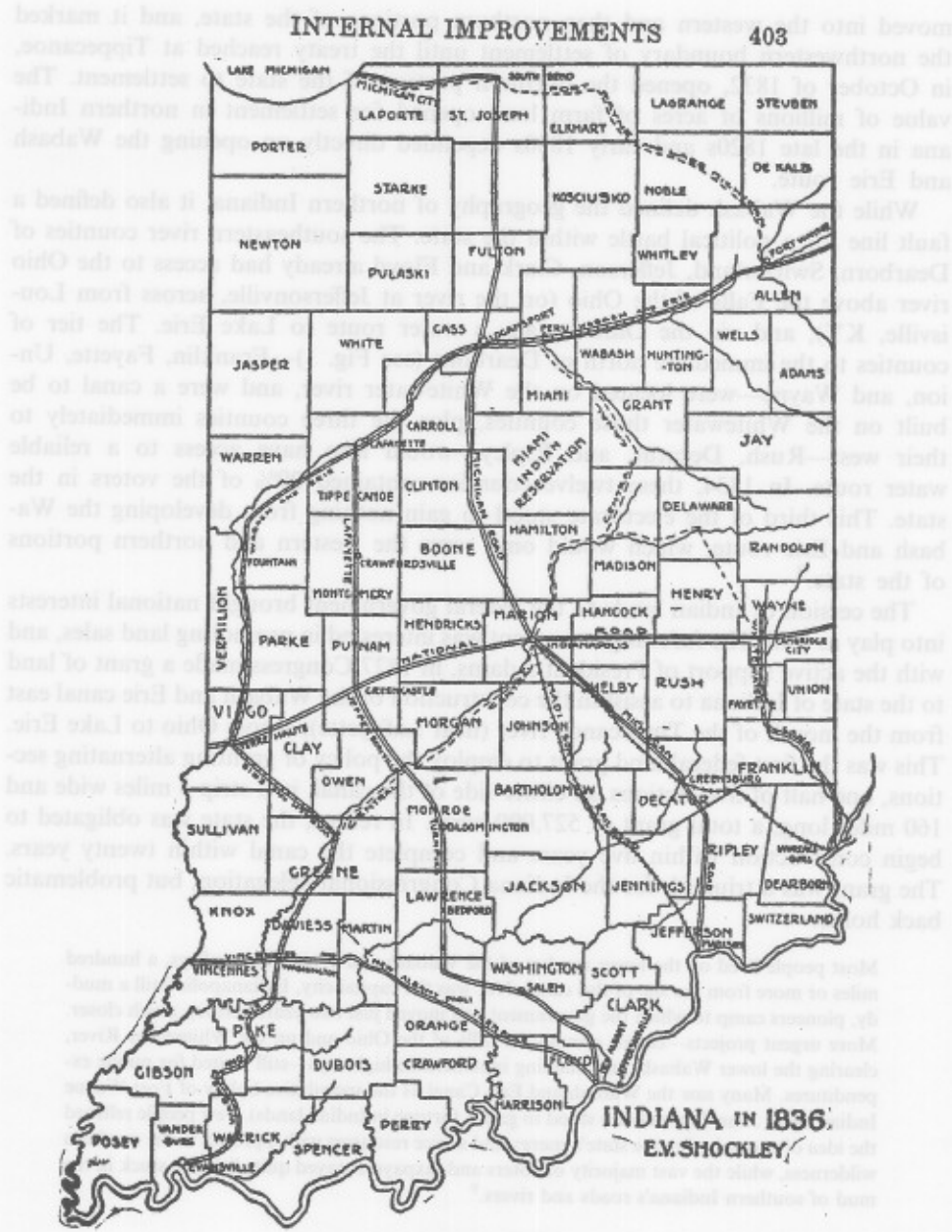


Fig. 1. Indiana counties and internal improvements in 1836 (Esarey, 1918).

moved into the western and then northern portions of the state, and it marked the northwestern boundary of settlement until the treaty reached at Tippecanoe, in October of 1832, opened the northern portion of the state to settlement. The value of millions of acres of farm land opened for settlement in northern Indiana in the late 1820s and early 1830s depended directly on opening the Wabash and Erie route.

While the Wabash defined the geography of northern Indiana, it also defined a fault line for a political battle within the state. The southeastern river counties of Dearborn, Switzerland, Jefferson, Clark and Floyd already had access to the Ohio river above the Falls of the Ohio (on the river at Jeffersonville, across from Louisville, KY), and via the Ohio canals, a water route to Lake Erie. The tier of counties to the immediate north of Dearborn (see Fig. 1)—Franklin, Fayette, Union, and Wayne—were located on the Whitewater river, and were a canal to be built on the Whitewater those counties, plus the three counties immediately to their west—Rush, Decatur, and Ripley—would also have access to a reliable water route. In 1834, these twelve counties contained 29% of the voters in the state. This third of the electorate stood to gain nothing from developing the Wabash and Erie route, which would only serve the western and northern portions of the state.⁸

The cession of Indian lands to the federal government brought national interests into play as well. The federal government was interested in promoting land sales, and with the active support of President Adams, in 1827 Congress made a grant of land to the state of Indiana to assist in the construction of the Wabash and Erie canal east from the mouth of the Tippecanoe river (near Lafayette), across Ohio to Lake Erie. This was the first federal land grant to employ the policy of granting alternating sections, one-half of five sections on either side of the canal, in a strip 5 miles wide and 160 miles long, a total grant of 527,000 acres. In return, the state was obligated to begin construction within five years and complete the canal within twenty years. The grant was a triumph for the Indiana Congressional delegation, but problematic back home:

Most people lived on the lower reaches of the Wabash and Whitewater valleys, a hundred miles or more from the site of this canal. Nor was the capital city, Indianapolis (still a muddy, pioneers camp to which the government had moved just two years before), much closer. More urgent projects—canals around the falls of the Ohio and up the Whitewater River, clearing the lower Wabash, and building innumerable highways—still waited for public expenditures. Many saw the Wabash and Erie Canal as the speculative hobby of Fort Wayne Indian agent John Tipton (who stood to gain a fortune in Indian lands). Few people relished the idea of encumbering the state's energy and scarce resources with a project in the northern wilderness, while the vast majority of voters and taxpayers stayed quite literally stuck in the mud of southern Indiana's roads and rivers.⁹

⁸ The 29% figure is taken from the enumeration of "polls" in the Indiana Auditor's Report for 1834.

⁹ Larson (2001, p. 207). See Fatout (1972), for a description of events leading up to the grant for the Wabash and Erie.

Table 1
National public land sales, Indiana land sales, Indiana land values and taxable acres 1834–1843

Year	National land sales	Indiana land sales	Acres taxed	Value of land and improvement	Value of town lots	Value per acre land	Value per acre land + town	Total taxes
1833	3,856	555	4,329					\$40,758
1834	4,658	674	4,651					\$36,459
1835	12,564	1,587	5,447	\$29,451	\$2,991	\$5.41	\$5.96	\$44,537
1836	20,074	3,245						\$51,279
1837	4,805	1,250	6,186	\$61,033	\$9,181	\$9.87	\$11.35	\$64,437
1838	3,414	602	7,130	\$60,612	\$14,171	\$8.50	\$10.49	\$164,633
1839	4,976	618						\$171,636
1840	2,236	118	8,273	\$58,344	\$12,504	\$7.05	\$8.56	\$300,481
1841	1,164		10,188					\$168,898
1842	1,129		13,646	\$73,297	\$12,482	\$5.37	\$6.28	\$393,248
1843	1,605		14,675	\$76,133	\$12,399	\$5.19	\$6.03	\$490,265

Notes. Acres in thousands of acres, value in thousands of dollars, and value per acre in dollars.

Land sales from Gates (1968).

All other information from Annual Report of the Auditor of State, Indiana, various years. These numbers are taken from the totals reported by the State Auditor, they differ in minor respects from other totals reported in the paper which represent the sum of the county figures reported by the Auditor.

Total taxes includes all revenues collected in each fiscal year.

The grant, however, was too attractive to pass up, and in the summer of 1832 the state created a Board of Canal Fund Commissioners and began construction of the Wabash and Erie. Indiana was in the canal business, if only in a small way.

The early years of the 1830s brought renewed prosperity to Indiana and the entire western region of the country. Table 1 provides some basic information for the years 1834–1843: national land sales in thousands of acres, public land sales in Indiana in thousands of acres, acres of land subject to taxation, the value of land and improvements, the value of town lots, average per acre value of land including and excluding town lots, and total tax revenues from all source collected in each fiscal year. The table shows the peak of land sales in 1836, the peak of land values in 1837, and the rapid decline in land values after 1839.¹⁰ Note one unusual feature of Table 1: the lag between public land sales and acres of land subject to taxation. Every state admitted to the Union from Ohio in 1803 to Missouri in 1821 was prohibited from levying taxes on land for five years from the date of sale to a private individual. The lag is pivotal in understanding Indiana's optimism about its fiscal future in 1836. The 1834 the state levied taxes on 4,651,000 acres of land. In 1835 and 1836 alone, public land sales in Indiana totaled 4,823,000 acres. The state expected its property tax base to double in acreage by 1841, and the increase in acreage would be augmented by the

¹⁰ We do not have the numbers for 1839. The Auditor reported in 1841 that per acre values in Indiana were \$7.30 in 1838, \$8.80 in 1839, \$7.05 in 1840, and \$6.18 in 1841. These numbers are not exactly the same as the actual numbers presented in earlier Auditor's Reports, but they are consistent. The Auditor felt that 1839 was the peak year for land values in Indiana.

new *ad valorem* property tax's ability to tax rising land values. Although public land sales in 1835 and 1836 were extraordinary by any measure, 1836 was not the end of the boom in Indiana.¹¹ Land sales fell back from their 1836 peak in 1837 and 1838, but stayed high by historical standards into 1839. Land values stayed high through 1839 as well.

— Once construction began on the Wabash and Erie canal in 1832, pressure mounted to do something for other parts of the state. Economic conditions were improving and land sales were booming. Southeastern Indiana made a strong case for building a canal along the Whitewater; southwestern Indiana demanded that the lower Wabash be cleared or a canal constructed; and central Indiana, rapidly growing and the home of the new capital, argued for a cross cut canal or railroad to connect the widespread regions of the state. The state's resources, however, were limited. The fiscal potential created by opening northern lands and the boom in land sales throughout the state could not be realized immediately because of the tax moratorium. Early public sales of Wabash and Erie canal lands had been disappointing. Governor Noah Noble, elected in 1831 on an anti-internal improvement platform, switched his position and became the leading proponent of transportation investment.¹² Noble eased some of the opposition concerns to higher taxation when, in his annual message to the legislature in December 1833, he proposed that the canal system might be carried out with borrowed funds.¹³ With Noble's support and urging, passage of some internal improvement system seemed inevitable in Indiana.

Only the most optimistic supporters suggested that the canals would immediately produce revenues capable of servicing the proposed debt (plans did not anticipate completion of the system until well into the 1840s), some taxes would have to be raised to pay interest. Internal improvement supporters faced two intertwined challenges: deciding which parts of the state would get projects and how the tax burden would be distributed across the population. Indiana legislatures met from December to February. The 1833/34 legislative session failed to produce a canal bill. The 1834/35 session spent a great deal of time arguing over proposed canal and railroad routes. The *Indiana Democrat* reported on January 20, 1835 that "We have never witnessed, in our ten years experience of legislative matters, so much interest

¹¹ More land was sold in 1836 than in any other year in the nation's history. The reasons for the land boom have never been satisfactorily explained, booms rarely are completely understandable, and there has been considerable disagreement about the causes of the Panic of 1837 that checked the land boom. See Temin (1969). Temin's explanation of the Panic of 1837 and the Crisis of 1839 have recently been questioned by Rousseau (2002) and Wallis (2001).

¹² Noble would head the Internal Improvement Board when his second term as Governor ended in 1837. The *Indiana Democrat*, July 19, 1837 chastised Noble and governor elect Wallace: "When the subject of internal improvements was first agitated by Ex. Governor Ray; Gov. Noble and Wallace were opposed to it. Ray was regarded as a visionary schemer, the advantages of internal improvements were underrated; and the resources of the state were not duly estimated. It was good policy, no doubt then, on the part of Noble and Wallace, to oppose internal improvements, and the Gov. then rode the anti internal improvements hobby, with whip and spur, with as much speed as he now rides the internal improvement hobby."

¹³ Riker and Thornbrough (1958, pp. 204–205).

manifested on any other question."¹⁴ In the end, however, intense sectional disputes stood in the way of compromise. As Nathan Palmer wrote to Senator John Tipton "A decided majority appeared to be in favor of entering into a general sistem [sic], but the rock upon which they split, was the details of the bill. Such was the conflicting interest that it seemed impossible to agree, and finally the matter fell, to be recusitated [sic] at the next session."¹⁵ Instead of authorizing construction, the legislature passed a canal bill on February 6, 1835, requiring the Canal Fund Commissioners to study the feasibility of a number of canals, roads, and railroads.

It was not until January 27, 1836, that Indiana passed the Mammoth Internal Improvement bill. The bill created a Board of Internal Improvement and authorized it to borrow up to \$10 million, secured by the good faith and credit of the state. The Board was to continue construction of the Wabash and Erie and extend its western terminus to Terre Haute; to begin clearing the lower Wabash; to begin construction of the Whitewater Canal; to begin construction of a Central Canal to connect the Wabash and Erie at Fort Wayne with the Whitewater canal via Indianapolis, and to extend south to Evansville on the Ohio river; to begin building the Madison railroad connecting Indianapolis with Madison in Jefferson county; to begin several new roads; and to begin surveying routes for proposed roads, canals, and railroads. The main projects and their routes are shown in Fig. 1.

3. *Ad valorem* taxation and the Mammoth Bill

Few Indiana historians understand how passage of the Mammoth bill was connected to changes in the structure of property taxation. Most historians ignore the new tax system altogether.¹⁶ The change to *ad valorem* property tax changes is

¹⁴ As quoted in Carmony (1998, p. 191).

¹⁵ Robertson and Riker (1942, p. 127). "Assemblymen wrestled with a multitude of proposals, making the usual vote-swapping bargains with each other, but they could not agree on the details of a general system satisfactory to all the clamorous sections of the state." Fatout (1972, p. 67).

¹⁶ The only explicit recognition of the link between the tax bill and the internal improvement bill comes in Riker and Thornbrough (1958, p. 316) and Carmony (1998, p. 158), but the nature of the connection is not explained or understood. The Indiana historians include Esarey (1912a,b, 1918), Fatout (1972), Carmony (1998), Duden (1909), Miller (1907), Riker and Thornbrough (1958), Cottman (1907a,b), Benton (1907), Chambers (1907), and Comstock (1911). The most thorough treatment of internal improvements in Indiana is Esarey's *Internal Improvements in Early Indiana* (1912), which is repeated, almost verbatim, in his *History of Indiana* (1918). Esarey makes no mention of the tax bills in connection with the internal improvement bills. The irresistible tendency is to suggest that Indiana made no provision for taxation at all when it started the Mammoth system. For example, "Numerous politicians and voters alike persuaded themselves that a system of internal improvements could be financed through long term loans paid for largely, if not entirely, by revenue generated by the resulting, canals, railroads, and turnpikes." Carmony (1998, p. 185). Or "The plan that emerged was a splendid free gift offered to the public with emphatic assurances that it would not cost anybody one cent of additional taxes" Fatout (1972, p. 73). Carmony and Fatout accurately reflect the general feeling that the Mammoth system would not result in higher taxes, while ignoring the explicit arrangement that legislators had made about the distribution of taxes should higher taxes be necessary. As soon as 1837 it was necessary to raise the tax rate from .5 mill to 1 mill. Tax rates would eventually rise to 4 mills in 1841 in an attempt to stave off default.

usually dated 1835, while the Mammoth bill is always dated 1836, implying the two changes occurred at least a year apart. In the 1850s, Indiana politicians blamed the collapse of the internal improvement system on the fact that projects had been started in so many parts of the state in order to placate sectional rivalries.¹⁷ Esarey's account of the passage of the Mammoth bill draws heavily on the recollection of politicians at the constitutional convention of 1850, particularly a speech given by Judge Kilgore. Kilgore's story emphasized the importance of logrolling and the sentiment, expressed in a speech by Owen, that "if we must be taxed for the support of this system, let us, at least, have a share in its benefits."¹⁸ It was forgotten that changes to the property tax were as important in working out the regional compromise as starting projects all over the state. Indeed, legislators required that the compromise over taxation be made explicit before the Mammoth bill could go forward, the central claim of this paper.

Prior to 1835, Indiana relied on two revenue sources: a poll tax and a land tax. Land was classified into one of three categories—first, second, and third rate—and taxed by the acre. The rates in force since 1831 levied a tax of "eighty cents on each hundred acres of first-rate land, sixty cents on each hundred acres of second-rate land, and forty cents on each hundred acre of third-rate land."¹⁹ Polls, "each male inhabitant between twenty-one and sixty years of age, who is sane and not a pauper," were taxed at thirty-seven and a half cents per person. In fiscal 1834, the state levied \$28,362 in poll taxes and \$25,807 in land taxes. As Indiana legislators contemplated an internal improvement system in the winters of 1833/34, 1834/35, and 1835/36 they also considered an *ad valorem* property tax.

The proponents and opponents of the internal improvement system were divided geographically. Construction on the Wabash and Erie began in 1832, and support came from the northern and western parts of the state to increase funding and speed construction. In the southeast corner of the state, proponents of the Whitewater canal—"the strongest of the interests—were sure of their position, but wished to hold the State to as few lines as possible so as to insure a rapid prosecution of the Whitewater canal." The Whitewater canal ran through Dearborn, Franklin, Fayette, and Wayne counties, and the Whitewater group included legislators from the bordering counties of Union, Rush, Henry, Decatur, and Delaware counties. Support for a system rallied around these two poles of interest. Vigorous opposition came from long settled counties in the south of Indiana: "As finally organized, this [canal] party controlled every county in the State but seven—Harrison, Posey, Crawford, Switzerland, Hendricks, Perry, and Spencer; and six of these were on the Ohio. The total voting strength of these counties was always less than ten out of a body of eighty members."²⁰

¹⁷ Esarey's (1912b) essay concludes with a sweeping indictment of Indiana politics in 1835 and 1836, taken from the words of Indiana politicians at the constitutional convention in 1850.

¹⁸ Kilgore's speech on the afternoon of Thursday, November 21, 1850 can be found in Indiana Constitutional Convention (1851, pp. 676–680), and Owen's comments on p. 684.

¹⁹ Indiana Laws, February 10, 1831, Chapter LXXXI, General Assembly, 15th session, pp. 426–427.

²⁰ Both quotes are from Esarey (1912b, p. 98) or Esarey (1918, p. 410).

The internal improvement counties (counties through which a proposed canal, railroad, or turnpike would pass) clearly possessed a majority of the votes in the Senate and House as early as 1833, why didn't a canal bill pass sooner? First, despite the claim by some canal promoters that property taxes would not have to be raised to cover interest payments, many voters and legislators had serious doubts that taxes would stay low. In fact, the Canal commissioners report in 1836 assumed that property tax rates would rise from 1/2 mill to 1 mill. The original 1/2 mill rate was raised to 1 mill in 1837, then in successive steps to 4 mills in 1842. Fears about higher taxes were legitimate and warranted. Actual property tax collections as a millage of property valuations are given in Table 2.

More importantly, it was generally believed that the proposed changes in the property tax would have a significant impact on the geographic allocation of taxation. Land owners in older, southern agricultural regions were sure that taxing land by value would disproportionately raise their tax burden. Richard Thompson, a representative from Bedford in Lawrence county, who was an enthusiastic supporter of internal improvements, was nonetheless concerned about how taxes might be raised to finance it. As he wrote to Governor Noble in June of 1835, he was adamantly opposed to *ad valorem* taxation:

Our people are opposed—most violently opposed to the *ad valorem* system of taxation, at this time. They think, that the time as not yet come—that the burden of taxation will be *unequally* increased upon the farmer of the old counties. This has always been my opinion. The advocates of that system, I think are mistaken when they assert that the system is equalized by bringing in to the treasury a tax from the north, which we now loose [sic]. It must be admitted that the farmer of the north, (however unimproved his farm may be if it be in cultivation at all) *must* have such articles of personal property as are taxable under the present law—that the farmer of the S. has accumulated a much larger portion of personal property than in

Table 2
Effective property tax rates in Indiana in millages

Year	Effective tax rate
1837	0.65
1838	1.70
1839	
1840	
1841	1.72
1842	3.60
1843	2.32
1844	2.08
1845	2.28
1846	2.40
1847	2.88
1848	3.21

Note. The effective tax rate is calculated by taking the ratio of taxes paid to the total value of assessed property.

The effective rate includes the effects of delinquencies and defaults. The legislated rate was usually the next highest half number, e.g., 1/2 mill, 1 mill.

the new counties. Under this state of things the aggregate increase will be such as to render it unequal and oppressive upon the farmer of the old counties, because he pays a tax for those things which the farmer of the new counties has not, and which he must have hereafter. Until the property is equalized and all the land of the state taxable, I think it bad policy—(Thompson to Noble, June 5, 1835, in Riker and Thornbrough, 1958, p. 372).

Thompson's letter shows that a canal supporter could still oppose the system if it entailed a switch to *ad valorem* taxation. It also shows the logic of the southern farmers case against *ad valorem* taxes: southern farmers possessed more wealth subject to the tax than northern farmers in new counties.

This logic is distinctly different from the logic that Governor Noble, the most important supporter of the internal improvement system, laid out in his Governor's messages in December of 1833, 1834, and 1835. All three messages urged a switch to *ad valorem* taxation and beginning a system of internal improvements. The message of December 3, 1833 called assessment under the current revenue system "defective, unequal, and unnecessarily expensive." The message of December 2, 1834 recommended that Indiana consider changing its "revenue laws to insure greater accuracy and uniformity, as well as economy, in assessing and rating lands for taxation." In his message of December 8, 1835 Noble was more explicit: "The expenses of our state government have been hitherto, borne, principally, by the landholders, while other large, and generally, much more productive investments of capital have contributed little or nothing to the state treasury. Although some of our citizens object to the number of articles included in the law, it is confidently believed, it can be so shaped as to render it agreeable to their views – particularly when they see that the tax upon land will be reduced in proportion to the amount that is charged upon other subjects of taxation – such property as now pays nothing and which can only be brought in by the change proposed. No good and satisfactory reason can be assigned why capital invested in town property, bank stock, merchandize, or money at interest, should not be subject to the same rate of taxation as an equal amount invested in land."²¹

What Noble understood and Thompson did not, was all farmers could realize lower taxes if a shift to *ad valorem* taxation occurred. The major shift in the incidence of taxation was not between northern and southern farmers in the new and old counties, but between residents of the towns and the farmers. The way to resolve the disagreement about the actual incidence of *ad valorem* taxation was to actually assess property values. This was done in the act to "provide for an equitable mode of levying the taxes of this state," approved on February 7, 1835. The act charged the Auditor of the state and the clerks of each county with appointing assessors to "take a list of all the taxable inhabitants of his township, and make an assessment of all the property therein made subject to taxation by this act, and for that purpose he shall call on each person resident in his township, and request of such person a list of all his property liable to tax-

²¹ Riker and Thornbrough (1958), the 1833 message is on pp. 191–210, the quote from p. 192; the 1834 message is on pp. 314–333, and the quote on p. 315; and the 1835 message is on pp. 385–412, and the quote from p. 407.

ation as aforesaid in said township; . . .”²² The Auditor was to report his findings to the Governor and legislature in December of 1835. The act, however, did not levy any taxes.²³ It mandated that information be collected on the value of land and personal property in order to make an informed decision about changing the revenue law. Every taxable inhabitant heard about the proposed law, as they were each to be visited by the assessor in their township.

The 1835 revenue law was intimately connected to the internal improvement bill considered at the same session. The *Indiana Journal*, January 5, 1835, reported on an amendment proposed by Mr. Clark to the internal improvement bill then under consideration. The amendment would have put off construction on any projects until further study was made and: “Also to inquire if it not be necessary that an *ad valorem* system of taxation be adopted by the state before entering upon any system of internal improvement, and providing that lands in the vicinity of the contemplated works shall be rated with a reference to the increased value they will acquire, and thereby make the burden of constructing works of improvement bear a proportion corresponding with the benefits received.” Although Clark’s amendment was rejected, the legislature ultimately enacted the amendment’s substance in the revenue bill of February 7, 1835, which required the Auditor to prepare a report on the effects of an *ad valorem* tax, and in the internal improvement bill passed on February 6, 1835, which required the commissioners of the canal fund to prepare a report on the canal and railroad projects authorized a year later in the Mammoth bill. The *Indiana Democrat*, February 27, 1835, understood the connection between the tax law and the internal improvement bill. “This law was considered by many as an entering wedge of the general system of [internal] improvement contemplated at the next session.”²⁴

Because the structure of the new property tax was contained in the 1835 bill, *ad valorem* taxation in Indiana is typically dated from 1835, even though *ad valorem* taxation was not authorized until the revenue bill of February 8, 1836 levied the first *ad valorem* tax. Internal improvements in Indiana date from the Mammoth bill of January 27, 1836. Internal improvements and *ad valorem* taxation were intimately connected, for the reasons that Clark laid out in his amendment: the redistribution of current tax burdens and expected future tax liabilities, and the coordination of the benefits from internal improvement spending with taxes levied to pay for the Mammoth system.

²² *Laws of Indiana*, Chapter XI, 19th session, p. 14.

²³ Section 30 of the act can be read as implying that the *ad valorem* tax would be implemented on February 1, 1836, but the legislature would explicitly authorize implementation of the tax in the winter of 1836. As discussed by State Senator Embree, the design of the act was explicitly designed to allow for public opposition, by “allowing it [the new tax] to take effect one year after its passage so that if the people should not be satisfied with its provisions they could easily instruct their representatives before it went into operation—this at least will bring the subject before the people and I hope will be the means of settling the question so that so much time and money will not hereafter be annually spent legislating on it.” From the Embree papers in the Indiana State Library, quoted by Riker and Thornbrough (1958, pp. 315–316).

²⁴ As quoted in Carmony (1998, p. 158); also referenced in Riker and Thornbrough (1958, p. 316).

4. *Ad valorem* taxation compared to per acre taxation

How did the proposed *ad valorem* tax compare to the old per acre tax? In his Governor's message of December 8, 1835, Noble reported:

The law of last session, providing for a change in our revenue system, does not require the clerks of the several counties to report the returns of the assessors to the Auditor of State before the first day of December, consequently I am not able to present you with a view of the result of the valuations. From the best information I can obtain, however, it is believed that the disparity anticipated in the value of real estate in the old and new districts of the state, does not exist. If, upon a comparison of all the returns, this opinion shall found to be correct, there can be but little reason to question the policy or justice of a change.²⁵

The assessors reports were ultimately filed and we can compare the returns of the State Auditor for 1834 and 1835 to ascertain the amount of property tax paid by each county under both forms of taxation. The results were surprising (they are reported by county in Appendix Table A1. In both years the state expected to receive roughly \$25,000 from the property tax on land, so we can compare directly the amount of tax paid by each county. Of the 55 counties for which complete information is available in both years, 39 paid less tax under the *ad valorem* scheme than the old system.²⁶ *Ad valorem* taxes were less than 80% of per acre taxes in 28 counties, while in only 12 counties were *ad valorem* taxes more than 120% of per acre taxes. The figures in the table and in the analysis, focus on the value of land and improvements, excluding town lots and personal property.²⁷

As already noted, Noble understood why so many counties paid lower taxes: the inclusion of taxes on town property, bank stock, merchandise or money at interest. The numerical majority of land owners in Indiana were farmers and the per acre tax fell largely on their land. *Ad valorem* taxation enabled to the state to tax the value of town lands and other personal property, and shift some of the tax burden away from agricultural land. Agricultural land in the older southern counties did not experience higher taxes as a result of the shift to *ad valorem* taxation (see below) and southern opposition to the canal bill was substantially muted as a result. Indiana was not a heavily urbanized state in 1835, and the small number of town residents bore a larger share of the tax burden under the new tax system. The adoption of the *ad valorem* tax, however, was not the result of tyranny of the majority, other forces were also at work.

²⁵ Riker and Thornbrough (1958, p. 407)

²⁶ Fifteen new counties were created in 1835, and these are not included in the comparison. Neither are the seven counties created between 1836 and 1844. Of the existing counties in existence in 1834, fifteen reported incomplete information in 1834 or 1835.

²⁷ It seems natural to include the value of town lots in the value of land, but a problem arises when we compare per acre valuations across counties. In most Indiana counties, the value of town lots per acre of land fell in the late 1830s as the amount of land subject to taxation rose. This has nothing to do with the actual value of the town lots, it is a result driven by acreage. Since the results in the paper would only be stronger if town lots were included, I have chosen to leave them out.

Indiana towns were located at breaks in the transportation network. When the state planned the system of internal improvements, it chose routes that followed existing rivers (a necessity for canals) and ran between existing population centers. To do otherwise made no sense. Although farmers along canal and railroad routes expected to benefit from lower transportation costs, the big winners from internal improvements, and therefore the most vocal promoters, were the mercantile interests in the towns located in the interstices of the system. Appendix Table A1 also includes the share of all land value in the county in town lots in 1835, and a variable “terminus” indicating whether two or more transportation lines (actual or proposed) intersected within the county. The table is sorted by the ratio of taxes paid under the *ad valorem* tax to taxes paid under the per acre tax. Counties whose taxes rose under the *ad valorem* system were much more likely to have a high share of town property in their total assessed land value, and they were more likely to be terminus counties.

Table 3 presents the results of bivariate regressions where the dependent variable is the ratio of *ad valorem* taxes proposed in 1835 to per acre taxes levied in 1834. The tax ratio is regressed on a dummy variable for “internal improvement” counties (all counties including a canal, railroad, or turnpike proposed in the Mammoth bill), a dummy for “terminus” counties (all counties including an intersection of two transportation routes, including the Ohio River), “town lands” (the value of town lands

Table 3
Regression of the ratio of *ad valorem* taxes levied in 1835 to the per acre taxes levied in 1834 on county characteristics (Standard Errors)

Internal Improvement	.33 (.15)	—	—	—
Terminus	—	.73 (.18)	—	—
Town lands as share of total value	—	—	2.45 (.45)	—
Latitude	—	—	—	.20 (.10)
Intercept	.78 (.12)	.86 (.07)	.71 (.08)	-7.08 (3.9)
<i>N</i>	53	53	53	53
<i>R</i> ²	0.09	0.24	0.36	.08

Notes. Dependent variable in all regressions “ratio of taxes in 1835/1834,” a continuous variable measuring the ratio of *ad valorem* taxes levied in 1835 to the per acre taxes levied in 1834.

All observations are county means or dummy variables.

“Internal Improvement” is a dummy variable equal to 1 if a county has a canal, railroad, or turnpike.

“Terminus” is a dummy variable equal to 1 if a county contains an intersection of a canal, railroad, turnpike, and/or river.

“Town Lands” is a continuous variable measuring the share of town lands in total value of all lands in 1835.

“Latitude” is the latitude of the center point of each county.

as a share of total land value in each county), and “latitude” (the latitude of the central point of each county).

The results clearly indicate counties that ultimately received a canal or railroad paid higher taxes. On average, *ad valorem* taxes in internal improvement counties were 33% higher than in non-internal improvement counties.²⁸ Terminus counties, including all of Indiana’s larger towns, paid *ad valorem* taxes that were 73% higher than non-terminus counties. This result is confirmed by the estimates for town lots. A one percentage point increase in the share of town land in the total land value in a county of increased that county’s *ad valorem* taxes by 2.5% points. Finally, the estimates for latitude address directly the concerns of southern counties, who felt they would pay higher taxes under the *ad valorem* scheme. Instead, northern counties paid slightly higher *ad valorem* taxes than southern counties relative to the per acre tax.

The regression estimates only emphasize what the eye sees in the raw data. The dozen counties that paid substantially higher *ad valorem* taxes were the primary beneficiaries of internal improvement investment (a point substantiated in the next section). Had the shift in revenue structure not been tied to the internal improvement program, the towns would have adamantly opposed the change. Towns stood to gain the most from canals and railroads, and they were quite willing to exchange higher taxes for the benefits they saw just over the horizon.

5. Internal improvement investment and land values

Indiana approved the Mammoth Bill and implemented the *ad valorem* property tax in the winter of 1836. Construction on canals and railroads began in the summer and counties began collecting the property tax. The remaining task is to determine whether the bargain made in 1836 was fulfilled: did counties located along canal and railroad routes experience a larger increase in property values than counties off the routes and thus pay a larger share of the property tax burden?

Property taxes collected in 1836 were based on the 1835 assessments and another round of assessments was made in 1837. By comparing the assessed value of land in 1835 and 1837, we can measure the impact of internal improvement construction on land values. As the result a historical quirk, we can perform the test twice. When the state began construction in 1836, it expected its property tax base to double in size by 1841 simply through the addition of taxable acreage, augmented by any rise in land values captured by the *ad valorem* property tax. Expectations about rising land values were realized through the summer of 1839. The state borrowed money in national and international credit markets, through the services of several investment banks, the most important being the Morris Canal and Banking Company of New Jersey. In retrospect, it was unfortunate that the

²⁸ Since the comparison between the per acre tax and the *ad valorem* tax both compare \$25,000 in total taxes, the mean ratio of taxes under the two systems is very close to 1. Evaluating the coefficients at the mean tax ratio of 1 produces the percentage changes in taxes reported in this paragraph.

state chose to sell bonds on credit to the Morris Bank. The bank agreed to take several million in state bonds and repay the state in installments. The state assumed liability for the bonds immediately, but was not paid for the bonds for several years. In the summer of 1839, the Morris Bank defaulted on roughly \$3,000,000 of its obligations to Indiana. The state relied on the Morris Bank installments to meet interest payments and to pay contractors. Construction on state projects was halted in August of 1839. With the end of construction land values began to plummet. The state struggled to meet its interest payments in 1839 and 1840. While it raised tax rates in an attempt to generate more revenue (Table 2), property values fell. By 1842, average land values per acre were half of their 1837 values (Table 1). The state was bankrupt and suspended interest payments on its debts in 1841.²⁹ The cessation of construction in 1839 affords us the opportunity to assess the effects of canals and railroads both when land prices were rising, and when land prices were falling and it was clear that the canals and railroads would not be built (although we will note an exception for the Whitewater canal shortly).

In 1835 and 1836, when the Indiana legislature authorized the Mammoth bill, land values were increasing throughout Indiana and the country. This general rise in land values should not be attributed to the Mammoth bill. Likewise, after 1839, when construction on the Indiana system halted and land values began to plummet, not all of the decline in land values should be attributed to the cessation of internal improvement construction. Table 4 presents some simple, but persuasive, differences-in-differences results. Between 1835 and 1837 land values in Indiana rose sharply, by an average of \$3.90 an acre statewide, by \$4.55 an acre in internal improvement counties, and by \$2.74 in non-internal improvement counties,³⁰ a difference of \$1.81 an acre. This is an estimate of how much canals and railroads raised land values, after accounting for the general rise in land values. The \$1.81 figure probably underestimates the effect of internal improvements on land values: the location of planned canals was public knowledge and land values had already risen in anticipation of construction when property assessments were made in 1835. Since construction on canals and railroads came to halt in the summer of 1839, a second differences-in-differences estimate comparing 1837 and 1842 gives us another way to measure the benefits of building canals and railroads, this time by measuring how much land values fell when it became clear that the projects would not be

²⁹ See Fatout (1972, pp. 96–106). The default crisis is considered in much greater detail, including the situation in Indiana in Wallis et al. (1997/2003) and the particular importance of the Morris defaults in 1839 for Indiana and the nation as a whole in Wallis (2001). For the purposes of this paper, it is enough to note that the Morris default was completely exogenous to Indiana (most of the Morris bonds went directly to Europe) and that the state was taken by surprise in the summer of 1839.

³⁰ This is the mean increase in land values per acre across counties, that is, it is the average of the county values. The numbers in Table 1 show that the average acre of land rose from \$5.41 per acre in 1835 to \$9.87 in 1837. These numbers are the average value for all acres, that is, total value of land in the state divided by total acreage. Because land values are not distributed equally over all counties, the two “averages” are slightly different.

Table 4
Differences-in-differences estimates change in average land value per acre Indiana counties

	1835–1837	1837–1842
All counties	\$3.90	–\$4.21
Internal improvement counties	\$4.55	–\$5.49
Non-internal improvement counties	\$2.74	–\$2.80
Difference	\$1.81	–\$2.69
<i>N</i>	60	75
Terminus counties	\$8.29	–\$9.06
Non-terminus counties	\$2.93	–\$3.11
Difference	\$5.36	–\$5.95
<i>N</i>	60	75
High tax ratio counties		
<i>Ad valorem</i> > 1.2 per acre	\$4.91	–\$5.38
Low tax counties		
<i>Ad valorem</i> < .8 per acre	\$2.99	–\$2.14
Difference	\$1.92	–\$3.24
<i>N</i>	52	51

Notes. Average land values per acre are calculated for land and improvements. They do not include town lots or personal property.

The number of observations in each cell varies. All differences are statistically significant at the 10% level or higher.

completed.³¹ The second column of the table shows that land values fell by an average of \$4.21 an acre statewide between 1837 and 1842. The decline was \$5.49 an acre in internal improvement counties and \$2.80 an acre in non-improvement counties, a difference of \$2.69 an acre. The average value of raw land (excluding improvements) was only \$3.85 an acre in 1842. Land owners expected substantial benefits from canals and railroads, benefits that were capitalized into land values. The effects were very large, and contributed substantially to the rise in land values up to 1837 and the collapse of land values after 1839.

Interpreting these estimates as the “true” effect requires the assumption that the only difference between improvement and non-improvement counties was the anticipated construction of a canal or railroad and that there were no general equilibrium effects of the system. For example, expectations about the value of land everywhere in Indiana could have changed when the Mammoth system was inaugurated, as potential land owners revised their expectations of transportation costs throughout the state. If land values in every county rose because of the Mammoth system, then the differences-in-differences understate the true impact of improvements on land values.

³¹ Ultimately the Wabash and Erie, and the Whitewater canal were completed, but not until later in the 1840s. In effect, even the estimates comparing 1837 and 1842 underestimate the effect of canals, since people knew that there were plans in the works to complete those two canals. The lower portion of the Whitewater canal had been completed in 1839. Later we will see that land values along the Whitewater rose between 1837 and 1842.

On the other hand, the Mammoth system could have reduced the amount of funds for transportation improvements in non-improvement counties. If so, then the differences-in-differences estimate overestimates the effect of improvements on land values. Were we interested in more precise estimates of the improvements on land values, these would be important issues to consider. Such refinements are not required for the purposes of verifying that land prices changed in the way that politicians expected them to change.³²

The second and third panel of the table calculate differences-in-differences estimates for two alternative groups of counties. “Terminus” counties contain an intersection between major canals, railroads, turnpikes, or rivers. The increase in property values between 1835 and 1837 was concentrated in the terminus counties. Appendix Table A2 gives the change in property value per acre between 1835 and 1837, between 1837 and 1842, and indicates whether a county is a terminus county. Between 1835 and 1837, land in terminus counties rose in value by \$8.29 an acre and by only \$2.93 an acre in non-terminus counties, a difference of \$5.36 an acre. Likewise, land value per acre fell by \$9.06 an acre in terminus counties and by \$3.11 an acre in non-terminus counties between 1837 and 1842, a difference of \$5.95 an acre. Land markets were active throughout the state, average land prices doubled in the typical county, but terminus counties were the center of the major land speculations. The towns were big canal promoters, agreed to pay higher taxes, and reaped the benefits of higher land values.

The third panel of the table separates counties by the ratio of *ad valorem* taxes under the 1835 assessment to the per acre taxes paid in 1834 (again, comparing \$25,000 of land taxes in both years and excluding town lots and personal property in 1835). The comparison is limited to counties with a ratio of less than .8 or more than 1.2.³³ Counties that paid higher taxes under *ad valorem* experienced a rise in property values of \$4.91 between 1835 and 1837, while counties with lower taxes under *ad valorem* experienced only a \$2.99 rise in per acre value, a difference of \$1.92 an acre. Between 1837 and 1842, value per acre fell by \$5.38 in high tax counties and by only \$2.14 in low tax counties, a difference of \$3.24 an acre. These results are striking evidence that, *ex ante*, counties that expected to realize large gains in property value because of canal and railroad construction were the same counties that, *ex post*, not only paid higher taxes but realized greater gains in land values. However we segregate the counties, land values rose disproportionately in internal improvement counties between 1835 and 1837, and fell disproportionately between 1837 and 1842.

The upper panel of Table 5 reports the results of bivariate regressions that duplicate the differences-in-differences results for internal improvement and terminus

³² This is the subject for another paper, with more careful consideration of the effect of different types of transportation projects on land values, using more thorough data, as done by Craig et al. (1998).

³³ If counties with higher taxes under the *ad valorem* system are compared to counties with lower taxes, i.e., using a break point of one, the difference estimate is small and statistically insignificant. There are a number of counties clustered around a ratio of one. A regression of the change in land values between 1835 and 1837 on the tax ratio is provided in Table 2. A rise in the tax ratio of .01 increases land values by about \$.02 an acre.

Table 5
Regressions of the change in value per acre 1835–1837 and 1837–1842 on county characteristics (Standard Errors)

	1835–1837			1837–1842		
Internal Improvement	1.81 (1.17)	—	—	-2.69 (.93)	—	—
Terminus	—	5.35 (1.33)	—	—	-5.95 (1.07)	—
Ratio of Taxes in 1835/1834	—	—	2.02 (.94)	—	—	-2.77 (.80)
<i>N</i>	60	60	52	75	75	51
<i>R</i> ²	0.04	0.22	0.08	0.09	0.29	0.19
Internal Improvement	0.34	—	—	-1.06 (.89)	—	—
Terminus	5.21 (1.43)	3.79 (1.69)	—	-5.44 (1.15)	-5.33 (1.24)	—
Wabash and Erie	—	0.17 (1.31)	—	—	-0.32 (1.01)	—
Ohio River	—	-0.04 (1.72)	—	—	-0.12 (1.13)	—
Central Canal	—	1.26 (1.33)	—	—	-2.53 (1.11)	—
Turnpike	—	-0.12 (1.14)	—	—	0.97 (.81)	—
Whitewater Canal	—	-0.12 (2.23)	—	—	3.53 (1.80)	—
Fort Wayne and Michigan	—	6.51 (2.20)	—	—	-6.35 (1.80)	—
Railroad	—	2.55 (1.61)	—	—	-1.34 (1.29)	—
<i>N</i>	60	60	—	75	75	—
<i>R</i> ²	0.22	0.36	—	0.3	0.48	—

Notes. Dependent variable in all regressions is the change in the per acre value of land and improvements. All observations are county means or dummy variables.

Intercept not reported because of space limitations.

"Internal Improvement" is a dummy variable equal to 1 if a county has a canal, railroad, or turnpike.

"Terminus" is a dummy variable equal to 1 if a county contains an intersection of a canal, railroad, turnpike, and/or river.

"Ratio of taxes in 1835/1834" is a continuous variable measuring the ratio of *ad valorem* taxes levied in 1835 to the per acre taxes levied in 1834.

The remaining variables are dummies for the counties that border on or contain the Wabash and Erie Canal, the Ohio River, the Central Canal, a turnpike, the Whitewater Canal, the Fort Wayne and Michigan Canal, or a railroad.

counties, and conveniently provide standard errors for the difference estimates. (Table 6 presents means and standard deviations for the variables used in the regression analysis.) The dependent variable in each regression is the change in the value of

Table 6

Variable means

Variable	Year	N	Mean	SD
Total acreage taxed	1834	63	73,873	50,708
Total acreage taxed	1835	63	86,663	97,443
Total acreage taxed	1837	79	77,033	62,464
Total acreage taxed	1842	86	158,679	76,444
Value of land and improvements	1835	62	\$479,086	\$420,870
Value of land and improvements	1837	79	\$772,601	\$756,841
Value of land and improvements	1842	84	\$867,064	\$615,253
Value of land per acre	1835	62	\$5.82	\$2.23
Value of land per acre	1837	79	\$9.37	\$4.91
Value of land per acre	1842	84	\$5.17	\$2.18
Change in value per acre	1835–1837	61	\$3.90	\$4.46
Change in value per acre	1837–1842	76	–\$4.21	\$4.28
Number of polls	1835	60	1,071	550
Number of polls	1837	82	1,016	626
Number of polls	1842	85	1,319	690
Latitude		92	39.84	1.07
<i>Dummy variables</i>				
Terminus		92	0.15	0.36
Turnpike		92	0.39	0.49
Wabash and Erie canal		92	0.22	0.41
Whitewater canal		92	0.04	0.21
Central canal		92	0.13	0.34
Railroad		92	0.10	0.30
Ohio River		92	0.34	0.13

land and improvements per acre in each county between 1835 and 1837 or between 1837 and 1842. In the regressions, the ratio of 1835 *ad valorem* taxes to 1834 per acre taxes is entered as a continuous variable. The lower panel of the table presents two specifications for each time period, again the dependent variable is the change in the land value per acre. When both terminus and internal improvement counties are included, terminus counties raise land values by \$5.21 an acre between 1835 and 1837, and lower land values by \$5.44 an acre between 1837 and 1842, while internal improvement counties have much smaller effects, raising land values by \$3.34 an acre between 1835 and 1837, and lowering land values by \$1.06 an acre from 1837 to 1842. The estimated effects for the terminus counties are in line with the difference estimates, and indicate that most of the action in both periods was in terminus counties. The second specification breaks up counties by the specific improvement located within their borders. Again, terminus counties have a large effect in both periods. The Fort Wayne and Michigan canal counties realize gains of \$6.51 an acre between 1835 and 1837, all of which was lost between 1837 and 1842.

The Whitewater case is particularly interesting.³⁴ The Whitewater canal, started in 1836, was to run from Wayne County south to Dearborn County. Construction started first on the south end of the canal, and by June of 1839 the lower half of the canal had been opened from Lawrenceburg to Brookeville. Construction then stalled, and when the state was unable to complete work “the canal was sold to Henry S. Vallette, a wealthy Cincinnati, who proceeded to complete it.” Construction on the Whitewater continued until 1846 when the canal reached Hagerstown in Wayne county. Whitewater canal counties realized a gain of \$3.53 an acre between 1837 and 1842, controlling for the terminus effect (two Whitewater counties are also terminus counties). The experience of the Whitewater counties shows what happened to land values in counties where canals were expected to be completed.

6. An independent estimate

In their paper on transportation improvements and land values, Craig et al. (1998) examine the relationship between per acre farm land values and access to transportation in the 1850 and 1860 Census. Their analysis is more sophisticated than the simple estimates in this paper, as they control for soil composition, crop mix, and population density and draw on a much larger geographic sample. Their results provide a useful reliability check on the results for Indiana.

Craig, Palmquist, and Weiss find that per acre land values in 1850 were \$12.12, that location on a canal or river raised land values by \$2.68 an acre, and that location on a railroad raised land values by \$1.80 an acre. Per acre land values in Indiana were roughly \$9.87 statewide in 1837, and per acre land values were \$1.81 higher in internal improvement counties. The larger terminus county effects are not comparable to the Craig, Palmquist, and Weiss results, as they look only at farm values and not urban land. In Indiana in 1837, about 20% of the value of lands was attributable to internal improvements, while Craig, Palmquist, and Weiss find that access to water raised land values by about 22%. The magnitudes of the Indiana effects are comfortably close to the magnitudes estimated by Craig et al. (1998).

7. Conclusions

This paper contributes to several strands of early 19th century American economic history. On the technical side, it adds to the empirical studies showing the relationship between transportation investment and land values, as in recent papers by Craig, Palmquist, and Weiss and by Coffman and Gregson (1998). Fogel (1964) used the change in land values after railroads were built as a rough estimate of social saving in *Railroads and American Economic Growth*. What distinguishes the Indiana

³⁴ For a brief history of the Whitewater Canal see Miller (1907). Portions of the Whitewater Canal are still in operation today, and remnants of the canal are visible for most of its length.

experience is the large fluctuations in land values within a very short period of time and the concentration of price changes in the terminus counties. The terminus effect is not an “urbanization” effect. These counties did not become more urbanized between 1835 and 1837 and then less urbanized between 1837 and 1842. The terminus result suggests that very substantial gains in land values may be overlooked if our primary focus is rural agricultural land. What is commonly attributed to urbanization may truly be capturing some of the benefits of transportation investment.

An appreciation of the ingenious ways in which American governments pursued the sometimes conflicting goals of promoting economic development while nurturing democratic political institutions is the focus of this paper. Indiana wanted canals and railroads for very good economic reasons. The typical citizen was a land speculator, if only in a small way, and the median voter certainly wanted to raise land values by building transportation improvements. Inevitably, however, building a canal rewarded some groups at the expense of others, an outcome inconsistent with beliefs about the fairness of democratic policies. Indiana struggled for a decade to find a compromise between sectional interests that would enable it to go forward with a system of transportation improvements. Ultimately, the compromise was not to build canals and railroads to every county. If that had been the only constraint the Indiana legislature could have passed the Mammoth bill in 1834 or 1835.

The critical compromise reallocated the burden of taxation across counties to coordinate the expected benefits of transportation expenditures with the expected costs of taxation. The counties that expected to gain the most from canal and railroad construction were asked to bear a larger share of the tax burden. The Auditor’s Report published in December of 1835 made comparison of tax burdens under the old per acre tax and the proposed *ad valorem* property tax easy and explicit. The legislature designed the 1835 tax bill so that citizens could compare their tax burdens under the old per acre tax system and the new *ad valorem* system. The majority of counties paid lower taxes under the new tax than the old tax. Southern counties who opposed statewide internal improvement spending paid lower taxes under the new tax than the old tax. Counties located on the intersections of major transportation routes, however, counties with towns that expected to reap the largest gains from state expenditures, paid substantially higher taxes under the new tax than the old tax. Terminus counties paid *ad valorem* taxes that were, on average, 73% higher than they paid under the per acre tax.

Indiana voters and politicians may have been naive: they certainly did not perceive that land values would fall precipitously after 1839, but there was nothing naive about the compromise they reached. They correctly anticipated how land values would be affected by canal and railroad construction. The average per acre value of land and improvements in 1835 was \$5.41. Between 1835 and 1837, value per acre rose by \$2.74 in non-improvement counties, \$4.55 in improvement counties, and \$8.29 in terminus counties. Property taxes on land and improvements in terminus counties rose three times faster than in non-improvement counties. The property tax coordinated the benefits of canal construction with the taxes levied to finance canal costs, enabling opponents and supporters of Indiana’s Mammoth system to reach a political compromise and launch Indiana’s ill-fated era of internal improvements.

Appendix. Table A1

Ratio of taxes paid under per acre and ad valorem taxes

County	Ratio 1835/34	Percent town lots	Terminus county
Martin	0.42	0.10	0
Scott	0.49	0.08	0
Pike	0.54	0.06	0
Daviess	0.58	0.12	1
Johnson	0.58	0.04	0
Bartholomew	0.60	0.00	0
Jennings	0.61	0.09	0
Harrison	0.61	0.07	0
Sullivan	0.62	0.07	0
Gibson	0.63	0.10	0
Randolph	0.65	0.03	0
Lawrence	0.67	0.06	0
Orange	0.68	0.12	0
Fountain	0.68	0.04	0
Rush	0.69	0.03	0
Owen	0.69	0.07	0
Jackson	0.70	0.06	0
Greene	0.70	0.11	0
Ripley	0.73	0.07	0
Knox	0.73	0.37	0
Hendricks	0.75	0.05	0
Clarke	0.75	0.13	0
Morgan	0.75	0.06	0
Warrick	0.76	0.11	0
Perry	0.80	0.09	0
Hamilton	0.83	0.06	0
Washington	0.83	0.14	0
Parke	0.87	0.07	0
Monroe	0.88	0.11	0
Marion	0.88	0.35	1
Shelby	0.88	0.04	0
Switzerland	0.91	0.10	0
Boone	0.92	0.07	0
Carroll	0.93	0.08	0
Vermilion	0.96	0.12	0
Clinton	0.97	0.06	0
Putnam	0.98	0.06	1
Vigo	0.99	0.26	1
Tippecanoe	1.10	0.18	1
Clay	1.12	0.09	0
Union	1.12	0.02	0
Madison	1.15	0.04	0
Henry	1.18	0.05	0
Hancock	1.20	0.10	0
Warren	1.21	0.03	0
Fayette	1.22	0.05	0
Delaware	1.23	0.06	0
Wayne	1.43	0.13	1

Appendix A (continued)

County	Ratio 1835/34	Percent town lots	Terminus county
Dearborn	1.54	0.14	1
St. Joseph	1.62	0.08	1
Grant	1.67	0.07	0
Franklin	2.01	0.04	0
Cass	2.14	0.80	1
Jefferson	4.12	0.63	1

Notes. Ratio 1835/34 is the ratio of taxes paid under the proposed ad valorem tax in 1835 to taxes paid by the county in 1834 under the per acre land tax. Both figures are taken from the Report of the State Auditor for 1834 and 1835.

The table only includes counties with complete information in the 1834 and 1835 reports.

Town Lots is the share of all land value reported as town lots in 1835.

Terminus equals 1 if the county contains the junction of two transportation lines.

Appendix. Table A2

Per acre land values and the change in land values 1835, 1837, and 1842

County	1835	1837	1842	1835–1837	1837–1842	Terminus
Adams	—	\$8.50	\$3.84		–\$4.66	0
Allen	\$5.79	\$26.24	\$3.43	\$20.45	–\$22.81	0
Bartholomew	\$7.49	\$10.68	\$8.27	\$3.19	–\$2.41	0
Benton	—	—	\$5.10			0
Blackford	—	—	\$3.55			0
Boone	\$5.65	\$5.00	\$4.03	–\$0.65	–\$0.97	0
Brown	—	\$5.66	\$4.84		–\$0.82	0
Carroll	\$7.69	\$11.20	\$3.48	\$3.51	–\$7.72	1
Cass	\$7.13	\$13.54	\$3.77	\$6.41	–\$9.76	0
Clarke	\$1.12	\$8.38	\$4.55	\$7.26	–\$3.83	0
Clay	\$4.44	\$7.56	\$4.84	\$3.12	–\$2.72	0
Clinton	\$4.07	\$6.49	\$4.63	\$2.41	–\$1.86	0
Crawford	—	\$6.27	\$3.67		–\$2.60	0
Daviess	\$3.81	\$5.47	\$4.49	\$1.66	–\$0.97	1
Dearborn	\$8.82	\$12.15	\$11.09	\$3.34	–\$1.07	1
Decatur	\$12.94	\$14.31	\$8.35	\$1.37	–\$5.96	0
DeKalb	—	—	\$2.84			0
Delaware	\$6.42	\$9.04	\$4.43	\$2.62	–\$4.61	0
Dubois	—	\$4.68	\$4.00		–\$0.68	0
Elkhart	\$3.59	\$11.64	\$3.71	\$8.05	–\$7.93	0
Fayette	\$10.80	\$17.07	\$13.44	\$6.27	–\$3.63	0
Floyd	—	\$15.85	\$8.57		–\$7.28	0
Fountain	\$5.91	\$9.28	\$5.38	\$3.37	–\$3.90	0
Franklin	\$7.97	\$13.16	\$9.33	\$5.18	–\$3.82	0
Fulton	—	\$6.85	\$2.42		–\$4.43	0
Gibson	\$3.89	\$7.79	\$5.26	\$3.90	–\$2.53	0
Grant	\$10.22	\$9.69	\$4.05	–\$0.53	–\$5.64	0
Greene	\$3.22	\$5.08	—	\$1.86	–\$5.08	0
Hamilton	\$7.22	\$9.59	\$4.85	\$2.38	–\$4.75	0
Hancock	\$6.90	\$8.43	\$4.19	\$1.53	–\$4.24	0

Appendix B (continued)

County	1835	1837	1842	1835–1837	1837–1842	Terminus
Harrison	\$3.99	\$4.65	\$3.78	\$0.66	-\$0.87	0
Hendrick	\$6.82	\$9.78	\$6.28	\$2.96	-\$3.50	0
Henry	\$7.71	\$10.81	\$8.19	\$3.10	-\$2.61	0
Howard	—	\$4.96	—	—	—	0
Huntingdon	\$5.00	\$4.71	\$3.94	-\$0.29	-\$0.77	0
Jackson	\$5.19	—	\$4.47	—	—	0
Jasper	—	—	\$4.20	—	—	0
Jay	—	\$4.88	\$3.25	—	-\$1.63	0
Jefferson	\$7.67	\$19.77	\$7.85	\$12.10	-\$11.92	1
Jennings	\$5.17	\$8.87	\$5.52	\$3.70	-\$3.35	0
Johnson	\$4.18	\$8.77	\$6.39	\$4.59	-\$2.38	0
Knox	\$3.44	\$6.50	\$4.96	\$3.07	-\$1.55	0
Kosciusco	—	\$5.91	\$2.98	—	-\$2.94	0
Lagrange	—	\$3.45	—	—	—	0
Lake	—	\$8.91	\$1.67	—	-\$7.24	0
Laporte	\$4.84	\$14.08	\$4.24	\$9.24	-\$9.84	0
Lawrence	\$4.49	\$7.78	\$5.98	\$3.29	-\$1.81	0
Madison	\$11.52	\$9.30	\$4.32	-\$2.22	-\$4.99	0
Marion	\$6.24	\$33.47	\$9.79	\$27.23	-\$23.68	1
Marshall	—	\$7.82	\$2.04	—	-\$5.78	0
Martin	\$3.05	\$3.41	\$5.12	\$0.36	\$1.71	0
Miami	—	\$18.15	\$3.80	—	-\$14.36	0
Monroe	\$4.95	\$8.43	\$5.96	\$3.47	-\$2.47	0
Montgomery	\$4.43	\$9.50	\$6.79	\$5.07	-\$2.71	0
Morgan	\$4.80	\$9.16	\$5.71	\$4.36	-\$3.46	0
Newton	—	—	—	—	—	0
Noble	—	—	\$2.15	—	—	0
Ohio	—	—	—	—	—	0
Orange	\$4.13	\$5.87	\$4.58	\$1.74	-\$1.29	0
Owen	\$4.01	\$6.31	\$4.67	\$2.29	-\$1.64	0
Parke	\$5.99	\$8.79	\$5.92	\$2.80	-\$2.87	0
Perry	\$6.55	\$9.81	\$5.69	\$3.25	-\$4.11	0
Pike	\$3.57	\$6.56	\$4.79	\$2.99	-\$1.78	0
Porter	—	\$8.00	\$2.60	—	-\$5.40	0
Posey	—	\$7.70	\$5.05	—	-\$2.65	0
Pulaski	—	—	—	—	—	0
Putnam	\$6.24	\$9.20	\$5.92	\$2.96	-\$3.28	1
Randolph	\$4.73	\$7.95	\$3.82	\$3.22	-\$4.13	0
Ripley	\$4.24	\$6.60	\$3.91	\$2.36	-\$2.69	0
Rush	\$5.43	\$12.01	\$9.60	\$6.58	-\$2.41	0
St. Joseph	\$4.54	\$9.17	\$3.67	\$4.63	-\$5.50	1
Scott	\$2.64	\$3.76	\$4.39	\$1.11	\$0.63	0
Shelby	\$6.91	\$8.83	\$5.89	\$1.92	-\$2.94	0
Spencer	—	\$6.47	\$4.61	\$6.47	-\$1.86	0
Starke	—	—	—	—	—	0
Stueben	—	—	\$2.14	—	—	0
Sullivan	\$3.97	\$5.55	\$3.81	\$1.59	-\$1.74	0
Switzerland	\$8.04	\$9.93	\$6.09	\$1.89	-\$3.84	0
Tippecanoe	\$6.17	\$12.47	\$6.36	\$6.30	-\$6.11	1
Tipton	—	—	—	—	—	0

Appendix B (continued)

County	1835	1837	1842	1835–1837	1837–1842	Terminus
Union	\$9.61	\$15.11	\$8.42	\$5.50	-\$6.70	0
Vanderburg	—	\$18.09	\$5.57		-\$12.52	0
Vermilion	\$5.89	\$7.63	\$5.12	\$1.74	-\$2.51	0
Vigo	\$7.06	\$9.97	\$7.63	\$2.91	-\$2.34	1
Wabash	\$4.33	\$4.13	\$4.30	-\$0.19	\$0.16	0
Warren	\$5.07	\$9.31	\$4.14	\$4.24	-\$5.17	0
Warrick	\$4.83	\$7.61	\$4.34	\$2.78	-\$3.27	0
Washington	\$5.03	\$7.51	\$5.76	\$2.48	-\$1.75	0
Wayne	\$9.01	\$13.82	\$11.15	\$4.81	-\$2.66	1
Wells	—	\$4.33	\$4.02		-\$0.30	0
White	\$4.45	\$5.08	\$3.34	\$0.63	-\$1.75	0
Whitely	—	—	\$2.85		\$2.85	0

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