Finance and Inequality in a Panel of US States*

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ABSTRACT

We examine the impact of sector-based reform on income inequality, concentrating on state banking deregulation in the US, for which we employ annual balanced panel data from all 50 states and the District of Columbia, covering the period from 1970 to 2000, for our baseline analysis. The estimation strategy exploits the variation across states and years in the enactment of laws that remove restrictions on in-state bank branch geographical expansion and cross-state bank business operational expansion to compute the effects of developments in the financial sector on income inequality. We find evidence that inequality on average decreases with within-state branching reform, whereas it on average increases with between-state banking deregulation. Utilising five different measures of inequality (top decile income share, Atkinson index, the Gini coefficient, relative mean deviation, and Theil entropy index), we determine that our finding materially depends on which measure of income inequality is being considered. We argue that this has not been stressed in the previous literature.

JEL codes:
G28, O11, O16, O51

Keywords:
Finance, financial sector laws, banking deregulation, income inequality, United States

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1. Introduction

Financial development has emerged as a prominent factor for explaining income inequality (Beck et al. 2007, 2010; Johansson and Wang 2014; De Haan and Sturm 2017; Blau 2018).[1] In this paper, we revisit this line of inquiry by focussing on policy reforms in the US financial system. Given, however, the dynamic and multifaceted nature of a modern economy, singling out one policy variable as the most valuable is an onerous task. This is further compounded in the case of the US financial sector because several reforms (on chartering restrictions and geographic expansion, deposit insurance, product-line and activity restrictions, pricing restrictions, and capital regulations) were concomitantly put in place between 1970 and 2000 (Kroszner and Strahan 2014). Nevertheless, this paper concentrates on banking sector-based reform relating to entry and location expansion and offers new insights about the distributional effects of financial policies.[2]

Our study rests upon two observations. The first is concerning the unresolved problem of income inequality, which varies widely between and within countries. On this, many international, national and sub-national (including governmental, non-governmental, for-profit, not-for-profit, and religious) organisations and leaders have weighed in. Recently, this issue has been given further central attention by Pedro Conceição, the Director of the Human Development Report Office (HDRO) of the United Nations Development Programme (UNDP) in a press release in March 2019 to re-articulate the objective of his agency, as it celebrates 30 years next year, writing that:

> We will start with inequality… [as] today's world remains deeply unfair. The life and prospects faced by a newborn in a poor country or a poor household are radically different from those of wealthier children. In all societies, long-standing forms of inequality persist while gaps are opening in new aspects of life.[3]

He went on to stress the need for urgency in grasping a deeper understanding of all the essential dimensions of inequality and the relevance of providing corresponding appropriate measures that can map them better. This sentiment was echoed by the 44th president of the United States, Barack Obama, who, in December 2013, labelled income inequality the "defining challenge of our time," and highlighted how "a family in the top 1 percent has a net worth 288

[1] Claessens and Perotti (2007) and Demirguc-Kunt and Levine (2009) are excellent references for a review of the theory, channels, and evidence on the links between finance and inequality.

[2] Other noteworthy candidates that have been used to account for income inequality in the previous literature are human capital accumulation, institutional development, economic growth, and population heterogeneity (Engerman and Sokoloff 1997, 2002; Dollar and Kraay 2002; Alesina et al. 2003). Fischer et al. (2019), on the other hand, investigates the impact of income inequality on finance.

[3] Retrieved from http://hdr.undp.org/en/content/human-development-reimagined.

times higher than the typical family, which is a record for [America]." When speaking on the "diminished levels of upward mobility," he described, "[a] child born in the top 20 percent has about a 2-in-3 chance of staying at or near the top. A child born into the bottom 20 percent has a less than 1-in-20 shot at making it to the top. He's 10 times likelier to stay where he is."[4]

We believe that these statistics resonate with what Okun, writing in 1975, described thus: "We can't have our cake of market efficiency and share it equally" (p. 2). Put differently, efficiency more often than not trumps equality in the age-old conundrum (the big trade-off) confronting every politician and policymaker in a capitalist democracy. The exigency to protect the many at the "base" versus the whims of the few at the "apex" is, perhaps, what drove the 7th president of the United States, General Andrew Jackson, to shut down the Second Bank of the United States, famously saying: "The bank is trying to kill me, but I will kill it."[5]

Additionally, in the Apostolic Exhortation *Evangelii Gaudium* (The Joy of the Gospel) of the Holy Father, the *Pontifex Maximus* Francis lent his voice to the discourse on the need to rethink the implementation of capitalism, given the growing plight of the poor (i.e., rising income inequality). The pope wrote:

> Just as the commandment "Thou shalt not kill" sets a clear limit in order to safeguard the value of human life, today we also have to say "thou shalt not" to an *economy of exclusion* and *inequality*. Such an economy kills. How can it be that it is not a news item when an elderly homeless person dies of exposure, but it is news when the stock market loses two points? This is a case of exclusion. Can we continue to stand by when food is thrown away while people are starving? This is a case of inequality (Francis 2013, p. 45 [emphasis added]).

The second observation is in connection with the statistical evidence from the US data on income inequality post-World War I (Fig. 1). We represent income inequality, using top decile income share. The figure shows the yearly trends for each state, from 1917 to 2015, with datelines to indicate some of the key regulatory and deregulatory events over this period.[6] The state-level picture is consistent with the U-shaped pattern established in the time-series data for the whole of the US by Piketty and Saez (2003) and Piketty (2014).[7] More specifically, the figure shows

[4] Retrieved from https://www.washingtonpost.com/politics/running-transcript-president-obamas-december-4-remarks-on-the-economy/2013/12/04/7cec31ba-5cff-11e3-be07-006c776266ed_story.html.
[5] Retrieved from https://www.britannica.com/event/Bank-War.
[6] In unshown plots for the four other measures of income inequality (Atkinson index, Gini coefficient, relative mean deviation and Theil entropy index) studied in this paper, our conclusion on the decadal movements are qualitatively the same.
[7] Rising income inequality is not a phenomenon that is unique to the US, in any case. Solt (2009) and Dabla-Norris et al. (2015), for example, document evidence of this outcome for many countries.

that top decile income share was largest in Delaware in 1917, amounting to over 63% followed by those of the District of Columbia (56.29%), New York (53.34%), and Maryland (51.25%).

At this same time, South Dakota, with 20.5%, had the smallest share of top decile income, while Idaho was the only other state where top 10% earners were making less than 25% of the total income reported. The next two decades, which includes the eras of the Great Depression and the beginning of World War II, continued to be characterised by a high share of income for the top decile though to varying degrees across states, most importantly after 1929. For instance, the mean top decile income share between 1917 and 1940 is 39.6%, with an overall standard deviation of 7.12%. Additionally, the minimum (maximum) top decile income share during this period is 18.03% (69.5%).

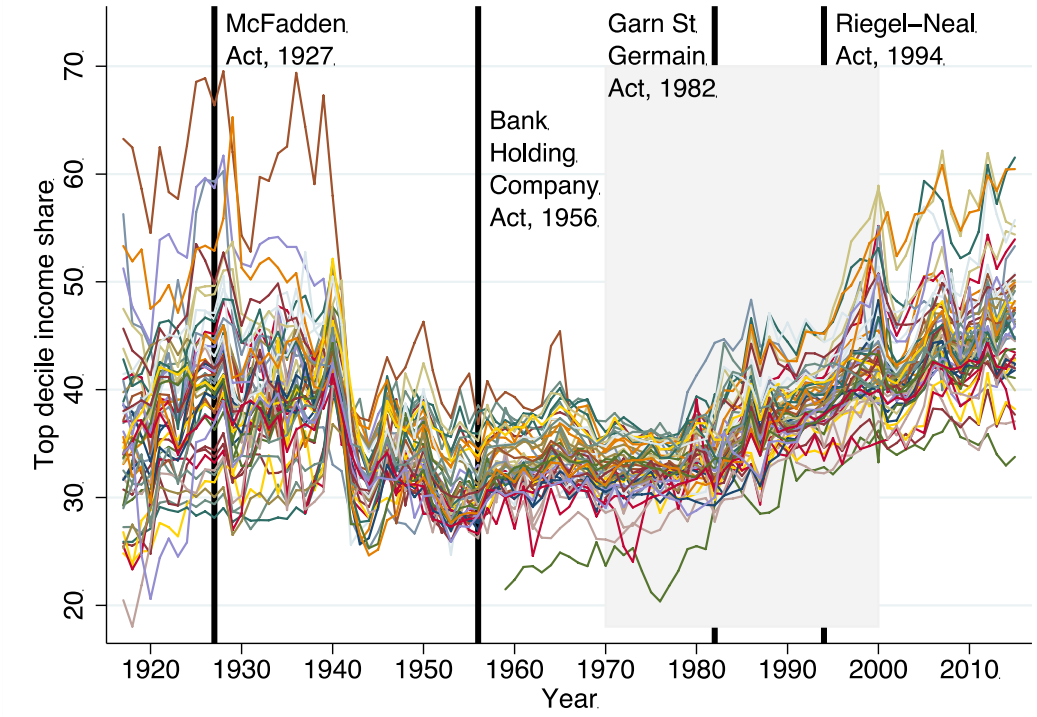

Fig. 1. Trends in top decile income share across US states

Notes: This figure shows the trends in top decile income share for US states and the District of Columbia from 1917 to 2015, with data for Alaska and Hawaii beginning in 1959 (when they were incorporated into the American Union), and date lines for key (de)regulatory events during the nearly 100-year period. Top decile income share is taken from Frank (2014). The 1927 McFadden Act permits states to restrict geographical branching of national banks. The 1956 Bank Holding Company Act authorises states to restrict entry by out-of-state banks and their holding companies. The 1982 Garn St Germain Act grants permissions to banks to buy failing banks or thrifts across state lines. The 1994 Riegel-Neal Interstate Banking and Branching Efficiency Act allows banks and their holding companies to purchase banks across state lines and allows national banks to establish branches across state lines. The shaded bar region from 1970 to 2000 covers the three decades of banking sector policy changes we are investigating with regards to income inequality in our baseline analysis. Variable definitions are given in the text.

In the forty years that followed, there appears to be a general plummeting and considerably less variability in top decile income share. Over the 1941-80 period, the mean (standard deviation) of this measure of income inequality is 33.02% (3.39%). We note that while the minimum top decile income share rose slightly to 20.37%, the maximum value fell substantially to 50.14%. Since the 1980s, however, the share of state income being amassed by the upper 10%

tail of the income distribution indicates a return to pre-World War II levels of high inequality. As illustrated, the top decile income share has climbed up to 61.54% and 60.45% in Florida and New York, respectively, while states with the smallest top decile income share are now Alaska (33.8%) and North Dakota (36.35%). Furthermore, the mean top decile income share has gone up to 41% over these thirty-five years (standard deviation is 5.61%, the minimum value is 25.22%, and the maximum value is 62.17%).[8]

Given these observations, our analysis centres on the last three decades of the 20th century, using US states' decisions to legalise both within-state bank branch geographical expansion and between-state re-chartering of new bank business expansions as quasi-natural experiments. These deregulatory events led to more branch openings and increased banking competitions, both of which one would anticipate extending credit to liquidity-constrained households (for purposes of productive endeavours) by reducing the cost of borrowing money, thereby improving access to capital. This outcome has been established in the previous literature to be an exogenous event (Jayaratne and Strahan 1996; Kroszner and Strahan 1999; Kerr and Nanda 2009; Beck et al. 2010; Dick and Lehnert 2010; Jerzmanowski 2017).

Based on the information on when all the 50 states and the District of Columbia introduced within-state branching reform and between-state banking deregulation over the 1970-2000 period, we utilize a generalized difference-in-difference specification to estimate the effect of financial, or, more aptly put, banking, sector deregulation on income inequality. In the baseline, we find that inequality on average falls with within-state branching reform, whereas it on average rises with between-state banking deregulation, after controlling for state fixed effects (or state time trend) and year fixed effects. While we separately establish that our within-state branching reform and between-state banking deregulation dates are not endogenous to income inequality, the estimation of panel data models with state and year fixed effects aid in mitigating further against the occurrence of this likely concern. We demonstrate that this finding materially depends upon which measure of income inequality is being considered.[9]

Reassuringly, we are able to establish the consistency of this result, finding, when the estimates are significant, that: (i) with respect to within-state branching reform, income inequality generally falls, regardless of which measure one looks at; (ii) with regards to between-state banking deregulation, (a) income inequality (proxied by top decile income share, Atkinson

[8] It is instructive to outline how these numbers underscore a potential higher level of income inequality today compared to 100 years ago. As an example, ten states had shares of top decile income in the 20-29% range and four states in the 50+% range in 1917. Conversely, the more equal states in 2015 according to this measure of income inequality are those with a third of total reported state income accruing to this group (top 10% earners), while also now top decile income share is at least 50% in ten states.

[9] While we take top decile income share as our primary measure of income inequality, we report throughout this paper results using four other measures of income inequality, which we mentioned above. A more detailed description of each measure is provided in Section 4 below.

index, and Theil entropy index) rises, (b) income inequality (proxied by the Gini coefficient) drops, and (c) income inequality (proxied by relative mean deviation) sometimes rises and at other times falls, depending on the model specification; and (iii) these associations are retained when we (a) control for differential trends in the starting positions of each state in relation to inequality, income, population size, and education level, (b) omit influential observations by evaluating different sub-samples of states, (c) account for the lag of income inequality and employ an alternative estimation technique, and (d) use alternative data frequency and sample period.

Besides, these relationships are confirmed when we control individually, rather than jointly, for the dates of within-state branching reform and between-state banking deregulation. We also use additional state-specific characteristics, such as the degree of banking restrictiveness before deregulation and the extent of discriminatory practices, and find that our baseline estimated results are mostly unaffected. Moreover, we confirm that the results presented are unchanged when controlling for a vector of time-varying state-specific factors, such as income growth, population growth, unemployment rate, union membership and house price index. Further, using the growth rate of income inequality leaves our results unaltered.

Using a linear treatment effect specification, the evidence supports the view that the rich are better positioned to take advantage of "financial reform capital" than the poor. By "financial reform capital," we mean the cumulative advantage that appropriating financial access bestows when not abused. As a result, income inequality rises with time elapsed since the introduction of both within-state branching reform and between-state banking deregulation. Conversely, we find a negative impact effect of banking industry deregulation, when we adopt consolidated measures of income inequality (Greenwood and Jovanovic 1990).

After establishing these patterns of associations between finance and inequality, we next confirm that the results are consistent with the model of credit market imperfections and human capital investment indivisibilities of Galor and Zeira (1993), such that we select the human capital channel for investigation. This yields that in the absence of free and high-quality state-sponsored education, the inequality-reducing effect of an increase in banking competition may not be realised, especially that individuals cannot infinitely accumulate human capital and there exist diminishing returns to schooling.[10]

The next section places our study alongside results in the previous literature. Section 3 provides an overview of the US banking deregulations. Section 4 describes the data, discusses some relevant statistics, and evaluates the extent of exogeneity of financial sector-based policy reform to both the levels and growth rates of income inequality. Section 5 outlines the empirical

[10] See also Galor and Moav (2004) for a similar explanation.

model and presents the baseline results. Section 6 implements various robustness checks. Section 7 explores a channel by which financial development may affect income inequality. Section 8 concludes the paper.

2. Relation to Previous Literature

Our main results are in line with previous literature that explores the impact of financial development on income inequality. Theoretically, financial deregulation may be captured by economically-powerful and politically-established elites in unequal states (Rajan and Zingales 2003). The tendency, therefore, is to see cases where a minority of the population benefits, even as the majority of the population bears the costs. Such a result will arise if reform leads to deepening, as opposed to broadening, of financial access. Accordingly, skewed distribution of access to financial services after deregulation may permit privileged interest groups to preserve and promote their rents by enlarging their own access to innovations in the financial markets, and despite increased entry, competition, and efficiency, the reality could be that financial development in the form of banking deregulation disproportionately boosts incomes of the wealthiest deciles and increases income inequality (Southworth 1928; White 1982).

This paper's results regarding within-state branching reform are consistent with the economic theory predicting that financial development may reduce income inequality by making financial products and services available to groups previously denied. This is the extensive margin interpretation in Becker and Tomes (1979, 1986), where financial market imperfections (information and transaction costs) that may lead to greater unequal access to capital for some groups within a society, with no or limited collateral and poor prevailing credit histories, are alleviated or eliminated. This is, likewise, in line with the empirical finding that growth is good for the poor (Dollar and Kraay 2002, 2016). More low-skilled workers may be able to find employment as the economy grows, thereby improving their economic outcomes and, by so doing, are able to invest in the educational outcomes of their children. This is expected to, at least, curb intergenerational inequality.

On the other hand, our between-state banking deregulation results are in line with the intensive margin channel modelled in Greenwood and Jovanovic (1990), who conclude that income inequality initially increases with financial development, as the economy grows, because it is largely those already able to access financial products and services at the previous level of innovation who are still able to access them after improvements in the quality and quantity of the products and services now on offer to the populace. In their model, the link between financial development and income inequality is analogous with the one hypothesized by Kuznets (1955) to exist between economic growth and income inequality.

Our results are also found to be supportive of the political economy studies indicating that restrictive laws favour the many small banks compared to the few large banks (Abrams and Settle 1993). More specifically, regulatory periods saw a proliferation of small banks, which are likely better positioned to cater to the needs of people at the lower end of the income distribution. Conversely, deregulation led to an increase in large banks that are probably more corporate orientated. Our results indicate that within-state branching reform is pro-poor, while between-state banking deregulation is pro-rich. This aligns with the findings of King and Levine (1993) and Jayaratne and Strahan (1996), who concluded that improving the quality of bank lending is more pro-growth than increasing its quantity.

Empirically, our results also identify with both aspects of the argument, as we found that the relationship between financial development and income inequality can be both negative and positive. These findings appear to crucially depend on what measures of financial development and income inequality were employed (Abiad et al. 2008). While a large fraction of the previous literature on this topic has focussed on cross-country analysis,[11] we have selected to pay closer attention to the developing income inequality within a nation (the United States) during a thirty-year period, which also saw a massive take up in financial reforms and incentive-based banking practices.

In the context of the US, and following the seminal work of Jayaratne and Strahan (1996),[12] a large literature emerged establishing the causes, consequences and implications of financial development, especially as it relates to institutional banking sector regulation and deregulation. To mention a few examples, it has since been shown that within-state branching reform and/or between-state banking deregulation have fostered entrepreneurship (Black and Strahan 2002), reduced and synchronised US states' business cycles (Morgan et al. 2004), espoused new firm entry and access to bank credit (Cetorelli and Strahan 2006), and facilitated Schumpeterian creative destruction (Kerr and Nanda 2009).

However, the closest forerunners to our paper are Beck et al. (2010) and a recent article by Xu et al. (2018). Beck et al. (2010) investigate the influence of within-state branch reform on the distribution of income in 48 US states and the District of Columbia (leaving out Delaware and

[11] A much-cited work in this area is Beck et al. (2007), who studied the effect of financial development (represented by private credit) on changes in income distribution and changes in both relative and absolute poverty (captured by growth of the Gini coefficient, growth of the lowest income quintile income share, and growth of poverty headcount). They found that financial development (i) disproportionately boosts incomes of the lowest quintile; (ii) is associated with a fall in the population share living on less than $1 a day; and (iii) reduce income inequality. Their results are obtained by applying both cross-sectional ordinary least squares and dynamic panel instrumental variables regressions to data covering the period 1960 to 2005 for 72 countries. Some recent related research endeavours at the cross-country levels supporting or detracting the results of Beck et al. (2007) include Gimet and Lagoarde-Segot (2011), Agnello et al. (2012), Hamori and Hashiguchi (2012), Delis et al. (2014), Jauch and Watzka (2016), Haan and Sturm (2017), Blau (2018), among others.

[12] These authors demonstrate that within-state branching reform is positively and significantly correlated with the growth of income per capita.

South Dakota) between 1976 and 2006, and find that reform lowered inequality by increasing the monetary gains of individuals below the median of the income distribution, without much effect on the incomes of those in the upper part. Xu et al. (2018), meanwhile, document contradicting evidence that income inequality responds positively and statistically significantly to between-state bank deregulation, between 1970 and 2000, for all states within the contiguous United States.

Our paper represents a synthesis of Beck et al. (2010) and Xu et al. (2018). Unsurprisingly, therefore, we have partly corroborated the result that finance decreases inequality (Beck et al. 2010) and partly confirmed the finding that finance increases inequality (Xu et al. 2018). There are important differences between the studies of Beck et al. (2010) and Xu et al. (2018), which it appears our paper has partially fused. First, Beck et al. (2010) employ data from the *Current Population Survey* (CPS) to calculate their measures of inequality, while, like us, Xu et al. (2018) took their inequality measures from Frank (2014), who compiled his data from *Statistics of Income* (SoI).[13]

Second, the work of Beck et al. (2010) focussed on within-state branch reform, whereas, following Jerzmanowski (2017), Xu et al. (2018) centralized on between-state banking deregulation. Our empirical approach is, however, in step with Kroszner and Strahan (2014), such that we present, as our main results, estimates from models that simultaneously account for both within-state branch reform and between-state bank deregulation.

3. A Brief History of US Banking Regulation and Deregulation

The US banking sector has gone through numerous phases of regulation and deregulation since its inception. From 1789, the US Constitution has, at different times, shifted the controlling powers on bank charters and regulation of banking activities between the states and the federal authorities.[14] Following the stock market crash of 1929 and the decade-long Great Depression that ensued, the post-New Deal bank-related restriction laws culminated in the Douglas amendment to the 1956 Bank Holding Company Act, in which banks and their holding companies were restricted from between-state bank mergers and acquisitions. States favour this form of banking regulation as it permits them to keep out of their territories banks they cannot generate tax revenue from because of the situation of such banks' registered head offices. This outcome derives from the provision of the 1927 McFadden Act, which requires that national

[13] As mentioned already, we used five different measures of inequality from Frank (2014), whereas Xu et al. (2018) selected only two of these measures.

[14] See Kroszner and Strahan (2014) for a more detailed description of the institutional background on regulation and deregulation of the US banking industry, with special focus on causes, consequences and implications for the future. While our focus here is on regulation and deregulation with regards to bank entry and geographic expansion, they also discussed regulation and deregulation in deposit insurance, bank products, pricing and capital requirements.

banks abide by state laws regarding bank branching operations.[15] These constitutional provisions in the McFadden Act remained in place until it was modified by the 1994 Riegel-Neal Interstate Banking and Branching Efficiency Act, which opened up in-state banks to out-of-state competition, by allowing nationwide mergers and acquisitions of banks, conversion of multibank holding companies' (MBHCs) subsidiaries into branches, and setting up of *de novo* ones across state lines.

Similarly, there existed laws that largely prevent within-state bank branch expansions in most states at least up to around the first half of the 1970s. The most stringent type of inhibitive geographic expansion laws concern "unit banking" charters, which prohibit affected banks from having any branches. States adopted this form of banking regulation in order to create location-specific monopolies from which to generate tax revenue and extract rents (Sylla et al. 1987; Noll 1989). Nonetheless, both forms of banking restrictions started to be relaxed from the mid-1970s, with the last of these finally removed in Iowa, in 1996, for within-state branching restrictions, and Hawaii, in 1997, for between-state banking regulation. Within-state branching reform and between-state banking deregulation dates are from Black and Strahan (2002), with Francis et al. (2014) update.[16]

Fig. 2 shows the spread of banking deregulations across the US since 1970. The left panel illustrates within-state branching reform, where dark regions depict the 17 states without intrastate bank branching restrictions, either at the start of the sample period in 1970 or as of the end of that decade. The states affected are Alaska, Arizona, California, Delaware, Idaho, Maine, Maryland, Nevada, New Jersey, New York, North Carolina, Ohio, Rhode Island, South Carolina, South Dakota, Vermont and Virginia, and the District of Columbia. Between-state banking deregulation is shown on the right, with dark regions revealing states without interstate bank branching restrictions, also in the 1970s. The only affected state is Maine, which was the first state to permit out-of-state MBHCs to operate within its borders. The interstate deregulation law was passed in Maine in 1978; however, the required bilateral reciprocity in which Maine's banks must be allowed to freely operate in states whose banks want to enter Maine's banking industry was not met by other states. Consequently, the interstate banking restriction remained in place until 1982, which is when Alaska and New York passed laws admitting out-of-state banks and their holding companies to operate in their territories. In both maps, the light regions represent all the remaining states that were still heavily regulated in 1980

[15] The barriers erected with the passing of the McFadden Act has been shown to work in favour of the interests of numerous small and poorly capitalised banks against those of few large and highly capitalised ones (e.g., Economides et al. 1996). This victory for small banks started to be reversed at the beginning of the 1970s when states, where large banks hold sway, kick-started the three decades of banking industry deregulations that followed (Kroszner and Strahan 1999).

[16] Table A.1 in the appendix provides the dates of branching reform and banking deregulation for all 50 states of the US and the District of Columbia (see Amel (1993) for additional description).

but have since enacted laws to deregulate both their within-state branching and between-state banking practices over the succeeding twenty years.

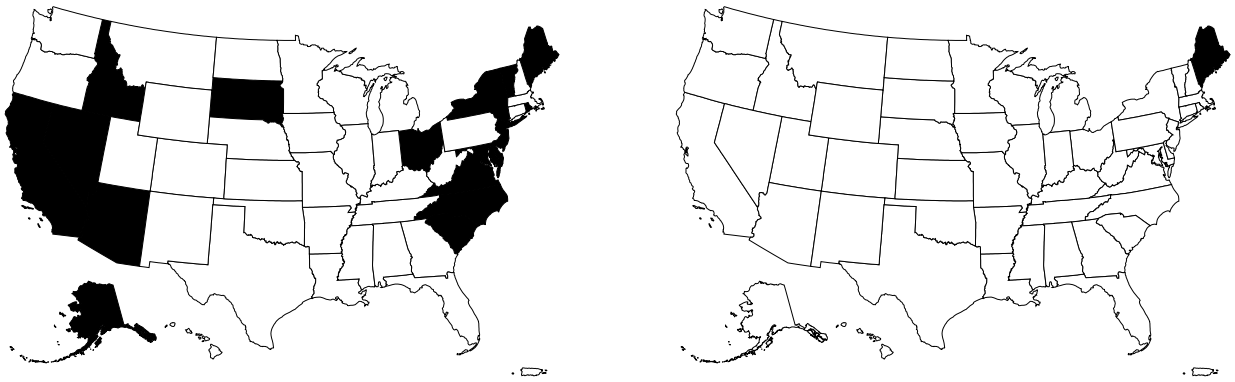

Fig. 2. Branching reform and banking deregulation in the US

Notes: This figure shows the diffusion of banking sector policy changes across the US over the 1970-2000 period. Within-state branching reform, shown on the left, with dark regions illustrating states without intrastate branching restrictions either at the start of the sample period in 1970 or as at the end of that decade. Any state branching reform that precedes 1970 is coded as 1970: the twelve affected states are Alaska (1960), Arizona (1960), California (1960), Delaware (1960), District of Columbia (1960), Idaho (1960), Maryland (1960), Nevada (1960), North Carolina (1960), Rhode Island (1960), South Carolina (1960), and South Dakota (1960). The other states that carried out within-state branching reform in the 1970s are Maine (1975), New Jersey (1977), New York (1976), Ohio (1979), and Vermont (1970). Between-state banking deregulation, shown on the right, with dark regions illustrating states without interstate banking restrictions either at the start of the sample period in 1970 or as at the end of that decade. The only affected state is Maine (1978). In both maps, the light regions illustrate all the remaining states that have enacted laws to deregulate both forms of geographic limitations over the succeeding twenty years. Within-state branching reform and between-state banking deregulation dates are from Black and Strahan (2002), with Francis et al. (2014) update. Variable definitions are given in the text.

4. Data, Summary Statistics and Exogeneity of Banking Deregulation

The unit of analysis in this study is a US state for which we require empirical measures for financial development and income inequality. To this aim, we work with the datasets of Black and Strahan (2002) and Frank (2014). Besides these sources, we also collect data from DeMuth (1986), Amel (1993), Hirsch et al. (2001), Collins (2004), Fryer (2007), Levine et al. (2008), Rice and Strahan (2010), Jerzmanowski (2017), the National Bureau of Economic Research (NBER), US Census Bureau, Bureau of Labour Statistics (BLS), Bureau of Economic Analysis (BEA), and Federal Housing Finance Agency (FHFA). This section begins by discussing the construction of indicators representing the presence of within-state branching reform and between-state banking deregulation. Following this, we describe our measures of income inequality, after which we define the other variables used in the paper. Finally, we provide summary statistics for our main variables, track changes in them over the sample period, and examine whether income inequality can predict when states across the US deregulated their banking industry.

4.1. Measuring Financial Development

Based on the above timeline of within-state branching reform and between-state banking deregulation, we construct the measures used to proxy state-level financial development in a fashion consistent with the popular indicators of Black and Strahan (2002), which we have revised for Hawaii and Iowa with data from Francis et al. (2014). These authors report the year

that each US state and the District of Columbia enacted laws to grant unrestricted branching expansions for both state and national banks. Thus, using $FD_{s,t}$ to denote financial development in state s in year t, we compute our two measures of banking deregulations using:

$$FD_{s,t} = \begin{cases} 1 & if\ Year\ of\ deregulation_s < t; \\ 0 & otherwise. \end{cases} \quad (1)$$

In the above, $FD_{s,t}$ is (i) the within-state branching reform, which is a binary indicator that is equal to zero in the years before a state permits intrastate branching expansion and one otherwise and (ii) the between-state banking deregulation, which is a binary indicator that is equal to zero in the years prior to a state allowing interstate banking competition and one otherwise; and $Year\ of\ deregulation_s$ refers to the year a state lifts its restrictions on the dimension of banking regulation we are interested in representing.

4.2. Measuring Income Inequality

We are concerned with outcome variables that reflect the extent of income inequality at the US state level at a more regular frequency (e.g., yearly). Until very recently, however, such measures have not been available, or were at best, hard to come by. For this reason, researchers have in the past relied on decennial data from the US Census Bureau and other forms of data interpolations (e.g., Partridge 1997, 2005; Panizza 2002). In our case, we have taken advantage of the income inequality database of Mark W. Frank,[17] which he has meticulously constructed using tax filing data of individuals obtainable from the *Statistics of Income* (SoI) of the US Internal Revenue Service (IRS). IRS's SoI documents the before-tax adjusted gross income of individuals, which, in addition to wages and salaries, also tabulates capital income (dividends, interests, rents, and royalties) and entrepreneurial gains (self-employment, small businesses, and partnerships). Meanwhile, important excluded income consists of the interest on state and local bonds and transfer income from federal and state governments.[18] Regardless, we note that this inequality database represents one of the most meaningful advances in recent years for the US, particularly at the individual state-level and covering nearly 100 years of annual data.[19]

To represent income inequality for each state and year over our sample period, therefore, we focus on five measures following Frank (2014). Given that many authors have raised concerns regarding the lack of tax filing by persons at the bottom end of income distribution in SoI (e.g., Panizza 2002; Piketty and Saez 2003; Frank 2014), our first and primary measure of income

[17] Retrieved from https://www.shsu.edu/eco_mwf/inequality.html.
[18] Frank (2014) presents the advantages and limitations of using this as a source of data for constructing income inequality (see also Panizza 2002).
[19] Frank's inequality database provides annual information on several measures of income inequality from 1916 to 2015, except for Alaska and Hawaii, for which data is available only from 1959, when they were admitted into the American Union (see Fig. 1). This is not a concern because we mainly utilise data for the 1970-2000 period. As a robustness check, however, we also present results covering the period 1960 to 2015.

inequality is based on top incomes. More specifically, we are using top decile income share, which represents the fraction of gross income before adjustment because of personal payments and transfers, such as income taxes, social security, Medicare deductions, family assistance, food stamps, unemployment insurance compensation and subsidised housing amongst others. Moreover, Lemieux (2006) and Piketty (2014) have also shown that income inequality has been notable in the last few decades due to the dramatic rise of income share accruing to the top earners, making this measure of utmost interest.

Our second measure of income inequality is the Atkinson index, which is a measure of income inequality derived from a social welfare function, with values ranging between zero and one, and higher values indicating greater inequality. In our case, the aversion parameter is set to 0.5, implying that the index is more sensitive to changes in the upper tail of the income distribution. Third, we employ the Gini coefficient, which is derived based on the area between the Lorenz curve and a hypothetical line of absolute equality, with values ranging between zero and one, and higher values indicating greater inequality. Our fourth measure is the relative mean deviation, which represents the average absolute distance between an individual's income and the mean income of the population, with values ranging between zero and one, and higher values indicating greater inequality. Finally, we utilise Theil entropy index, which is an unbound derivative of statistical information theory, where larger values indicate greater income inequality.[20] In all these alternative measures of income inequality, a value of zero will be obtained when every individual in an economy earns identical income, and the value of one (or the log of number of observation in the case of Theil entropy index) will be obtained when only one individual earns all the available income in an economy (Beck et al. 2010; Frank 2014).

Fig. 3 shows the cross-state average for each measure of income inequality. Throughout this paper, we use the natural logarithm of these measures, but in Fig. 3, we instead rescale the original data by fixing the 1970 value at unity. There is a clear upward trend for all five measures, with the Theil entropy index exhibiting the largest divergence compared to the starting position, whereas both the Gini coefficient and relative mean deviation began and ended on approximately similar points. The changes amount to 37.57% for top decile income share, 56.38% for Atkinson index, 26.83% for the Gini coefficient, 27.06% for relative mean deviation,

[20] As the existing literature reaches conflicting conclusions on the relationship between financial development and income inequality, we have been motivated to report results for the various measures just described. We thus view this to be an important robustness check because each of these inequality measures tends to capture different dimensions of income distribution based on the principles of transfers and decomposability. An advantage, for instance, of Atkinson index, Gini coefficient, relative mean deviation and Theil entropy index over our primary measure, top decile income share, is that they represent income inequality over the entirety, rather than just the upper tail, of the income distribution. This advantage may, however, be more difficult to operationalise in the context of Frank's primary data source (SoI), which discriminates against individuals with income below a certain threshold. Moreover, this problem may have been ameliorated for our sample period because of the introduction of tax filing requirements in 1940 for individuals at the lower tail of the income distribution (see Frank (2014) for further description and properties of these different measures of income inequality).

and 121.18% for Theil entropy index over the thirty-one year sample period. In this paper, we seek to understand which type of banking industry policy change, discussed in the previous section, contributed to these rising trends in income inequality.

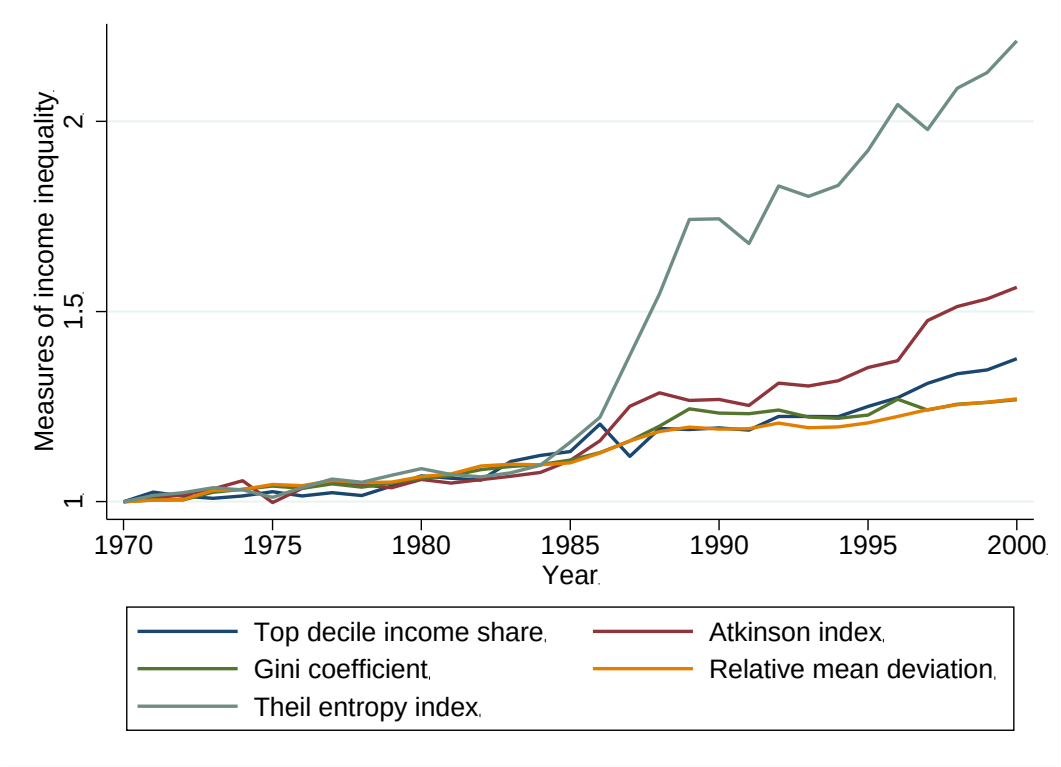

Fig. 3. Tracking various measures of income inequality in the US

Notes: This figure shows the state-level average for top decile income share, Atkinson index, Gini coefficient, relative mean deviation, and Theil entropy index, which are taken from Frank (2014) for each year from 1970-2000. Variable definitions are given in the text.

4.3. Other Variables

We obtain additional variables in order to assess (i) the possibility that differential trends in initial state characteristics are not the principal drivers of income inequality, (ii) heterogeneity in other state characteristics, (iii) whether our baseline estimates will survive the inclusion of time-varying state-specific controls, and (iv) whether branching reform and banking deregulation affect income inequality via human capital accumulation. More specifically, to control for the impact of initial state characteristics, we use data for 1970 for each measure of income inequality (described above), output per worker obtained from Jerzmanowski (2017), US Census Bureau measure of state-level population size,[21] high school and college education attainment, defined, respectively, as the total number of high school graduates divided by the total state population, and the total number of college graduates divided by the total state population, both taken from Frank (2009).

In terms of other heterogeneous state characteristics, we explore the extent of restrictive banking regulations before and around deregulation years, the effect of credit market reform

[21] Retrieved from https://www.nber.org/data/census-intercensal-population/.

and the role of discrimination. To represent entry barriers erected by state governments, we use two measures. The first is a binary indicator that takes a value of one, if a state had unit banking law in place before deregulation, and zero otherwise, based on Amel (1993) and Kroszner and Strahan (1999). The second is the branching restrictiveness index of Rice and Strahan (2010), which was constructed to range in values between zero and four, depending on whether a state takes advantage of the four provisions in the Riegel-Neal Act before its official trigger date of June 1, 1997, namely: (i) the minimum age of the target institution, (ii) *de novo* interstate branching, (iii) the acquisition of individual branches, and (iv) a state-wide deposit gap. The branching restrictiveness index took a zero value when a state did not impose any of these four provisions and increases by one for each enforced barrier.

Given the insights gleaned from Chatterji and Seamans (2012), we examine whether our results are robust to state policy changes concerning increased loan supply through heightened credit market competition. To this aim, we construct four variables around the interest rate effects of *Marquette National Bank of Minneapolis v. First Omaha Service Corp.* (439 US 299 [1978]), using information from DeMuth (1986). First, we create an interest rate ceiling indicator that we set equal to zero, one, or two if DeMuth identifies a state as having, respectively, no interest rate controls, moderate interest rate controls, or strict interest rate controls. The last three are binary indicators that take a value of one and zero otherwise if a state has (i) no interest rate controls, (ii) moderate interest rate controls, and (iii) strict interest rate controls.

Besides, we construct four indexes to reflect historical and contemporaneous laws, which prejudice against certain groups. These are (i) slave states, which is a binary indicator that takes a value of one if a state is recognised as pre-Civil War slavery condoning, and zero otherwise, (ii) anti-miscegenation law states, which is a binary indicator that takes a value of one if a state only repealed such laws post-*Loving v. Virginia* (388 US 1 [1967]), and zero otherwise, taken from Fryer (2007), (iii) no fair housing law states, which is a binary indicator that takes a value of one if a state has no fair housing law in place before the 1968 Fair Housing Act, and zero otherwise, based on Collins (2004), and (iv) high racial bias index, which is a binary indicator that takes a value of one if a state has a racial bias index that is above the median, and zero otherwise (Levine et al. 2014).

To account for the role of time-varying factors in our empirical model specification, we use data on the growth rate of gross state product (GSP) from BEA, state population growth rate from US Census Bureau, state union membership calculated as the percentage of nonagricultural wage and salary workers who are union members of Hirsch et al. (2001),[22] state unemployment rate from BLS, and state house price index (all-transactions) from FHFA.[23] The inclusion of

[22] Retrieved from http://unionstats.gsu.edu/MonthlyLaborReviewArticle.htm.
[23] Retrieved from https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index-Datasets.aspx.

these variables helps to additionally condition on movements in state economic performance, demography, labour market outcomes, and living costs.

In terms of how banking deregulation affects income inequality, we inspect mainly the role of human capital development based on a large and well-established theoretical literature. For this purpose, we exploit three state-level measures of educational attainment to proxy for human capital level. The first is a composite measure of human capital computed by Turner et al. (2007) in line with Bils and Klenow (2000) for state *s* in year *t* using:

$$\log H_{s,t} = \phi_P P_{s,t} + \phi_S S_{s,t} + \phi_T T_{s,t} \quad (2)$$

where H is human capital, P is years of primary education, S is years of secondary education, T is years of tertiary education, and ϕ_P, ϕ_S and ϕ_T are parameters assumed to be equal and set to 0.10. We take this data from Jerzmanowski (2017). The last two education attainment measures are the high school and college education variables from Frank (2009) described above for which we now use data covering the 1970-2000 period.

4.4. Summary Statistics

We next present summary statistics for our measures of income inequality and indicators of financial development for the whole of the US and by the four regions of the country (note that the statistics presented are for the natural logarithm of the measures of income inequality, as used in the regression analysis), and look at the evolution of the US banking industry vis-a-vis the rising income inequality.[24]

Table 1 reports the mean and standard deviation (overall, between, and within) for these variables. There are 1581 observations in our baseline sample, obtained from 31 years of data covering the period 1970 to 2000 for all 50 states of the US and the District of Columbia. The mean of top decile income share is 3.587 for the whole of the US, which is smaller than the average for the Northeast and South of the country. On average, the West is the most equitable. Regarding our banking deregulation measures, the evidence in rows 6-7 confirms that most states permitted geographical expansion of branches for in-state banks before they removed cross-state banking restrictions. This fact is pronounced both at the national and regional level, except in the Midwest, where states appear to have liberalised the interstate banking almost immediately after the intrastate branching reform. Moreover, the Northeast has the most extended history of within-state branching reform and between-state banking deregulation (0.746; 0.545), while the Midwest had the shortest (0.460; 0.425). Finally, it can be seen that all the variables display reasonable variation overall, as well as between and within states.

[24] Summary statistics for all other variables used in the analysis are in the appendix (Table A.2).

Table 1**:** Summary statistics

	US	Midwest	Northeast	South	West
A. Mean					
Top decile income share	3.587	3.546	3.627	3.629	3.542
Atkinson index	-1.549	-1.581	-1.523	-1.543	-1.545
Gini coefficient	-0.656	-0.664	-0.671	-0.658	-0.637
Relative mean deviation	-0.313	-0.323	-0.326	-0.313	-0.295
Theil entropy index	-0.676	-0.737	-0.614	-0.662	-0.679
Within-state branching reform	0.617	0.460	0.746	0.628	0.660
Between-state banking deregulation	0.467	0.425	0.545	0.476	0.439
B. Standard deviation (overall, between, within)					
Top decile income share	0.130, 0.073, 0.109	0.103, 0.047, 0.093	0.141, 0.063, 0.128	0.100, 0.050, 0.087	0.152, 0.081, 0.130
Atkinson index	0.159, 0.061, 0.147	0.141, 0.037, 0.137	0.185, 0.079, 0.169	0.149, 0.067, 0.134	0.164, 0.050, 0.156
Gini coefficient	0.095, 0.036, 0.088	0.089, 0.038, 0.081	0.102, 0.029, 0.098	0.091, 0.039, 0.083	0.099, 0.028, 0.095
Relative mean deviation	0.086, 0.033, 0.080	0.078, 0.032, 0.072	0.096, 0.030, 0.092	0.083, 0.035, 0.075	0.088, 0.030, 0.083
Theil entropy index	0.324, 0.126, 0.298	0.299, 0.079, 0.289	0.361, 0.156, 0.330	0.300, 0.135, 0.270	0.338, 0.116, 0.319
Within-state branching reform	0.486, 0.264, 0.410	0.499, 0.217, 0.454	0.436, 0.191, 0.398	0.484, 0.272, 0.405	0.474, 0.293, 0.382
Between-state banking deregulation	0.499, 0.096, 0.490	0.495, 0.080, 0.489	0.499, 0.099, 0.490	0.500, 0.048, 0.498	0.497, 0.126, 0.482
Observations (N, n, T)	1581, 51, 31	372, 12, 31	279, 9, 31	572, 17, 31	403, 13, 31

Notes: This table reports the mean and standard deviation for the state-year, region-year observations of the main variables used for the baseline analysis. The measures of state-level income inequality are the natural logarithms of top decile income share, Atkinson index, Gini coefficient, relative mean deviation and Theil entropy index, which are taken from Frank (2014). Within-state branching reform and between-state banking deregulation measures are based on dates taken from Black and Strahan (2002), with Francis et al. (2014) update. Additional summary statistics for these and other variables used in the paper are provided in the appendix (Table A.2). Variable definitions are given in the text. The sample period is 1970-2000.

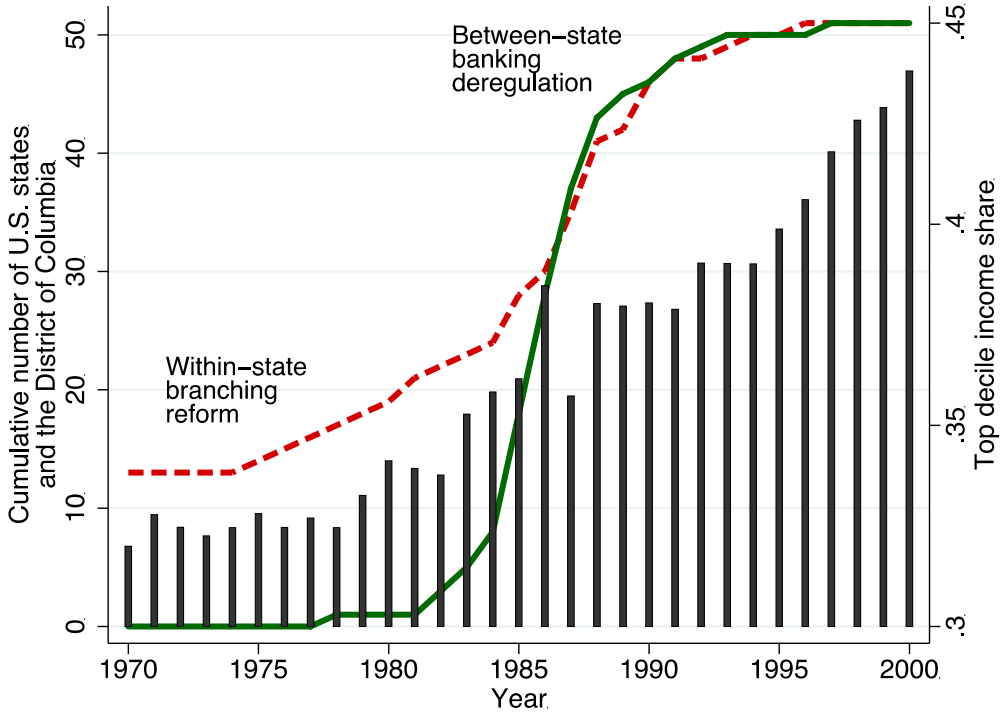

Fig. 4. Branching reform, banking deregulation and average top decile income share

Notes: This figure shows the time-series plots of the cumulative number of US states and the District of Columbia removing within-state branching and between-state banking restrictions (left y-axis) and bar charts of top decile income share (right y-axis). Top decile income share is taken from Frank (2014). Within-state branching reform and between-state banking deregulation dates are from Black and Strahan (2002), with Francis et al. (2014) update. Variable definitions are given in the text.

Next, we track changes in banking industry deregulations and the rising income inequality using top decile income share. Fig. 4 plots the time series of the cumulative number of US states and the District of Columbia, removing within-state branching and between-state banking restrictions on the left axis and the bar charts of the annual state average of top decile income share on the right axis. In 1970, only 12 states permitted state-wide geographical branching expansions, and none allowed interstate banking competition. This was the status quo for within-state branching restrictions until 1974, and this condition persisted until 1977 for between-state banking regulation. During this decade, the gap in income between the top 10% earners and the rest of the population appears to have been relatively stable. However, as more states introduced banking sector deregulation, especially across state lines, we observe that top decile income share, which averages around 10% in the 1970s rose sharply to over 40% in the year 2000.[25]

[25] In unshown plots for the four other measures of income inequality (Atkinson index, Gini coefficient, relative mean deviation and Theil entropy index) studied in this paper, our conclusion on the rising of income inequality as more states deregulate, especially across state lines, is qualitatively the same. Besides, this pattern is not dominated by a few states. As seen in both Figs. 1 and 4, there is a pronounced upward trend in income inequality both within and across US states and the District of Columbia over our regression sample period (1970-2000).

4.5. Exogeneity of Banking Deregulation

Before proceeding to the section on empirical analysis, we now examine how exogenous our branching reform and banking deregulation indicators are to income inequality. As discussed in the introduction, the results in this paper are predicated on the assumption that the years of branching reform and banking deregulation, which occur at different times for different states, provide us with exogenous variations in the banking industry with regards to income inequality. On this, it has been robustly argued in several studies that relaxation of US state bank branch stipulations are exogenous policy shocks with respect to, for instance, subsequent economic growth (Jayaratne and Strahan 1996; Kroszner and Strahan 1999; Jerzmanowski 2017), growth in entrepreneurship and business closures (Kerr and Nanda 2009), and personal bankruptcy rate (Dick and Lehnert 2010), observed in states carrying out reforms. Moreover, Beck et al. (2010) in a closely related study posit that this is equally true for the link between finance and inequality, and, thus, study how the US banking deregulations affect the distribution of income. Since we have a longer time-series, dating back to the beginning of the 1970s, when, effectively, the banking sector policy changes took off, we proceed to inquire as to whether pre-existing income inequality can explain the timing of US banking deregulations.[26]

To this aim, we construct both the average level and the average growth of top decile income share for 1970 to the years before branching reform and banking deregulation for each state, and plot these values against the years of state branching reform and banking deregulation (Figs. 5-6). Fig. 5 shows that there is no association between average level of top decile income share and the year of branching reform (left panel), and in right panel, this lack of relationship is again confirmed between the average growth rate of top decile income share and the year of branching reform. The corresponding *t*-statistic for average and growth of income inequality in the fitted lines are 1.21 and 1.42. Further, in Fig. 6, it is evident that top decile income share, whether measured in levels or growth rates, cannot account for years of banking deregulation, with *t*-statistic of 0.30 and 0.09, respectively.

5. Estimation Strategy and Results

5.1. Empirical Model

To obtain the inequality effects of the sector-based financial institutions policy, we run, in the baseline analysis, regressions of the form:

$$I_{s,t} = \alpha W_{s,t} + \beta B_{s,t} + \Phi_s + \Psi_t + \varepsilon_{s,t} \quad (3)$$

[26] See also Black and Strahan (2001), who argue that actions of the Office of the Comptroller of the Currency (OCC) and the 1980s crisis in the savings and loans (S&Ls) market were crucial to the timing of state branching reforms and banking deregulations.

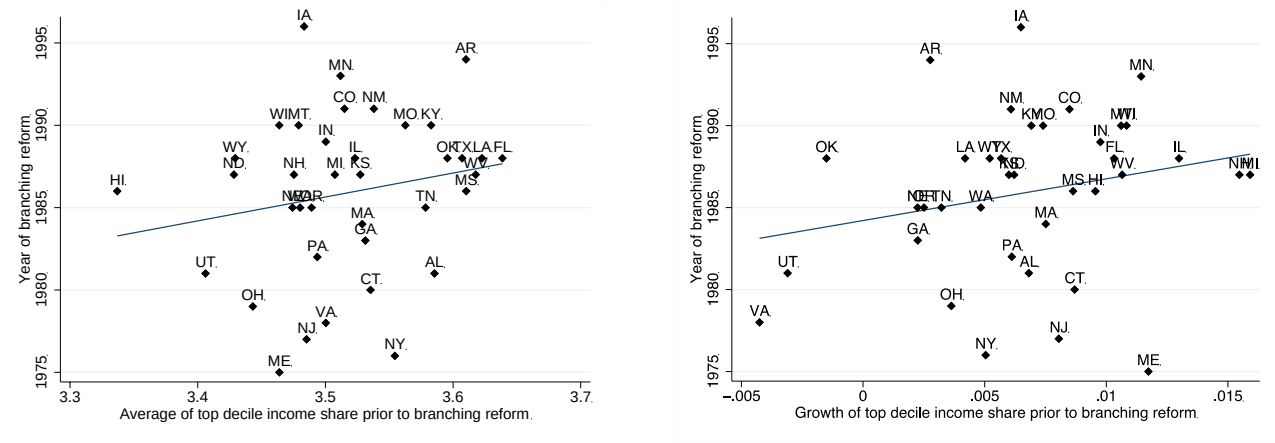

Fig. 5. Year of branching reform vs. top decile income share

Notes: This figure shows a scatter plot of the year of branching reform against the average level of top decile income share before within-state branching reform (left panel) and a scatter plot of the year of branching reform against the average growth of top decile income share before within-state branching reform (right panel). Top decile income share is taken from Frank (2014). Within-state branching reform dates are from Black and Strahan (2002), with Francis et al. (2014) update. Variable definitions are given in the text.

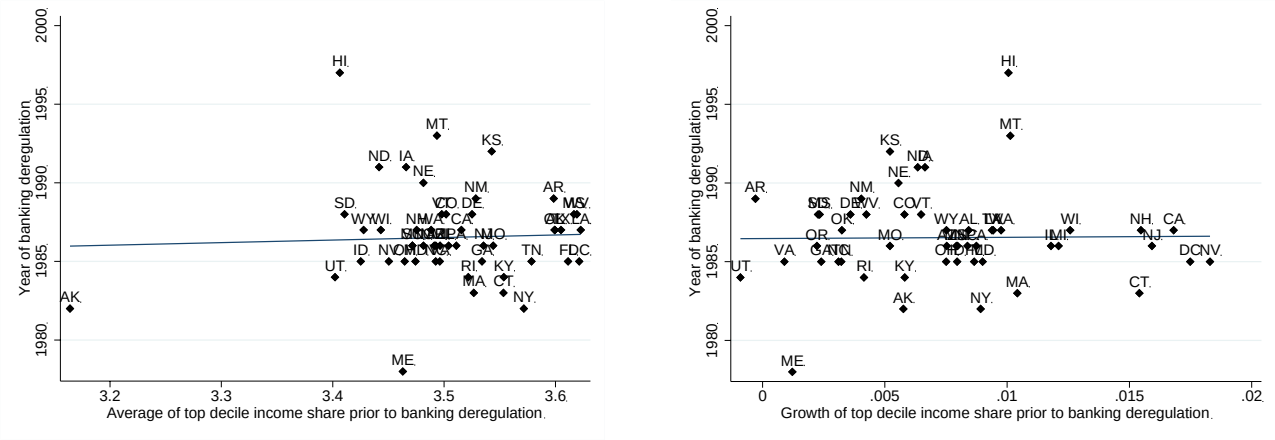

Fig. 6. Year of banking deregulation vs. top decile income share

Notes: This figure shows a scatter plot of the year of banking deregulation against the average level of top decile income share before between-state banking deregulation (left panel) and a scatter plot of the year of banking deregulation against the average growth of top decile income share before between-state banking deregulation (right panel). Top decile income share is taken from Frank (2014). Between-state banking deregulation dates are from Black and Strahan (2002), with Francis et al. (2014) update. Variable definitions are given in the text.

where *s* designates states, *t* designates year, and *I* is a measure of income inequality, which is the natural logarithm of either the top decile income share, Atkinson index, Gini coefficient, relative mean deviation or Theil entropy index. Our main explanatory variables are: (i) *W*, which refers to within-state branching reform, a binary indicator that takes a unit value once a state permits in-state geographical branching expansion through mergers and acquisitions (M&As), using the BHC structure, and zero otherwise, and (ii) *B*, which refers to between-state banking deregulation, a binary indicator that takes a unit value once a state permits out-of-state banks to operate within its borders, and zero otherwise. Φ_s is a set of state fixed effects and controls for fixed differences across states (e.g., in economic size, population makeup, cultural environment and legal framework), thereby making the analysis that of how changes in our measures of income inequality vary with changes in *W* and *B*. Ψ_t is a set of year fixed effects and absorbs secular fluctuations (e.g., in policy stances and economic and political cycles at the national

level) that may impact on the results of our estimation.[27] ε is a disturbance term that captures the effects of all other time-varying sources of differences in the dependent variable and possible functional form misspecification of the above econometric model.

In the regression equation (3), the parameters of interest are α and β, which, respectively, capture the effects of within-state branching reform and between-state banking deregulation on each measure of income inequality over the 1970-2000 period. To address the possible serial correlation problem for differences-in-differences estimation that may bias the estimation of standard errors raised in Bertrand et al. (2004),[28] standard errors are clustered at the state level in all regressions. A benefit of this clustering approach, which allows for an arbitrary serial correlation within group (state) over time in the disturbance term, is that it guarantees that appropriate standard errors are obtained on our coefficient estimates.

5.2. Baseline Regression Estimates

We estimate variants of the model specified in equation 3, including (i) only the binary indicator for within-state branching reform; (ii) only the binary indicator for between-state banking deregulation; and (iii) both indicators at the same time. To conserve on space, we only report results from our preferred specification, which is the one that jointly controls for the two banking sector policy variables together. The estimates of the baseline model specifications where the two financial indicators are separately entered are reported in the appendix (Tables A.3 and A.4) because, unlike Beck et al. (2010), we did not find that either within-state branching reform or between-state banking deregulation produced effects that are consistently superior over the other across the different measures of income inequality. Hence, we prefer the model that simultaneously account for both types of banking industry policy change.

Our baseline regression estimates are presented in Table 2. We begin by discussing the results in panel A, where we also control for state and year fixed effects. Columns 1-5 show our estimates of the inequality effects of within-state branching reform and between-state banking deregulation on top decile income share, Atkinson index, Gini coefficient, relative mean

[27] Kroszner and Strahan (2014), in particular, provide a compelling explanation for how cross-state and cross-time variations in banking deregulation are sufficient to fully account for unobserved state-specific differences, aggregate economic shocks and any time trends. They further laid out reasons why technology, interest groups, and politico-economy factors are not likely to affect a state's economic performance beyond state and year fixed effects. This is probably because any state-level macroeconomic activities that correlate with income inequality and financial development and that would normally lead to persistent unobservable differences across states are expunged with the inclusion of state fixed effect. In any case, the use of state and year fixed effects is the entrenched approach in studies of the impacts of banking deregulation (e.g., Kerr and Nanda 2009; Jerzmanowski 2017). Other authors have used a similar approach to work around the omitted variable problem in similar and different contexts (e.g., Blinder and Esaki 1978; Ager and Bruckner 2013).

[28] See also Kezdi (2004) for a discussion of a similar issue.

deviation, and Theil entropy index, respectively. The estimate of α in column 1 indicates that top decile income share decreases following within-state branching reform and is statistically significant. On the other hand, the estimate of β in the same column indicates that there is no material effect of between-state banking deregulation on top decile income share, though the coefficient is positive.

Table 2: Branching reform, banking deregulation and income inequality

	Top decile income share (1)	Atkinson index (2)	Gini coefficient (3)	Relative mean deviation (4)	Theil entropy index (5)
A. Pre-post specification with state fixed effects					
Within-state branching reform	-0.030**	-0.008	-0.011	-0.01	-0.003
	(0.013)	(0.400)	(0.121)	(0.167)	(0.891)
Between-state banking deregulation	0.019	0.027***	-0.011**	-0.006	0.106***
	(0.111)	(0.001)	(0.035)	(0.269)	(0.001)
State fixed effects?	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes
R-squared	0.795	0.898	0.904	0.881	0.907
Observation	1581	1581	1581	1581	1581
B. Pre-post specification with state time trend					
Within-state branching reform	-0.016**	-0.006	-0.018***	-0.015***	0.005
	(0.020)	(0.307)	(0.001)	(0.002)	(0.764)
Between-state banking deregulation	0.013	0.014	-0.015***	-0.011***	0.087**
	(0.226)	(0.103)	(0.000)	(0.002)	(0.011)
State time trend?	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes
R-squared	0.882	0.945	0.934	0.926	0.941
Observation	1581	1581	1581	1581	1581

Notes: This table reports the results from the baseline regressions. Panels A and B report estimates from models including state fixed effect and state time trend, respectively. The dependent variable is the natural logarithms of top decile income share (column 1), Atkinson index (column 2), Gini coefficient (column 3), relative mean deviation (column 4) and Theil entropy index (column 5), which are taken from Frank (2014). Within-state branching reform and between-state banking deregulation measures are based on dates taken from Black and Strahan (2002), with Francis et al. (2014) update. All regressions include year fixed effects; state fixed effects and state time trend are included in regressions as indicated. Constant terms are included in all regressions but are not reported. Standard errors, clustered at the state level, are in parenthesis. ***, ** and * denote significantly different from zero at the 1%, 5% and 10% significance level, respectively. Variable definitions are given in the text. The sample period is 1970-2000.

More specifically, the introduction of within-state branching reform is associated with a 3% decline in top decile income share in subsequent years. This estimate is also economically

substantial: using the magnitude of α in column 1; we can gauge the effect of transitioning from fully regulated in-state branch geographical expansion to fully deregulated one on top decile income share to be a decrease of 1.85% (obtained as 0.617∗0.030) post-branching reform years. Additionally, this estimate implies a drop in the average top decile income share of 0.67 (obtained as 36.44∗0.0185) per annum following a branching reform event. For all the other measures of income inequality, the estimates of α continue to be negative but are no longer statistically significant. An interesting finding, meanwhile, is the different signs and levels of significance for estimates of β, which is positive for top decile income share (but not significant), Atkinson index (and significant) and Theil entropy index (and significant) and negative for the Gini coefficient (and significant) and relative mean deviation (but not significant). As alluded to earlier, our finding throughout this paper is that no particular type of banking sector policy shock consistently affects the various measures of income inequality in a statistically significant manner.

In panel B of Table 2, we employ specifications that instead account for state time trend, and we can conclude that the qualitative nature of our results, as discussed above, holds. Furthermore, it is notable that more coefficients of within-state branching reform are now highly significant. These results also mitigate against the concern that states may be exhibiting different time trends and, in general, we find some evidence in support of the view that states may not be subject to a common time trend. We come back to this issue later under robustness checks. In the rest of the paper, our preoccupation is to validate these findings by testing heterogeneity at the state level, excluding outlier observations, and utilizing alternative estimation technique and data frequency/sample to provide litmus tests for the implications of our baseline estimates.

6. Robustness Checks

6.1. Heterogeneous State Characteristics

A concern that could be raised regarding our baseline results is that heterogeneity may be a significant driver of the variation in inequality experienced across US states. We address this issue next by controlling for differential trends based on the heterogeneity of the starting positions of each state, focussing on the initial values of each measure of income inequality and measures that can proxy for economic development, demography and human capital at the beginning of the sample period. To this aim, we create additional binary variables to capture whether the values of top decile income share, Atkinson index, Gini coefficient, relative mean deviation, Theil entropy index, output per worker, population size, and education at the high school and college levels in a state are above/below the median value in 1970, and interact them with year fixed effects. We then include these interaction terms in our baseline regressions.

Table 3: Heterogeneous state characteristics

	Top decile income share (1)	Atkinson index (2)	Gini coefficient (3)	Relative mean deviation (4)	Theil entropy index (5)
A. Income inequality					
Within-state branching reform	-0.025**	-0.008	-0.011	-0.01	-0.005
	(0.013)	(0.417)	(0.108)	(0.160)	(0.822)
Between-state banking deregulation	0.021*	0.027***	-0.012**	-0.005	0.101***
	(0.067)	(0.001)	(0.027)	(0.300)	(0.002)
R-squared	0.81	0.902	0.907	0.885	0.909
B. Output per worker					
Within-state branching reform	-0.027**	-0.007	-0.011*	-0.01	0.003
	(0.014)	(0.462)	(0.090)	(0.133)	(0.864)
Between-state banking deregulation	0.015	0.024***	-0.013*	-0.007	0.096***
	(0.163)	(0.003)	(0.054)	(0.240)	(0.001)
R-squared	0.812	0.902	0.91	0.89	0.914
C. Population size					
Within-state branching reform	-0.033***	-0.016	-0.014*	-0.013*	-0.015
	(0.009)	(0.144)	(0.051)	(0.052)	(0.467)
Between-state banking deregulation	0.014	0.020**	-0.011**	-0.007	0.083**
	(0.289)	(0.029)	(0.021)	(0.104)	(0.017)
R-squared	0.801	0.905	0.911	0.892	0.915
D. High school					
Within-state branching reform	-0.028**	-0.007	-0.011	-0.01	0.00
	(0.014)	(0.456)	(0.135)	(0.176)	(0.986)
Between-state banking deregulation	0.023**	0.029***	-0.013**	-0.007	0.114***
	(0.042)	(0.001)	(0.019)	(0.185)	(0.000)
R-squared	0.819	0.903	0.907	0.885	0.913
E. College education					
Within-state branching reform	-0.028**	-0.007	-0.01	-0.009	-0.001
	(0.022)	(0.486)	(0.138)	(0.178)	(0.955)
Between-state banking deregulation	0.018	0.027***	-0.010*	-0.004	0.101***
	(0.109)	(0.001)	(0.060)	(0.455)	(0.000)
R-squared	0.825	0.905	0.913	0.893	0.92
State fixed effects?	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes
Observation	1581	1581	1581	1581	1581

Notes: This table reports the results from controlling for heterogeneity in the initial state conditions. Panels A-E report estimates from models controlling for year fixed effects interacted with binary indicators for high (above the median) and low (below the median) 1970 values of income inequality, output per worker, population size, high school and college education, respectively. The dependent variable is the natural logarithms of top decile income share (column 1), Atkinson index (column 2), Gini coefficient (column 3), relative mean deviation (column 4) and Theil entropy index (column 5), which are taken from Frank (2014). Within-state branching reform and between-state banking deregulation measures are based on dates taken from Black and Strahan (2002), with Francis et al. (2014) update. All regressions include year fixed effects; state fixed effects and state time trend are included in regressions as indicated. Constant terms are included in all regressions but are not reported. The bottom panel reports the features common to all specifications. Standard errors, clustered at the state level, are in parenthesis. ***, ** and * denote significantly different from zero at the 1%, 5% and 10% significance level, respectively. Variable definitions are given in the text. The sample period is 1970-2000.

Table 3 presents the results. In panel A, we report the results from a specification that controls for year fixed effects interacted with a set of indicators for whether a state has top decile income share (column 1), Atkinson index (column 2), Gini coefficient (column 3), relative mean deviation (column 4), and Theil entropy index (column 5) that is above/below the median value in 1970. It is important to do this exercise because we particularly see differential trends of income inequality amongst states as a potential source of bias in our baseline regressions. The results in panel A of Table 3 are, however, qualitatively unchanged from the ones reported in panel A of Table 2. An advantage of this specification is that it works to determine the effect of our banking binary indicators by contrasting states with similar levels of income inequality at the beginning of our sample. The results in panel A reveal that our baseline regression estimates are robust to the inclusion of these interaction terms.[29]

Panels B to E additionally report the results from estimating model specifications that used year fixed effects interacted with the beginning of the sample values of output per worker, population size, high school and college education, respectively. Focussing on the statistically significant estimates, we observe that the effects of within-state branching reform and between-state banking deregulation are very similar in panels B to E of Table 3 when compared to panel A of Table 2. Notable exceptions in these cases are that α is negative and statistically significant in panel B (column 3), and panel C (columns 3 and 4), and β is still positive, but now statistically significant in panel D (column 1).

What is consistent about the results in panels A to E relative to our baseline regressions, that do not control for these interaction terms, is that within-state branching reform coefficients always have a negative sign whenever they are significant, which suggests that this form of banking sector policy change works to lower income inequality regardless of which measure we employ. Conversely, we cannot say the same about between-state banking deregulation, which, as in the baseline regressions, sometimes reinforces income inequality (based on top decile

[29] As can also be seen, the results in panel A of Table 3 validate our baseline findings in panel A of Table 2. For example, the coefficient of between-state banking deregulation in column 1 is now also significant and remains positive. This suggests that, given the initial top decile income share, introducing within-state branching reform is pro-poor, while instituting between-state banking deregulation is pro-rich.

income share, Atkinson index, and Theil entropy index), but at other times dampens it (based on Gini coefficient). Further, both the within-state branching reform and between-state banking deregulation are rarely effective when income inequality is measured by relative mean deviation, as in the baseline regressions.

A further robustness check regarding heterogeneity is carried out and reported in the appendix (Table A.5). Employing an interaction model, we investigate whether the relationship between within-state branching reform and between-state banking deregulation, and income inequality, varies with (i) the extent of pre-existing branching restrictions or those which deregulation laws caused to persist if implemented, (ii) the ease of obtaining credit, and (iii) the degree of discrimination at the state level. More specifically, we include a binary indicator for states with unit banking laws (column 1), branch restrictiveness index, which ranges from zero to four (column 2), interest rate ceiling indicator, which ranges from zero to two (column 3), a binary indicator for no interest rate ceiling states (column 4), a binary indicator for moderate interest rate ceiling states (column 5), a binary indicator for strict interest rate ceiling states (column 6), a binary indicator for slave states (column 7), a binary indicator for anti-miscegenation law states (column 8), a binary indicator for no fair housing law states (column 9), and a binary indicator for high racial bias states (column 10).

Overall, while there is some evidence of interaction effect, which we found to be negative, the primary outcome is that the estimated coefficients concerning within-state branching reform and between-state banking deregulation are as in the baseline regressions.

6.2. Influential Observations

Another concern that could be raised pertains to whether some influential observations in our sample, with their unique characteristics, are driving our baseline results. We employed seven different procedures for removing such observations. First, we drop observations with absolute standardized residuals greater than 1.96. Second, we exclude observations with a Cook's distance higher than the rule-of-thumb sill of 4 divided by the number of observations. Third, we implement a robust regression that assigns influential observations, smaller weights. Fourth, we compute a Huber *M* regression that has the characteristic of being more robust in the presence of influential observations. Fifth, we re-estimate our preferred specification by dropping each region at a time to control for the potential influence of region-based financial centres, elites and interest groups. Sixth, we follow existing literature to exclude observations belonging to certain states with known peculiar characteristics that may bias our baseline

results. Seventh, we remove all the states that were always deregulated during our sample period.[30]

Table 4 presents the results. Columns 1-4 report the estimates from the first four procedures, and in all four cases, we note that omitting the influential observations did not change the qualitative nature of our results that within-state branching reform reduces income inequality regardless of which measure we look at, whereas between-state banking deregulation contributes to it, especially when income inequality is measured using top decile income share, Atkinson index, and Theil entropy index. As before, both measures of banking deregulations lower income inequality as measured by the Gini coefficient. In columns 5-8, we show the findings from implementing the fifth approach. More specifically, we drop states from the Midwest in column 5, the Northeast in column 6, the South in column 7, and the West in column 8, and in all four instances, within-state branching reform coefficient estimates continue to be negative when statistically significant. The results for between-state banking deregulation are mostly unchanged from the baseline regressions. In column 9, where we dropped observations for Alaska, Delaware, Hawaii, New York and South Dakota, our results remain very close to our baseline estimates. Finally, column 10 upholds our baseline findings, suggesting that the twelve states that already removed in-state bank branch geographic expansion in 1970 were not driving our results.

6.3. Alternative Specifications and Estimations

This subsection examines the robustness of our baseline results to alternative model specifications and estimation methods. First, we ask whether income inequality rises or falls with years of banking sector deregulatory experiences. For this purpose, we construct two new banking binary indicators to use instead of the within-state branching reform and between-state banking deregulation ones. These indicators take a value of zero in the years before branching reform and banking deregulation and a value of one in the years of policy intervention. For all subsequent years, the values increase by unity, with the minimum (maximum) value being 0 (31). By following this approach, we are exploring the consequences of year-by-year dynamics of income inequality compared to years of deregulatory events.

[30] The dimension of deregulation we refer to here is the within-state branching reform and the twelve states concerned are Alaska, Arizona, California, Delaware, District of Columbia, Idaho, Maryland, Nevada, North Carolina, Rhode Island, South Carolina, South Dakota and Vermont.

Table 4**:** Influential observations

	Excluding observations with absolute standardized residuals greater than 1.96 (1)	Excluding observations with Cook's distance greater than 4 divided by number of observations (2)	Robust regression (3)	Huber M regression (4)	Excluding states from Midwest (5)	Excluding states from Northeast (6)	Excluding states from the South (7)	Excluding states from the West (8)	Excluding Alaska, Delaware, Hawaii, New York and South Dakota (9)	Excluding states always branch reformed (10)
A. Top decile income share										
Within-state branching reform	-0.025***	-0.025***	-0.023**	-0.027***	-0.032**	-0.041***	-0.026*	-0.019**	-0.031**	-0.015*
	(0.004)	(0.003)	(0.030)	(0.000)	(0.043)	(0.005)	(0.089)	(0.032)	(0.018)	(0.059)
Between-state banking deregulation	0.015**	0.015**	0.028***	0.017***	0.015	0.024	0.026*	0.011	0.015*	0.005
	(0.035)	(0.033)	(0.002)	(0.009)	(0.331)	(0.113)	(0.075)	(0.159)	(0.052)	(0.552)
R-squared	0.855	0.855	0.856	0.855	0.798	0.785	0.823	0.802	0.796	0.789
Observations	1501	1499	1576	1581	1209	1302	1054	1178	1426	1178
B. Atkinson index										
Within-state branching reform	-0.006	-0.006	-0.004	-0.006	-0.007	-0.017	-0.012	0.005	-0.005	-0.006
	(0.445)	(0.449)	(0.605)	(0.147)	(0.577)	(0.140)	(0.342)	(0.572)	(0.608)	(0.524)
Between-state banking deregulation	0.026***	0.028***	0.041***	0.026***	0.023**	0.031***	0.033***	0.020**	0.020**	0.025***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.011)	(0.001)	(0.001)	(0.022)	(0.011)	(0.004)
R-squared	0.935	0.935	0.912	0.916	0.893	0.899	0.892	0.913	0.908	0.898
Observations	1486	1484	1572	1581	1209	1302	1054	1178	1426	1178
C. Gini coefficient										
Within-state branching reform	-0.007	-0.007	-0.006	-0.008***	-0.012	-0.012	-0.016	-0.003	-0.010*	-0.017***
	(0.103)	(0.107)	(0.229)	(0.000)	(0.149)	(0.172)	(0.110)	(0.693)	(0.065)	(0.006)

Between-state banking deregulation	-0.007*	-0.007**	-0.003	-0.008***	-0.008	-0.007	-0.012*	-0.016***	-0.011**	-0.008
	(0.055)	(0.034)	(0.521)	(0.009)	(0.170)	(0.200)	(0.086)	(0.007)	(0.011)	(0.137)
R-squared	0.949	0.949	0.935	0.932	0.914	0.902	0.891	0.916	0.93	0.927
Observations	1492	1490	1578	1581	1209	1302	1054	1178	1426	1178
D. Relative mean deviation										
Within-state branching reform	-0.006	-0.006	-0.005	-0.007***	-0.011	-0.011	-0.013	-0.001	-0.008	-0.014**
	(0.180)	(0.180)	(0.290)	(0.002)	(0.152)	(0.186)	(0.196)	(0.863)	(0.128)	(0.027)
Between-state banking deregulation	-0.004	-0.004	-0.001	-0.004	-0.004	-0.001	-0.005	-0.011**	-0.006	-0.002
	(0.197)	(0.197)	(0.856)	(0.263)	(0.510)	(0.879)	(0.416)	(0.047)	(0.149)	(0.646)
R-squared	0.931	0.931	0.913	0.908	0.892	0.881	0.863	0.895	0.907	0.903
Observations	1492	1492	1581	1581	1209	1302	1054	1178	1426	1178
E. Theil entropy index										
Within-state branching reform	-0.004	-0.004	0.007	-0.001	0.002	-0.025	0.004	0.011	-0.007	0.004
	(0.791)	(0.814)	(0.637)	(0.931)	(0.952)	(0.286)	(0.880)	(0.565)	(0.732)	(0.845)
Between-state banking deregulation	0.103***	0.102***	0.235***	0.101***	0.091***	0.105***	0.114***	0.113***	0.089***	0.091***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.009)	(0.005)	(0.003)	(0.001)	(0.002)	(0.003)
R-squared	0.94	0.94	0.937	0.916	0.899	0.909	0.908	0.919	0.916	0.911
Observations	1485	1483	1552	1581	1209	1302	1054	1178	1426	1178
State fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports the results from controlling for the presence of influential observations. The procedures for removing influential observations are excluding observations with absolute standardized residuals greater than 1.96 (column 1), excluding observations with a Cook's distance greater than 4 divided by the number of observations (column 2), implementing robust regression that assigns influential observations smaller weights (column 3), computing Huber M regression that has the characteristic of being more robust in the presence of influential observations (column 4), dropping states from each region at a time: (i) Midwest (columns 5); (ii) Northeast (column 6); (iii) South (column 7); and (iv) West (column 8), excluding states (Alaska, Delaware, Hawaii, New York and South Dakota), with known peculiar characteristics that may bias our results (column 9), and removing states that always permitted in-state bank geographical expansion (column 10). The dependent variable is the natural logarithms of top decile income share (panel A), Atkinson index (panel B), Gini coefficient (panel C), relative mean deviation (panel D) and Theil entropy index (panel E), which are taken from Frank (2014). Within-state branching reform and between-state banking deregulation measures are based on dates taken from Black and Strahan (2002), with Francis et al. (2014) update. All regressions include year fixed effects; state fixed effects and state time trend are included in regressions as indicated. Constant terms are included in all regressions but are not reported. The bottom panel reports features common to all specifications. Standard errors, clustered at the state level, are in parenthesis. ***, ** and * denote significantly different from zero at the 1%, 5% and 10% significance level, respectively. Variable definitions are given in the text. The sample period is 1970-2000.

Table 5: Accounting for years since branching reform and banking deregulation

	Top decile income share (1)	Atkinson index (2)	Gini coefficient (3)	Relative mean deviation (4)	Theil entropy index (5)
Years since within-state branching reform	0.003**	0.001	-0.000	-0.000	0.003
	(0.020)	(0.342)	(0.555)	(0.768)	(0.259)
Years since between-state banking deregulation	0.007**	0.010**	0.008***	0.008***	0.013*
	(0.043)	(0.032)	(0.003)	(0.003)	(0.077)
State fixed effects?	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes
R-squared	0.808	0.906	0.913	0.896	0.908
Observation	1581	1581	1581	1581	1581

Notes: This table reports the results from the linear treatment effect specification of the baseline regressions. The dependent variable is the natural logarithms of top decile income share (column 1), Atkinson index (column 2), Gini coefficient (column 3), relative mean deviation (column 4) and Theil entropy index (column 5), which are taken from Frank (2014). Years since within-state branching reform and Years since between-state banking deregulation measures are based on dates taken from Black and Strahan (2002), with Francis et al. (2014) update. All regressions include year fixed effects; state fixed effects and state time trend are included in regressions as indicated. Constant terms are included in all regressions but are not reported. The bottom panel reports features common to all specifications. Standard errors, clustered at the state level, are in parenthesis. ***, ** and * denote significantly different from zero at the 1%, 5% and 10% significance level, respectively. Variable definitions are given in the text. The sample period is 1970-2000.

Table 5 presents the estimation results of this linear treatment effect specification. We can see that the estimated effect of between-state banking deregulation is positive and statistically significant in all cases, while the estimated effect of within-state branching reform is significant only in column 1 concerning top decile income share. These estimates seem interesting. For instance, all statistically significant coefficients (α and β alike) are positive, implying that income inequality grows with time despite the impact effect of within-state branching reform and between-state banking deregulation. Put differently, over the long-run, the rich have been able to appropriate a bigger chunk of the higher income, which may have arisen due to banking sector policy changes.

Second, we further examine the robustness of our results to controlling for the lagged values of income inequality, and, in addition to the FE estimation method, use the system-GMM estimator for this dynamic panel model. Table 6 presents the results. Again, the results in panel A of this table confirms our baseline estimates that within-state branching reform negatively affects income inequality (when statistically significant as in the cases of top decile income share, Gini coefficient, and relative mean deviation), while between-state banking deregulation is generally a precursor to higher income inequality (when statistically significant as in the cases of top decile income share, Atkinson index, and Theil entropy index).

Table 6: Dynamic model specification

	Top decile income share (1)	Atkinson index (2)	Gini coefficient (3)	Relative mean deviation (4)	Theil entropy index (5)
A. FE					
Within-state branching reform	-0.008**	-0.002	-0.004**	-0.004*	0.004
	(0.016)	(0.624)	(0.042)	(0.077)	(0.471)
Between-state banking deregulation	0.010**	0.012**	0.002	0.001	0.024**
	(0.043)	(0.012)	(0.477)	(0.587)	(0.043)
Income inequality lagged	0.796***	0.619***	0.748***	0.688***	0.833***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R-squared	0.912	0.940	0.955	0.938	0.970
B. GMM					
Within-state branching reform	-0.009***	-0.005	-0.006**	-0.006**	0.003
	(0.005)	(0.438)	(0.016)	(0.042)	(0.629)
Between-state banking deregulation	0.010*	0.013**	-0.000	-0.002	0.014
	(0.061)	(0.019)	(0.918)	(0.565)	(0.255)
Income inequality lagged	0.770***	0.220**	0.574***	0.399***	0.939***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AR(2) *p*-value	0.219	0.01	0.059	0.157	0.057
State fixed effects?	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes
Observation	1530	1530	1530	1530	1530

Notes: This table reports the results from using alternative model specification and estimation strategies. Panels A and B report estimates using fixed-effect (FE) and system generalized method of moments (GMM) estimators, respectively. The dependent variable is the natural logarithms of top decile income share (column 1), Atkinson index (column 2), Gini coefficient (column 3), relative mean deviation (column 4) and Theil entropy index (column 5), which are taken from Frank (2014). Within-state branching reform and between-state banking deregulation measures are based on dates taken from Black and Strahan (2002), with Francis et al. (2014) update. All regressions include year fixed effects; state fixed effects and state time trend are included in regressions as indicated. Constant terms are included in all regressions but are not reported. The bottom panel reports features common to all specifications. Standard errors, clustered at the state level, are in parenthesis. ***, ** and * denote significantly different from zero at the 1%, 5% and 10% significance level, respectively. Variable definitions are given in the text. The sample period is 1970-2000.

Nickell (1981) bias is, however, a well-known problem associated with the previous results because of the inclusion of the lagged dependent variable that may lead to inconsistent estimates of the parameters of interest. This is because lagged income inequality depends on lagged error term, which is a function of state fixed effects, and for instances such as this, it is now commonplace to use the system GMM estimator of Arellano and Bover (1995) and Blundell and Bond (1998). As a robustness check on the estimation technique in this specification, panel B reports the estimates from utilizing system GMM. Looking at the results in both panels A and B, we can confirm that the estimates of the parameters of interest are almost identical in every

respect, but more importantly, the system GMM estimator confirms our main finding from using the FE technique.

Third, current cross-country empirical work on finance and inequality have failed to investigate whether the effect of finance on inequality changes relative to a countries' initial level of income inequality. In that tradition, we have so far estimated models in which we have restricted the effect of within-state branching reform and between-state banking deregulation to be identical across states' initial level of income inequality. To correct for this, we re-estimate our baseline regression specification and include the natural logarithm of the initial levels of income inequality and their interactions with both within-state branching reform and between-state banking deregulation.[31]

Table 7 presents the results. There is no evidence of interaction effects for all the measures of income inequality, except relative mean deviation. In column 4, there appears to be some evidence that there is a link with the interaction of between-state banking deregulation and initial level of relative mean deviation with an estimated coefficient (standard error) of 0.018 (0.010), which is significant at the 5% level. In light of the results in Table 7, we conclude that our baseline results are robust to interaction effects (based on the initial levels of income inequality), though the estimated coefficients of within-state branching reform and between-state banking deregulation are largely lower than in the baseline regressions. We reckon that this is due to the statistically significant positive autocorrelations in the measures of income inequality.

Fourth, we have so far focussed on the separate effects of within-state branching reform and between-state banking deregulation. We now instead consolidate the two measures into one and examine the overall effect of a state authorizing any form of banking sector competition. Our econometric specification is as in equation 3, except that now we have merged both the within-state branching reform and between-state banking deregulation into a single banking deregulation binary indicator. More specifically, we code this consolidated banking deregulation indicator in state *s* at time *t* to be zero in all years for which *t* is less than the year of within-state branching reform or that of between-state banking deregulation, whichever comes first, and code it to take a value of one afterwards.[32]

[31] By this specification, we are asking whether our baseline results of the effects of our banking deregulation measures will vary given that states may differ in their initial inequality conditions. This is the approach taken by Rioja and Valev (2004) in their study of the relationship between financial development and sources of growth and Brueckner and Lederman (2018) in their study of the association between inequality and GDP per capita growth. Other related studies include, for example, Barro (2000) and Castello-Climent (2010).

[32] We note that this measure coincides with the within-state branching reform in 31 states (Alabama, Alaska, Arizona, California, Connecticut, Delaware, Georgia, Hawaii, Idaho, Kansas, Maine, Maryland, Mississippi,

Table 7: Different levels of income inequality

	Top decile income share (1)	Atkinson index (2)	Gini coefficient (3)	Relative mean deviation (4)	Theil entropy index (5)
Within-state branching reform	-0.012***	0.000	-0.005**	-0.003	-0.004
	(0.009)	(0.974)	(0.039)	(0.316)	(0.640)
Between-state banking deregulation	0.011*	0.014***	0.002	0.005*	0.030**
	(0.083)	(0.002)	(0.386)	(0.053)	(0.026)
Income inequality lagged	0.797***	0.618***	0.749***	0.678***	0.836***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Within-state branching reform∗Income	0.001	0.001	-0.001	0.004	-0.011
inequality lagged	(0.269)	(0.595)	(0.720)	(0.639)	(0.202)
Between-state banking deregulation∗	-0.001	0.002	0.000	0.018**	0.012
Income inequality lagged	(0.505)	(0.320)	(0.966)	(0.010)	(0.287)
State fixed effects?	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes
R-squared	0.912	0.94	0.955	0.938	0.97
Observation	1530	1530	1530	1530	1530

Notes: This table reports the results from conditioning on initial income inequality. The dependent variable is the natural logarithms of top decile income share (column 1), Atkinson index (column 2), Gini coefficient (column 3), relative mean deviation (column 4) and Theil entropy index (column 5), which are taken from Frank (2014). Within-state branching reform and between-state banking deregulation measures are based on dates taken from Black and Strahan (2002), with Francis et al. (2014) update. All regressions include year fixed effects; state fixed effects and state time trend are included in regressions as indicated. Constant terms are included in all regressions but are not reported. The bottom panel reports features common to all specifications. Standard errors, clustered at the state level, are in parenthesis. ***, ** and * denote significantly different from zero at the 1%, 5% and 10% significance level, respectively. Variable definitions are given in the text. The sample period is 1970-2000.

In the appendix, Table A.6 presents the results from this exercise. The estimates indicate that the overall average significant effect of banking deregulation on income inequality has been negative, which is consistent with the existing literature employing within-state branching reform as the main explanatory variable (e.g., Beck et al. 2010). In our case, we interpret these results relative to the baseline regression estimates as being due to more states carrying out within-state branching reform (which we have found to be generally negatively related to income inequality) before between-state banking deregulation (which we have found to be generally positively related to income inequality). This may perhaps explain the results with regards to top decile income share.

Montana, Nebraska, Nevada, New Jersey, New York, North Carolina, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Utah, Vermont, Virginia, Washington, and West Virginia) and the District of Columbia, and with the between-state banking deregulation in 17 states (Arkansas, Colorado, Florida, Illinois, Indiana, Iowa, Kentucky, Louisiana, Massachusetts, Michigan, Minnesota, Missouri, New Mexico, Oklahoma, Texas, Wisconsin, and Wyoming). New Hampshire and Tennessee are the remaining two states, both of which introduced in-state bank geographical expansion and cross-state banking competition in the same year.

In terms of the estimated negative effect of the consolidated banking deregulation indicator on the Gini coefficient, there is no surprise here. In the baseline results, both the within-state branching reform and between-state banking deregulation had inverse relationships with the Gini coefficient, whether accounted for jointly (Table 2) or individually (Tables A.3 and A.4). For the lack of meaningful association with the others, especially Atkinson index and Theil entropy index, we opine that this may be due to the attenuating effect arising from the opposing signs of the impacts that within-state branching reform (negative) and between-state banking deregulation (positive) have in our baseline results.

Fifth, our baseline regressions are based on the natural logarithm of the measures of income inequality, rather than their growth rates. While we require more theoretical clarification to underpin whether the dependent variables should be in levels or first differences, we carry out a further robustness check of our baseline specification by using the growth of our measures of income inequality as dependent variables. In the appendix, Table A.7 presents the results from this exercise. The coefficients of the between-state banking deregulation in these first-differences estimations reaffirm our baseline levels estimations. More specifically, they imply that income inequality growth stems from states allowing between-state banking deregulation (columns 1, 2 and 5). Conversely, within-state branching reform ushers in decline in the growth of income inequality (columns 1, 3 and 4). Further, we find evidence in all five columns in support of convergence effect, such that one would expect states with initially high inequality levels to experience a greater closing of the inequality gap than states with initially low inequality level.

6.4. Alternative Data Frequency and Sample Period

Table 8 presents the results from two more robustness checks. First, we address in panel A an additional concern that could be raised; the possibility that idiosyncratic shocks might distort income inequality more when using annual data. To assuage this, we estimate specifications using five-yearly panel data, where instead of thirty-one annual observations per state, we now have seven observations per state. Second, we exploit in panel B the longer sample period available for our inequality data by considering a specification that uses annual data from 1960 to 2015, which increases our observations by 1275 relative to our baseline number of 1581 observations. Nevertheless, the estimated coefficients in both panels are similar in sign and significance to the baseline regressions.

Table 8: Alternative data frequency and sample period

	Top decile income share (1)	Atkinson index (2)	Gini coefficient (3)	Relative mean deviation (4)	Theil entropy index (5)
A. Five-yearly data, 1970-2000					
Within-state branching reform	-0.044**	-0.014	-0.01	-0.009	-0.012
	(0.014)	(0.302)	(0.248)	(0.282)	(0.609)
Between-state banking deregulation	0.008	0.023**	-0.013	-0.009	0.086**
	(0.527)	(0.039)	(0.125)	(0.281)	(0.013)
State fixed effects?	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes
R-squared	0.772	0.901	0.9	0.879	0.912
Observation	357	357	357	357	357
B. Annual data, 1960-2015					
Within-state branching reform	-0.029*	-0.004	-0.004	-0.007	0.001
	(0.085)	(0.779)	(0.653)	(0.454)	(0.973)
Between-state banking deregulation	0.014	0.025**	-0.014**	-0.01	0.103***
	(0.284)	(0.012)	(0.036)	(0.161)	(0.001)
State fixed effects?	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes
R-squared	0.849	0.917	0.918	0.913	0.913
Observation	2856	2856	2856	2856	2856

Notes: This table reports the results from using alternative data frequency and longer sample period. Panels A and B report estimates from models using five-yearly data for the period 1970-2000 and annual data for the period 1960-2015, respectively. The dependent variable is the natural logarithms of top decile income share (column 1), Atkinson index (column 2), Gini coefficient (column 3), relative mean deviation (column 4) and Theil entropy index (column 5), which are taken from Frank (2014). Within-state branching reform and between-state banking deregulation measures are based on dates taken from Black and Strahan (2002), with Francis et al. (2014) update. All regressions include year fixed effects; state fixed effects and state time trend are included in regressions as indicated. Constant terms are included in all regressions but are not reported. The bottom panel reports features common to all specifications. Standard errors, clustered at the state level, are in parenthesis. ***, ** and * denote significantly different from zero at the 1%, 5% and 10% significance level, respectively. Variable definitions are given in the text. The sample period in panel A is 1970-2000 and in panel B is 1960-2015.

6.5. Additional Controls: Time-Varying State-Level Factors

One of the strengths of our empirical strategy that employs state and year fixed effects is that a wide range of potentially important factors driving income inequality are already accounted for in the results presented so far. This is because any inter-state and over-time variations in regulations between states, whether unobserved state-level differences, federal-level shocks, or any trends, have been fully absorbed by adding state and year fixed effects. In practice, this accords our baseline empirical specification enough variations in the within-state banking reform and between-state banking deregulation to extract their influence on income inequality. Nevertheless, a possible reservation that could be laid against our findings is that we have not

directly controlled for time-varying state-level factors that may be driving income inequality across US states.

We consider this particular concern in this sub-section, with Table 9 presenting the results. Panels A-E report the results from a specification that include, as an additional covariate, GSP growth rate, rate of growth of state population, union membership, unemployment rate, and house price index, respectively. Lastly in panel F, all five controls are added simultaneously. Most reassuringly, the results on the estimated coefficients on both the within-state branching reform and between-state banking deregulation are similar to our baseline regression estimates. To summarise, the findings remain that, when statistically significant, within-state branching reform (between-state banking deregulation) on average reduces (raises) income inequality.[33]

7. Channels

How does banking deregulation affect income inequality? The literature on the finance-inequality nexus has identified numerous channels by which developments in the financial sector may shape the economic opportunities faced by different strata of a population. For instance, changes in the financial institutions, system and structures, by influencing capital allocation, savings mobilization, risk diversification, and human capital accumulation, can directly or indirectly equalize income opportunities or widen income gaps between the most affluent and the most impoverished groups within a society (Claessens and Perotti 2007; Demirguc-Kunt and Levine 2009).

In this section, we explore more systematically the human capital channel. Human capital is modelled by Galor and Zeira (1993) to be the intermediating channel through which inequality affects income per capita and has been empirically investigated in Brueckner et al. (2015, 2018). We test this in the context of cross-state analysis by estimating a version of equation 3, with a measure for human capital accumulation included as an additional control:

$$I_{s,t} = \alpha W_{s,t} + \beta B_{s,t} + \gamma M_{s,t} + \Phi_s + \Psi_t + \varepsilon_{s,t} \quad (4)$$

where M designates the mechanism of interest, which in this case is human capital accumulation, and γ is a parameter that captures its effect on each measure of income inequality. All other variables and parameters are as previously described. To represent human capital accumulation, we utilise the composite measure of human capital from Turner et al. (2007) and high school and college education attainments from Frank (2009). The results from estimating equation 4 are reported in panel A of Table 10. We find that achieving more schooling mostly leads, on average, to decreases in income inequality. Attaining high school education before dropping out, meanwhile, tends to have the largest impact for lowering income inequality.

[33] The inequality-reducing effect of between-state banking deregulation on Gini coefficient remains an exception, as was obtained in the baseline results.

Table 9: Additional time-varying state-level controls

	Top decile income share	Atkinson index	Gini coefficient	Relative mean deviation	Theil entropy index
	(1)	(2)	(3)	(4)	(5)
A. GSP growth					
Within-state branching reform	-0.030**	-0.010	-0.010	-0.009	-0.006
	(0.014)	(0.352)	(0.138)	(0.186)	(0.754)
Between-state banking deregulation	0.019	0.025***	-0.009*	-0.004	0.101***
	(0.128)	(0.005)	(0.062)	(0.368)	(0.002)
R-squared	0.795	0.898	0.906	0.882	0.909
Observations	1581	1581	1581	1581	1581
B. Population growth					
Within-state branching reform	-0.030**	-0.008	-0.011	-0.010	-0.002
	(0.014)	(0.418)	(0.106)	(0.158)	(0.926)
Between-state banking deregulation	0.014	0.021***	-0.009	-0.004	0.085***
	(0.199)	(0.004)	(0.102)	(0.429)	(0.001)
R-squared	0.798	0.901	0.906	0.882	0.916
Observations	1581	1581	1581	1581	1581
C. Union membership					
Within-state branching reform	-0.031**	-0.009	-0.012*	-0.011	-0.004
	(0.012)	(0.354)	(0.089)	(0.123)	(0.862)
Between-state banking deregulation	0.018	0.026***	-0.012**	-0.006	0.106***
	(0.123)	(0.001)	(0.014)	(0.155)	(0.001)
R-squared	0.796	0.898	0.906	0.884	0.907
Observations	1581	1581	1581	1581	1581
D. Unemployment rate					
Within-state branching reform	-0.032***	-0.013	-0.013*	-0.013*	-0.014
	(0.008)	(0.209)	(0.085)	(0.088)	(0.489)
Between-state banking deregulation	0.010	0.013**	-0.011**	-0.007	0.072***
	(0.323)	(0.050)	(0.018)	(0.127)	(0.003)
R-squared	0.777	0.913	0.886	0.860	0.917
Observations	1275	1275	1275	1275	1275
E. House price index					
Within-state branching reform	-0.024**	-0.005	-0.012	-0.012	0.010
	(0.038)	(0.568)	(0.107)	(0.125)	(0.571)
Between-state banking deregulation	0.016*	0.018***	-0.012**	-0.008	0.092***
	(0.096)	(0.008)	(0.021)	(0.150)	(0.000)
R-squared	0.790	0.916	0.888	0.862	0.918
Observations	1326	1326	1326	1326	1326

F. All time-varying controls					
Within-state branching reform	-0.026**	-0.007	-0.012	-0.011	0.001
	(0.031)	(0.446)	(0.119)	(0.140)	(0.971)
Between-state banking deregulation	0.011	0.013**	-0.009**	-0.005	0.069***
	(0.212)	(0.039)	(0.045)	(0.234)	(0.001)
R-squared	0.788	0.917	0.891	0.865	0.924
Observations	1275	1275	1275	1275	1275
State fixed effects?	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes

Notes: This table reports the results from controlling for additional time-varying factors. Panels A-F report estimates from models controlling for gross state product (GSP) growth, population growth, union membership, unemployment rate, house price index, and all controls together, respectively. The dependent variable is the natural logarithms of top decile income share (column 1), Atkinson index (column 2), Gini coefficient (column 3), relative mean deviation (column 4) and Theil entropy index (column 5), which are taken from Frank (2014). Within-state branching reform and between-state banking deregulation measures are based on dates taken from Black and Strahan (2002), with Francis et al. (2014) update. All regressions include year fixed effects; state fixed effects and state time trend are included in regressions as indicated. Constant terms are included in all regressions but are not reported. Standard errors, clustered at the state level, are in parenthesis. ***, ** and * denote significantly different from zero at the 1%, 5% and 10% significance level, respectively. Variable definitions are given in the text. The sample period is 1970-2000.

Lastly, in panel B of Table 10, we estimate another version of equation 3, where, instead of the inequality measures on the left-hand-side, each human capital measure is now regressed on our banking deregulation indicators:

$$M_{s,t} = \alpha W_{s,t} + \beta B_{s,t} + \Phi_s + \Psi_t + \varepsilon_{s,t} \quad (5)$$

The results show that within-state branching reform and between-state banking deregulation lack significant effect on high school and college education. In terms of composite human capital, there is no evident association with within-state branching reform, but between-state banking deregulation has a statistically significant positive effect at the 10% level. Our interpretation of these estimates is that financial development, in the forms of within-state branching reform and between-state banking deregulation, have certainly deepened across US states, but a lot remains to be done to broaden its reach.

Anecdotal evidence in the existing literature suggests that within-state branching reform is analogous with expanding the breadth of financial services, while between-state banking deregulation is parallel to augmenting the depth of financial services. We believe that this is one of the reasons we have obtained these results. Our finding here is material, indicating that the effect of state-level banking sector policy changes on income inequality is dependent on whether within-state branching reform (breadth of financial services) or between-state banking deregulation (depth of financial services) dominates.

Table 10: Investigating education as a mechanism

	Top decile income share (1)	Atkinson index (2)	Gini coefficient (3)	Relative mean deviation (4)	Theil entropy index (5)
A. The conditional effect of finance on inequality					
Within-state branching reform	-0.031***	-0.009	-0.011	-0.01	-0.004
	(0.008)	(0.373)	(0.116)	(0.173)	(0.847)
Between-state banking deregulation	0.020*	0.028***	-0.011**	-0.006	0.108***
	(0.087)	(0.001)	(0.042)	(0.270)	(0.001)
Human capital	-0.424*	-0.167	-0.049	0.041	-0.483
	(0.065)	(0.314)	(0.610)	(0.677)	(0.161)
R-squared	0.8	0.898	0.904	0.881	0.908
Within-state branching reform	-0.029**	-0.008	-0.011	-0.01	-0.001
	(0.010)	(0.419)	(0.133)	(0.175)	(0.945)
Between-state banking deregulation	0.021*	0.028***	-0.010**	-0.005	0.109***
	(0.088)	(0.001)	(0.042)	(0.302)	(0.001)
High school	-0.270***	-0.147*	-0.066*	-0.042	-0.293**
	(0.002)	(0.073)	(0.056)	(0.277)	(0.048)
R-squared	0.806	0.899	0.905	0.882	0.909
Within-state branching reform	-0.030**	-0.009	-0.011	-0.01	-0.003
	(0.012)	(0.397)	(0.121)	(0.166)	(0.874)
Between-state banking deregulation	0.019	0.027***	-0.011**	-0.006	0.105***
	(0.110)	(0.001)	(0.034)	(0.256)	(0.001)
College education	-0.032	0.014	-0.002	0.007	0.076
	(0.435)	(0.734)	(0.898)	(0.711)	(0.332)
R-squared	0.796	0.898	0.904	0.881	0.907
	Human capital		High school		College education
B. The relationship between finance and education					
Within-state branching reform	-0.002		0.005		0.006
	(0.721)		(0.696)		(0.674)
Between-state banking deregulation	0.004*		0.01		0.017
	(0.087)		(0.175)		(0.102)
R-squared	0.955		0.936		0.942
State fixed effects?	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes
Observation	1581	1581	1581	1581	1581

Notes: This table reports the results of investigating education as a potential mechanism for banking deregulation to affect income inequality. Panel A reports estimates from models that add human capital, high school and college education in successions and panel B reports estimates of the effect of within-state branching reform and between-state banking deregulation on education measures. In panel A, the dependent variable is the natural logarithms of top decile income share (column 1), Atkinson index (column 2), Gini coefficient (column 3), relative mean deviation (column 4) and Theil entropy index (column 5), which are taken from Frank (2014). In panel B, the dependent variable is the natural logarithms of human capital (column 1), high school (column 3), and college education (column 5). Within-state branching reform and between-state banking deregulation measures are based on dates taken from Black and Strahan (2002), with Francis et al. (2014) update. All regressions include year fixed effects; state fixed effects and state time trend are included in regressions as indicated. Constant terms are included in all regressions but are not reported. The bottom panel reports features common to all specifications. The bottom panel reports features common to all specifications. Standard errors, clustered at the state level, are in parenthesis. ***, ** and * denote significantly different from zero at the 1%, 5% and 10% significance level, respectively. Variable definitions are given in the text. The sample period in panel A is 1970-2000.

8. Conclusion

Investigation of inequality, its causes, consequences, and why and how it persists has been rigorous in the literature at least since Kuznets (1955). Our motivation in this paper has been to empirically examine whether within-state branching reform and between-state banking deregulation over a thirty-year period in the US has had any meaningful impact on income inequality. Our results reveal that the emergence of banking deregulation laws across US states from the mid-1970s to late 1990s has had both equalising and disequalising effects on income inequality. If we were to accord within-state branching reform similar meaning to internal or local financing, and if we view between-state banking deregulation as external or global financing, our results would suggest that financial localization is income equalising, whereas financial globalization is disequalising for income.

Our main contribution to this line of research is that we have used new datasets that have significantly reduced both the measurement and identification problems faced in previous studies on the finance-inequality nexus, especially in cross-country analysis. Our main result indicates that banking competition in the form of within-state branching reform reduces income inequality, whereas the results regarding banking competition in the form of between-state banking deregulation increase income inequality. These results underscore the findings of Abiad et al. (2008) that different dimensions of financial development imply varying impacts on income inequality.

Considering our results in light of the previous literature, which we briefly reviewed in Section 2, the aggregate effect of financial development (deregulation policy) on income inequality remains unresolved. This finding should be anticipated, given theoretical predictions in relation to the intensive and extensive margins. What we do know is that the inequality effect depends on which of these two margins dominates: (i) when the intensive margin is larger, those currently accessing financial services and products are favoured to enjoy more access to a greater variety and quality of product-lines and activities at the expense of the excluded groups, which will raise income inequality; and (ii) when the extensive margin is larger, those lacking access

before can now also join the community of users of financial services and products, with a potential to reduce income inequality.

Finally, while the international policy community may have correctly pinpointed finance as useful for reducing inequality, the unqualified emphasis on programmes that counsel on financial development is likely to be ineffective if not complemented with the pursuit of financial diffusion. It seems likely that the key factor, which primarily accounts for whether inequality gap widens or narrows is whether the consequent restructuring of the financial system and institutions lead to an equilibrium, where financial depth dominates financial breadth, or vice-versa. Upon this basis, we assert that policy matters, exhibiting first-order importance for inequality, and the crucial challenge before every stakeholder (economists and policymakers to begin with) is to advance, adapt, and implement policies that do not only stimulate financial development but also those that champion financial inclusion.

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Appendix

Table A.1: Timing of branching reform and banking deregulation

State	State postal code	Year of branching reform	Year of banking deregulation	State	State postal code	Year of branching reform	Year of banking deregulation
Alabama	AL	1981	1987	Montana	MT	1990	1993
Alaska	AK	1960	1982	Nebraska	NE	1985	1990
Arizona	AZ	1960	1986	Nevada	NV	1960	1985
Arkansas	AR	1994	1989	New Hampshire	NH	1987	1987
California	CA	1960	1987	New Jersey	NJ	1977	1986
Colorado	CO	1991	1988	New Mexico	NM	1991	1989
Connecticut	CT	1980	1983	New York	NY	1976	1982
Delaware	DE	1960	1988	North Carolina	NC	1960	1985
District of Columbia	DC	1960	1985	North Dakota	ND	1987	1991
Florida	FL	1988	1985	Ohio	OH	1979	1985
Georgia	GA	1983	1985	Oklahoma	OK	1988	1987
Hawaii	HI	1986	1997	Oregon	OR	1985	1986
Idaho	ID	1960	1985	Pennsylvania	PA	1982	1986
Illinois	IL	1988	1986	Rhode Island	RI	1960	1984
Indiana	IN	1989	1986	South Carolina	SC	1960	1986
Iowa	IA	1996	1991	South Dakota	SD	1960	1988
Kansas	KS	1987	1992	Tennessee	TN	1985	1985
Kentucky	KY	1990	1984	Texas	TX	1988	1987
Louisiana	LA	1988	1987	Utah	UT	1981	1984
Maine	ME	1975	1978	Vermont	VT	1970	1988
Maryland	MD	1960	1985	Virginia	VA	1978	1985
Massachusetts	MA	1984	1983	Washington	WA	1985	1987
Michigan	MI	1987	1986	West Virginia	WV	1987	1988
Minnesota	MN	1993	1986	Wisconsin	WI	1990	1987
Mississippi	MS	1986	1988	Wyoming	WY	1988	1987
Missouri	MO	1990	1986				

Notes: Within-state branching reform and between-state banking deregulation dates are from Black and Strahan (2002), with Francis et al. (2014) update. (Any state branching reform that precedes 1970 is coded as 1970 in our baseline analysis.)

Table A.2: Additional summary statistics

	Min	p25	p50	Mean	p75	Max	SD	Obs
Top decile income share	20.37	20.37	20.37	36.43	36.43	58.93	4.841	1581
Natural logarithm of top decile income share	3.014	3.014	3.014	3.587	3.587	4.076	0.13	1581
Growth rate of top decile income share	-0.198	-0.198	-0.198	0.0103	0.0103	0.241	0.0415	1530
Atkinson index	0.152	0.152	0.152	0.215	0.215	0.38	0.0363	1581
Natural logarithm of Atkinson index	-1.885	-1.885	-1.885	-1.549	-1.549	-0.968	0.159	1581
Growth rate of Atkinson index	-0.261	-0.261	-0.261	0.0146	0.0146	0.291	0.0472	1530
Gini coefficient	0.41	0.41	0.41	0.521	0.521	0.695	0.05	1581
Natural logarithm of Gini coefficient	-0.892	-0.892	-0.892	-0.656	-0.656	-0.364	0.0951	1581
Growth rate of Gini coefficient	-0.113	-0.113	-0.113	0.00786	0.00786	0.149	0.0237	1530
Relative mean deviation	0.561	0.561	0.561	0.734	0.734	0.982	0.0639	1581
Natural logarithm of relative mean deviation	-0.578	-0.578	-0.578	-0.313	-0.313	-0.0179	0.0863	1581
Growth rate of relative mean deviation	-0.14	-0.14	-0.14	0.00791	0.00791	0.171	0.023	1530
Theil entropy index	0.291	0.291	0.291	0.538	0.538	1.326	0.188	1581
Natural logarithm of Theil entropy index	-1.233	-1.233	-1.233	-0.676	-0.676	0.282	0.324	1581
Growth rate of Theil entropy index	-0.395	-0.395	-0.395	0.0257	0.0257	0.505	0.0686	1530
Within-state branching reform	0	0	0	0.617	0.617	1	0.486	1581
Between-state banking deregulation	0	0	0	0.467	0.467	1	0.499	1581
Natural logarithm of output per worker	10.36	10.36	10.36	10.88	10.88	12.26	0.246	1578
Natural logarithm of population size	12.62	12.62	12.62	14.68	14.68	16.81	1.055	1581
Natural logarithm of high school	-1.311	-1.311	-1.311	-0.67	-0.67	-0.399	0.18	1581
Natural logarithm of college educated	-3.267	-3.267	-3.267	-2.188	-2.188	-1.154	0.34	1581
Natural logarithm of human capital pw	0.934	0.934	0.934	1.232	1.232	1.457	0.0923	1581
Unit banking states	0	0	0	0.314	0.314	1	0.464	1581
Slave states	0	0	0	0.294	0.294	1	0.456	1581
Antimiscegenation law states	0	0	0	0.314	0.314	1	0.464	1581
No fair housing law states	0	0	0	0.549	0.549	1	0.498	1581
High interracial marriage bias states	0	0	0	0.529	0.529	1	0.499	1581
No interest rate control states	0	0	0	0.353	0.353	1	0.478	1581
Moderate interest rate control states	0	0	0	0.333	0.333	1	0.472	1581
Strict interest rate control states	0	0	0	0.314	0.314	1	0.464	1581
Branch restrictiveness index	0	0	0	2.412	2.412	4	1.403	1581
GSP growth	-0.31	-0.31	-0.31	0.077	0.077	0.442	0.0448	1581
Population growth	0	0	0	0	0	0	0	1581
Union membership	3.3	3.3	3.3	17.95	17.95	42.4	7.971	1581
Unemployment rate	0.823	0.823	0.823	2	2	3	0	1275
House price index	3.775	3.775	3.775	4.886	4.886	6.049	0.398	1326

Notes: This table reports the summary statistics of the variables used in regressions. Variable definitions are given in the text. The sample period is 1970-2000.

Table A.3: Within-state branching reform and income inequality

	Top decile income share (1)	Atkinson index (2)	Gini coefficient (3)	Relative mean deviation (4)	Theil entropy index (5)
A. Pre-post specification with state fixed effects					
Within-state branching reform	-0.029**	-0.007	-0.012*	-0.01	0.004
	(0.016)	(0.508)	(0.095)	(0.146)	(0.836)
State fixed effects?	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes
R-squared	0.794	0.896	0.903	0.881	0.902
Observation	1581	1581	1581	1581	1581
B. Pre-post specification with state time trend					
Within-state branching reform	-0.014**	-0.004	-0.020***	-0.017***	0.017
	(0.037)	(0.468)	(0.000)	(0.001)	(0.358)
State time trend?	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes
R-squared	0.882	0.944	0.933	0.925	0.938
Observation	1581	1581	1581	1581	1581

Notes: This table reports the results from using within-state branching reform to represent financial development. The dependent variable is the natural logarithms of top decile income share (column 1), Atkinson index (column 2), Gini coefficient (column 3), relative mean deviation (column 4) and Theil entropy index (column 5), which are taken from Frank (2014). Within-state branching reform measure is based on dates taken from Black and Strahan (2002), with Francis et al. (2014) update. All regressions include year fixed effects; state fixed effects and state time trend are included in regressions as indicated. Constant terms are included in all regressions but are not reported. Standard errors, clustered at the state level, are in parenthesis. ***, ** and * denote significantly different from zero at the 1%, 5% and 10% significance level, respectively. Variable definitions are given in the text. The sample period is 1970-2000.

Table A.4: Between-state banking deregulation and income inequality

	Top decile income share (1)	Atkinson index (2)	Gini coefficient (3)	Relative mean deviation (4)	Theil entropy index (5)
A. Pre-post specification with state fixed effects					
Between-state banking deregulation	0.015	0.026***	-0.013**	-0.007	0.106***
	(0.178)	(0.001)	(0.027)	(0.198)	(0.001)
State fixed effects?	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes
R-squared	0.789	0.897	0.903	0.88	0.907
Observation	1581	1581	1581	1581	1581
B. Pre-post specification with state time trend					
Between-state banking deregulation	0.011	0.013	-0.018***	-0.013***	0.088**
	(0.330)	(0.124)	(0.000)	(0.001)	(0.010)
State time trend?	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes
R-squared	0.882	0.944	0.933	0.924	0.941
Observation	1581	1581	1581	1581	1581

Notes: This table reports the results from using between-state banking deregulation to represent financial development. The dependent variable is the natural logarithms of top decile income share (column 1), Atkinson index (column 2), Gini coefficient (column 3), relative mean deviation (column 4) and Theil entropy index (column 5), which are taken from Frank (2014). Between-state banking deregulation measure is based on dates taken from Black and Strahan (2002), with Francis et al. (2014) update. All regressions include year fixed effects; state fixed effects and state time trend are included in regressions as indicated. Constant terms are included in all regressions but are not reported. Standard errors, clustered at the state level, are in parenthesis. ***, ** and * denote significantly different from zero at the 1%, 5% and 10% significance level, respectively. Variable definitions are given in the text. The sample period is 1970-2000.

Table A.5: Additional heterogeneous effects

	Unit banking law states (1)	Branch restrictiveness index (2)	Interest rate ceiling indicator (3)	No interest rate control states (4)	Moderate interest rate control states (5)	Strict interest rate control states (6)	Slave states (7)	Anti-miscegenation law states (8)	No fair housing law states (9)	High racial bias index states (10)
A. Top decile income share										
Within-state branching reform	-0.028*	0.004	-0.042**	-0.019	-0.030**	-0.036**	-0.027*	-0.018	-0.005	-0.016
	(0.061)	(0.810)	(0.031)	(0.115)	(0.043)	(0.015)	(0.077)	(0.183)	(0.648)	(0.320)
Between-state banking deregulation	0.031*	0.017	0.034**	0.006	0.030**	0.022**	0.030**	0.034**	0.028	0.046***
	(0.060)	(0.341)	(0.017)	(0.704)	(0.038)	(0.035)	(0.033)	(0.015)	(0.108)	(0.008)
Within-state branching reform∗	0.013	-0.013**	0.014	-0.02	0.01	0.019	-0.013	-0.023	-0.046**	-0.008
Interaction term	(0.507)	(0.044)	(0.315)	(0.380)	(0.634)	(0.412)	(0.450)	(0.152)	(0.027)	(0.658)
Between-state banking deregulation∗	-0.038**	-0.001	-0.015	0.037*	-0.037**	-0.007	-0.041***	-0.051***	-0.018	-0.053***
Interaction term	(0.036)	(0.927)	(0.270)	(0.078)	(0.020)	(0.756)	(0.010)	(0.001)	(0.394)	(0.002)
R-squared	0.799	0.800	0.797	0.799	0.800	0.796	0.806	0.815	0.809	0.812
B. Atkinson index										
Within-state branching reform	-0.009	0.017	-0.013	0.001	-0.015	-0.008	-0.014	-0.008	-0.001	0.003
	(0.465)	(0.255)	(0.421)	(0.947)	(0.233)	(0.525)	(0.273)	(0.515)	(0.934)	(0.825)
Between-state banking deregulation	0.034***	0.025*	0.035***	0.018*	0.038***	0.025***	0.035***	0.036***	0.034**	0.047***
	(0.001)	(0.078)	(0.007)	(0.084)	0.000	(0.005)	0.000	0.000	(0.011)	0.000
Within-state branching reform∗	0.011	-0.010*	0.006	-0.019	0.028	-0.004	0.017	0.006	-0.014	-0.009
Interaction term	(0.529)	(0.056)	(0.655)	(0.342)	(0.117)	(0.863)	(0.314)	(0.732)	(0.463)	(0.628)
Between-state banking deregulation∗	-0.022	0.000	-0.008	0.026	-0.036***	0.005	-0.030**	-0.032**	-0.013	-0.038**
Interaction term	(0.138)	(0.988)	(0.481)	(0.140)	(0.007)	(0.780)	(0.042)	(0.031)	(0.456)	(0.013)
R-squared	0.898	0.899	0.898	0.899	0.899	0.898	0.899	0.9	0.899	0.903
C. Gini coefficient										

Within-state branching reform	-0.008	0.005	-0.008	-0.013	-0.013	-0.008	-0.014	-0.012	-0.015	-0.009
	(0.329)	(0.578)	(0.446)	(0.126)	(0.149)	(0.283)	(0.136)	(0.176)	(0.107)	(0.341)
Between-state banking deregulation	-0.009	-0.009	-0.019*	-0.009	-0.008	-0.018**	-0.008	-0.009	0.002	0.002
	(0.222)	(0.289)	(0.082)	(0.136)	(0.195)	(0.028)	(0.207)	(0.175)	(0.832)	(0.704)
Within-state branching reform∗	-0.004	-0.006*	-0.005	0.003	0.009	-0.013	0.009	0.006	0.007	0.005
Interaction term	(0.703)	(0.060)	(0.579)	(0.831)	(0.361)	(0.373)	(0.420)	(0.601)	(0.550)	(0.698)
Between-state banking deregulation∗	-0.009	-0.002	0.008	-0.007	-0.01	0.018	-0.012	-0.01	-0.024**	-0.028**
Interaction term	(0.314)	(0.592)	(0.352)	(0.582)	(0.241)	(0.226)	(0.230)	(0.342)	(0.041)	(0.011)
R-squared	0.905	0.906	0.905	0.904	0.904	0.905	0.905	0.904	0.907	0.909
D. Relative mean deviation										
Within-state branching reform	-0.006	0.009	-0.009	-0.01	-0.012	-0.008	-0.012	-0.011	-0.012	-0.006
	(0.436)	(0.301)	(0.391)	(0.189)	(0.217)	(0.283)	(0.188)	(0.215)	(0.158)	(0.507)
Between-state banking deregulation	-0.002	0.000	-0.012	-0.004	-0.003	-0.011	-0.003	-0.003	0.007	0.011
	(0.731)	(0.977)	(0.262)	(0.540)	(0.631)	(0.149)	(0.615)	(0.582)	(0.358)	(0.111)
Within-state branching reform∗	-0.003	-0.007**	-0.002	-0.001	0.007	-0.008	0.008	0.007	0.005	0.003
Interaction term	(0.772)	(0.039)	(0.827)	(0.962)	(0.478)	(0.589)	(0.449)	(0.531)	(0.649)	(0.785)
Between-state banking deregulation∗	-0.011	-0.003	0.006	-0.005	-0.009	0.015	-0.01	-0.009	-0.024**	-0.033***
Interaction term	(0.227)	(0.280)	(0.439)	(0.666)	(0.328)	(0.294)	(0.313)	(0.355)	(0.044)	(0.002)
R-squared	0.883	0.886	0.882	0.881	0.882	0.882	0.882	0.882	0.885	0.89
E. Theil entropy index										
Within-state branching reform	0.002	0.035	-0.01	0.011	-0.009	-0.004	-0.005	0.007	0.033*	0.03
	(0.941)	(0.267)	(0.741)	(0.587)	(0.718)	(0.860)	(0.824)	(0.755)	(0.090)	(0.283)
Between-state banking deregulation	0.115***	0.117***	0.123***	0.090***	0.123***	0.107***	0.123***	0.127***	0.109***	0.135***
	(0.002)	(0.005)	(0.001)	(0.006)	0.000	(0.001)	0.000	0.000	(0.002)	0.000
Within-state branching reform∗	0.003	-0.014	0.01	-0.024	0.029	0.005	0.007	-0.014	-0.066*	-0.04
Interaction term	(0.942)	(0.196)	(0.622)	(0.518)	(0.431)	(0.887)	(0.817)	(0.669)	(0.053)	(0.254)
Between-state banking deregulation∗	-0.028	-0.006	-0.017	0.046	-0.053*	-0.002	-0.063**	-0.074**	-0.007	-0.052*
Interaction term	(0.392)	(0.533)	(0.407)	(0.192)	(0.080)	(0.956)	(0.041)	(0.017)	(0.835)	(0.086)
R-squared	0.907	0.908	0.907	0.908	0.908	0.907	0.909	0.911	0.909	0.911

State fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1581	1581	1581	1581	1581	1581	1581	1581	1581	1581

Notes: This table reports the results from controlling for the presence of additional state heterogeneity. The interaction terms are a binary indicator that takes a value of one if a state had unit banking law in place before deregulation and zero otherwise (column 1), a branching restrictiveness index that takes a zero value when a state did not impose any of (i) the minimum age of the target institution, (ii) *de novo* interstate branching, (iii) the acquisition of individual branches, and (iv) a statewide deposit gap, as provided for in Riegel-Neal Act for states to maintain their control over territorial banking expansions, and which value increases to a maximum of four for each enforced barrier (column 2), an interest rate ceiling indicator that we set equal to zero, one, or two if a state has no interest rate controls, moderate interest rate controls, or strict interest rate controls (column 3), a binary indicator that takes a value of one if a state has no interest rate controls and zero otherwise (column 4), a binary indicator that takes a value of one if a state has moderate interest rate controlsand zero otherwise (columns 5), a binary indicator that takes a value of one if a state has strict interest rate controls and zero otherwise (column 6), a binary indicator that takes a value of one if a state is recognised as a pre-Civil War slavery condoning and zero otherwise (column 7), a binary indicator that takes a value of one if a state only repealed antimiscegenation law after *Loving v. Virginia* (388 US 1 [1967]) and zero otherwise (column 8), a binary indicator that takes a value of one if a state has no fair housing law in place before the 1968 Fair Housing Act and zero otherwise (column 9), and a binary indicator that takes a value of one if a state has a racial bias index that is above the median and zero otherwise (column 10). The dependent variable is the natural logarithms of top decile income share (panel A), Atkinson index (panel B), Gini coefficient (panel C), relative mean deviation (panel D) and Theil entropy index (panel E), which are taken from Frank (2014). Within-state branching reform and between-state banking deregulation measures are based on dates taken from Black and Strahan (2002), with Francis et al. (2014) update. All regressions include year fixed effects; state fixed effects and state time trend are included in regressions as indicated. Constant terms are included in all regressions but are not reported. The bottom panel reports features common to all specifications. Standard errors, clustered at the state level, are in parenthesis. ***, ** and * denote significantly different from zero at the 1%, 5% and 10% significance level, respectively. Variable definitions are given in the text. The sample period is 1970-2000.

Table A.6: Consolidated banking sector deregulation indicator and income inequality

	Top decile income share (1)	Atkinson index (2)	Gini coefficient (3)	Relative mean deviation (4)	Theil entropy index (5)
Any of within-state branching reform/	-0.032**	-0.011	-0.015*	-0.013	0.001
between-state banking deregulation in operation	(0.014)	(0.316)	(0.081)	(0.101)	(0.955)
State fixed effects?	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes
R-squared	0.795	0.897	0.904	0.882	0.902
Observation	1581	1581	1581	1581	1581

Notes: This table reports the results from using a consolidated measure of banking deregulation. The dependent variable is the natural logarithms of top decile income share (column 1), Atkinson index (column 2), Gini coefficient (column 3), relative mean deviation (column 4) and Theil entropy index (column 5), which are taken from Frank (2014). Any of within-state branching reform/between-state banking deregulation measures are based on dates taken from Black and Strahan (2002), with Francis et al. (2014) update. All regressions include year fixed effects; state fixed effects and state time trend are included in regressions as indicated. Constant terms are included in all regressions but are not reported. Standard errors, clustered at the state level, are in parenthesis. ***, ** and * denote significantly different from zero at the 1%, 5% and 10% significance level, respectively. Variable definitions are given in the text. The sample period is 1970-2000.

Table A.7: Deregulation and growth of income inequality

	Growth of top decile income share (1)	Growth of Atkinson index (2)	Growth of Gini coefficient (3)	Growth of relative mean deviation (4)	Growth of Theil entropy index (5)
Within-state branching reform	-0.008**	-0.002	-0.004**	-0.004*	0.004
	(0.016)	(0.624)	(0.042)	(0.077)	(0.471)
Between-state banking deregulation	0.010**	0.012**	0.002	0.001	0.024**
	(0.043)	(0.012)	(0.477)	(0.587)	(0.043)
Income inequality lagged	-0.204***	-0.381***	-0.252***	-0.312***	-0.167***
	0.000	0.000	0.000	0.000	0.000
State fixed effects?	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes
R-squared	0.402	0.422	0.401	0.287	0.438
Observation	1530	1530	1530	1530	1530

Notes: This table reports the results from using the growth rates of the dependent variables. The dependent variable is the log differences of top decile income share (column 1), Atkinson index (column 2), Gini coefficient (column 3), relative mean deviation (column 4) and Theil entropy index (column 5), which are taken from Frank (2014). Within-state branching reform and between-state banking deregulation measures are based on dates taken from Black and Strahan (2002), with Francis et al. (2014) update. All regressions include year fixed effects; state fixed effects and state time trend are included in regressions as indicated. Constant terms are included in all regressions but are not reported. Standard errors, clustered at the state level, are in parenthesis. ***, ** and * denote significantly different from zero at the 1%, 5% and 10% significance level, respectively. Variable definitions are given in the text. The sample period is 1970-2000.