The Financial Origins of the Rise and Fall of American Inflation

Itamar Drechsler, Alexi Savov, Philipp Schnabl*

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Abstract

We propose and test a new explanation for the rise and fall of the Great Inflation, a defining event in macroeconomics. We argue that its rise was due to the imposition of binding deposit rate ceilings under the law known as Regulation Q, and that its fall was due to the removal of these ceilings once the law was repealed. Deposits were the dominant form of saving at the time, hence Regulation Q suppressed the return to saving. This drove up aggregate demand, which pushed up inflation and further lowered the real return to saving, setting off an inflation spiral. The repeal of Regulation Q broke the spiral by sending deposit rates sharply higher. We document that the rise and fall of the Great Inflation lines up closely with the imposition and repeal of Regulation Q and the enormous changes in deposit rates and quantities it produced. We further test this explanation in the cross section using detailed data on local deposit markets and inflation. By exploiting four different sources of geographic variation, we show that the degree to which Regulation Q was binding has a large impact on local inflation, consistent with the hypothesis that Regulation Q explains the observed variation in aggregate inflation. We conclude that in the presence of financial frictions the Fed may be unable to control inflation regardless of its policy rule.

Keywords: Inflation, monetary policy, banks, deposits, regulation Q

*Drechsler: University of Pennsylvania and NBER, idrechsl@wharton.upenn.edu. Savov and Schnabl: New York University and NBER, asavov@stern.nyu.edu and schnabl@stern.nyu.edu. We thank Markus Brunnermeier, John Campbell, John Cochrane, François Gourio, Raghuram Rajan, Valerie Ramey, Philip Strahan, Joseph Vavra, and seminar participants at the American Finance Association Meeting, Australian National University, Central Bank of Canada, Chicago Booth, Emory University, European Central Bank, HEC Paris, Johns Hopkins University, NBER Asset Pricing, New York Federal Reserve Bank, Northeastern University, RCFS Winter Conference, Virtual Finance Workshop, Washington University, University of Virginia, University of British Columbia, and University of Wisconsin Madison for their comments. We thank Pauline Liang and Andrew Teodorescu for excellent research assistance. Suggestions and comments are welcome.

1 Introduction

The Great Inflation, like the Great Depression before it, was a defining economic event that led to a revolution in macroeconomic thinking. As inflation climbed from 2% in 1965 to 14% in 1980, the old Keynesian playbook no longer seemed to work: high interest rates were failing to reduce inflation, and high inflation was failing to reduce unemployment. The ensuing economic upheaval forced a reckoning: Why did the Great Inflation start? What would it take to end it? And how could it be prevented from ever happening again? The lessons economists took from this era have become a core part of macroeconomic policymaking. Many economists credit them with the low inflation and longer expansions experienced by the U.S. since the beginning of the 1980s.

The standard narrative of the Great Inflation places much of the blame on the Federal Reserve. By failing to act aggressively enough, the Fed had allowed inflation to get out of hand and squandered its credibility with the public (Clarida, Gali and Gertler, 1999). The loss of credibility raised inflation expectations, which made inflation accelerate further. The cycle was only broken when Fed chair Paul Volcker raised the short-term rate to such a high level that the economy went into severe recession. Yet he did not let up. This drastic and painful step restored credibility, re-anchored expectations, and brought inflation to heel. The main lesson from this narrative is that inflation depends on expectations, and expectations depend on the credibility of the central bank.

In this paper, we propose and test a new, entirely different explanation for the Great Inflation. Our hypothesis is that what made inflation rise and fall was the imposition and eventual repeal of hard ceilings on deposit rates under the law known as Regulation Q. Deposits were the dominant form of saving for households at the time, hence they effectively set the interest rate available to most savers. Deposit rate ceilings kept this rate stuck at a low level, so that no matter how much the Fed raised the funds rate, it could not reach households. Regulation Q thus disabled the transmission of monetary policy to households.

By suppressing the return to saving, Regulation Q increased the incentive to spend, i.e. it raised aggregate demand. And since aggregate supply is fairly inelastic in the short run, higher demand manifested mainly as higher inflation.[1] In turn, higher inflation

[1] Indeed, Regulation Q likely made output especially inelastic. By making deposits unattractive, deposit rate ceilings starved banks of funding and choked off the flow of credit. This prevented aggregate supply from expanding to meet the increased aggregate demand.

further lowered the real deposit rate. This again pushed up demand, raised inflation, and so on, resulting in an inflation spiral that was the hallmark of the Great Inflation.

The spiral was broken by the repeal of Regulation *Q* at the end of the 1970s, when mounting pressure from savers finally forced Congress to act. New, deregulated deposit products were introduced, and their rates immediately shot up far higher than the old ceilings. Households poured vast amounts of savings into these new products. Their attractive returns removed the incentive to spend and the upward pressure on prices, so that inflation finally abated. And as the deregulated deposit rates closely tracked the Fed funds rate, the transmission of monetary policy was restored.

The main lesson from this explanation for the Great Inflation is that inflation depends on the functioning of the financial system. Once financial institutions stop transmitting the Fed's target rate changes, the particular rule for these rate changes becomes less important. On the other hand, if the financial system *is* transmitting rate changes, then an inflation spiral is unlikely. This could explain why fears of a return of the Great Inflation in the wake of the Fed's drastic measures following the 2008 financial crisis did not materialize. Moreover, since the zero lower bound is effectively a *floor* on deposit rates (rather than a *ceiling*), our results can explain the recent period of abnormally *low* inflation. Looked at this way, the Great Inflation can be reconciled with the current era.

We test the hypothesis that Regulation *Q* led to the rise and fall of the Great Inflation both at the aggregate level and in the cross section of U.S. cities. The aggregate time series shows that the start and end of the Great Inflation line up closely with the imposition and removal of deposit rate ceilings. The Fed first allowed rate ceilings to become binding in 1965, which is widely taken as the start of the Great Inflation (e.g., Meltzer, 2005). At the other end, the first two types of deregulated deposit products, Money Market Certificates (MMCs) and Small Saver Certificates (SSCs), were introduced in 1978.III and 1979.III, respectively. Inflation peaked shortly thereafter, in 1980.I. As others have noted, this peak precedes Volcker's sustained rate hike, which began in 1980.IV (Goodfriend and King, 2005). By then inflation had already declined from 15.8% in 1980.I to 7.5% in 1980.III (it then rose to 11.2% in 1980.IV). In addition, long-term rates, an indicator of inflation expectations, remained stubbornly high: the ten-year rate was still above its 1980.III level as late as 1982.IV. Thus, inflation began falling after Regulation *Q* was substantially lifted but before the Fed regained its credibility under Volcker.

The first deregulated deposit products had a huge impact on the returns available to households. Upon their introduction, MMCs paid 4% more than the old ceilings. Their rate went up another 3% by 1979.III when SSCs were introduced with similar results. Moreover, from that point on the rates on both products closely tracked the Fed funds rate so that, in addition to the initial rate shock, the passthrough of monetary policy was restored.

Households responded en masse to the higher rates. Within a year of their introduction, MMCs accounted for 22% of all small-time and savings deposits. By the time of Volcker's rate hike in 1980.IV, the combined share of MMCs and SSCs was 48%. In dollar terms, they stood at \$462 billion or 16.2% of GDP (equivalent to \$3.48 trillion in 2019).

The massive shift to deregulated accounts pushed up the overall rate on deposits that households were earning. Under Regulation Q, the average nominal rate on savings and small-time deposits was nearly constant and never exceeded 6%, even as the Fed funds rate rose above 12%. In contrast, after deregulation it rose quickly, from 6% on the eve of deregulation in 1978.II to 8.5% by the time Volcker hiked in 1980.IV and 11.3% one year later. In sum, the average rate almost doubled.

The change was even more striking in real terms. In the years prior to when Regulation Q became binding, the average real return on savings and small-time deposits was always between 1% and 2%. However, after the rate ceilings became binding in 1965, the real return became increasingly negative, reaching -5.8% by 1979.[2] This created a powerful incentive for households to spend instead of save, pushing up prices and inflation. Once deregulated products came in, the real average deposit rate went up quickly, crossing zero by 1980.IV and reaching 4.4% one year later, a swing of over 10% in two years. Such a large real rate shock reduces the pressure on households to spend and thus plausibly brings inflation down.

Despite their extremely unattractive rates, deposits remained very large during the Regulation Q period. We calculate that the dollar cost of the negative real rate on savings and small-time deposits stood at 4% of consumption in 1979 (equivalent to \$584 billion in 2019). These enormous numbers show that by and large households were unable to escape the cost of deposit rate ceilings.

Although we find the aggregate evidence compelling, it remains possible to rationalize it under the conventional view. Under this view, the behavior of real deposit rates is

[2] By contrast, the real Fed funds rate hovered around zero during Regulation Q, never dropping below -1.6%. Indeed, it was positive until 1973.IV when inflation had already reached 11%. Thus, the hypothesis that inflation was driven by low real rates finds more support in deposit rates than the Fed's policy rule.

still caused by Regulation Q and its repeal, but it had no direct impact on inflation despite the close timing. Rather, the rise and fall of the Great Inflation is solely due to the loss of Fed credibility and its eventual restoration under Volcker. The fact that inflation started declining prior to Volcker's sustained rate hike is due to transitory forces such as the economic recession and the delayed adjustment of inflation expectations is due to the time it takes to learn about the regime switch.

We address this identification challenge by exploiting plausibly exogenous geographic variation in the degree to which Regulation Q was binding at the local level, and analyze its effect on local inflation. Our hypothesis is that areas where Regulation Q was more binding should have a greater increase in inflation, and areas where it was more quickly lifted should have a greater decrease in inflation.

Our approach requires detailed data on local deposit markets and inflation during the Great Inflation era. For commercial banks, we obtain novel historical data from call reports filed with the Federal Reserve Board. For Savings and Loans institutions (S&Ls), which were as large as banks in retail deposit markets, we obtain novel data from similar reports filed with the Federal Home Loan Bank Board and the Office of Thrift Supervision. For inflation, we use the Consumer Price Index (CPI), which is published by the Bureau of Labor Statistics (BLS) for the 25 largest MSAs. To expand our cross section, in some tests we proxy for inflation using nominal wage growth, which is available from the Quarterly Census of Employment and Wages for the universe of MSAs.[3]

The rich history of Regulation Q affords us four sources of geographic variation in its implementation and repeal. We use these to examine its impact on the Great Inflation from start to finish. We present them in chronological order: (i) when Regulation Q first becomes binding in 1965, (ii) the "NOW account experiment" in New England between 1974 and 1979, and (iii) the deregulation of small-time deposits in 1978–79. We end with (iv) a test based on differences between banks and S&Ls that covers the entire period.

Regulation Q first becomes binding. The Fed first imposed binding deposit rate ceilings on savings deposits in mid 1965. Interestingly, S&Ls were initially not subject to these ceilings because they were not regulated by the Fed but by the Federal Home Loan Bank Board. This allowed S&Ls to pay higher deposit rates than banks, right at the the onset of the Great Inflation. The regulatory quirk was remedied in September 1966 when

[3]Perhaps surprisingly, there is substantial variation in local inflation rates. This is likely due to the large share of non-traded goods and services in consumption. A growing literature, discussed below, has been taking advantage of this variation.

S&Ls were brought into the Regulation Q regime. We exploit this difference in the timing of the imposition of binding rate ceilings by comparing areas based on the local market share of S&Ls. This is a plausibly exogenous source of variation because the S&L share is a very slow-moving local characteristic based on historical differences that are unrelated to contemporaneous economic conditions.

We find no differences in inflation across MSAs by S&L share until 1965. Then in mid-1965, when Regulation Q becomes binding for banks, high S&L share MSAs begin to experience lower inflation than low S&L share MSAs (they also experience higher deposit rates, as predicted). Moreover, the difference in inflation rates disappears once Regulation Q is extended to S&Ls in late 1966. The results are economically large, such that going from non-binding to fully binding rate ceilings is predicted to raise inflation by 1.4% per year, about the same as the observed aggregate rate of increase over this period.

NOW account experiment. In 1972, a small Massachusetts savings bank began offering what it called Negotiable Order of Withdrawal (NOW) accounts. NOW accounts were effectively interest-bearing checking accounts that paid a rate of 5%, in contravention of Regulation Q. Local commercial banks sued but the Massachusetts Supreme Court unexpectedly ruled in favor of NOW accounts at state-chartered savings banks. The commercial banks began lobbying Congress to allow them to compete. The result was that in 1974.I Congress authorized NOW accounts exclusively in Massachusetts and its neighbor New Hampshire (the two effectively shared a banking market). This became known as the "NOW account experiment" (Kimball, 1980).

NOW accounts proved extremely popular, with 80% of Massachusetts households opening a NOW account within a few years (Kimball, 1980). This massive take-up shows that deposit rate ceilings had been severely binding and NOW accounts offered partial relief. Their success triggered a domino effect radiating outward from Massachusetts: Congress authorized NOW accounts in the rest of New England in 1976.I, in New York in 1978.IV, in New Jersey in 1979.IV, and nationwide in 1980.IV.

The NOW account experiment amounts to a partial repeal of Regulation Q. Its staggered introduction across the Northeast offers a nearly ideal setting for identifying the effect of deposit rate ceilings on inflation. The initial site (Worcester, MA) is essentially random, and the subsequent expansion follows an obvious geographic pattern dictated by proximity and banking market overlap. This makes it unlikely that confounding factors such as local economic conditions played a significant role.

We analyze the NOW account experiment using a standard difference-in-differences regression with an indicator variable that turns on whenever a state authorizes NOW accounts. We find that MSAs in states that allow NOW accounts see a 1.2% drop in annual inflation compared to MSAs in other states. This effect is economically large given that NOW accounts lifted Regulation *Q* only partially. The results are robust to including MSA fixed effects and controlling for local employment growth. They are also robust to using nominal wage growth as a proxy for inflation, which expands the number of treated MSAs.

Deregulation of small time deposits. The repeal of Regulation Q at the national level began with the introduction of MMCs in 1978.III. This was done in part to allow banks to compete with money market funds, which although quite small (only $3.9 billion in 1978.III) were beginning to take off at the time. MMCs had a minimum denomination of $10,000, which created a perception of unfairness toward small savers. This perception led to the introduction of SSCs in 1979.III, which had no minimum denomination but a longer maturity.

We use the deregulation of small time deposits to analyze the effect of the repeal of Regulation *Q* on the end of the Great Inflation. We expect that areas with a greater take-up of deregulated deposits should experience a greater decline in inflation. To address the endogeneity of the take-up, we instrument it with the local share of small time deposits taken as of three years prior to deregulation (in 1975.III). The idea is that time deposits are imperfect substitutes for checking and savings deposits because they have longer maturity and lower liquidity. To the extent that banks or depositors in different areas have a long-standing preference for time deposits, then they will be more likely to take up their deregulated counterparts.[4] Using the small-time deposit share three years prior to deregulation picks up these persistent differences while avoiding the impact of current economic conditions. Moreover, since 1975.III represents a trough in inflation, economic conditions at the time of the instrument were quite different.

We find that the 1975 small time deposit share is a strong predictor of the take-up of new deposit products in the first stage.[5] A 10% increase in the 1975 small time deposit

[4]For example, consistent with Drechsler, Savov and Schnabl (2017*a*), banks and S&Ls with longer-duration assets will prefer time deposits in order to hedge their interest rate risk.

[5]We measure the take-up using MMCs only because we do not have data on SSCs for a subset of our financial institutions. In the aggregate, MMCs accounted for more than two thirds of the total take-up. Among institutions with data on both MMCs and SSCs, we find a strong positive correlation. The results are similar if we impute SSC take-up for the institutions with missing data.

share raises the take-up of deregulated deposits from 1978.III to 1981.III by 3.1%. In the second stage, a 10% increase in the instrumented take-up of deregulated deposits, lowers inflation by 2.4%. Again, the results are similar when proxying for inflation using nominal wage growth. The economic magnitude of this estimate is very large. Multiplying it by the aggregate share of deregulated products at that time (28%) suggests that deregulation explains an 11% decrease in aggregate U.S. inflation. This is close to the full drop in inflation under Volcker.

A possible concern with these results is that our instrument proxies for other variables that directly affect inflation. We conduct several robustness to alleviate this concern. First, we find that the results are almost identical when estimated with OLS regressions. This shows that there are no omitted variables that bias the take-up of deregulated deposits. Second, the results are robust to controlling for pre-1978 inflation and post-1978 employment growth. This suggests that we are not not simply picking up pre-trends in inflation or contemporaneous variation in economic conditions. Third, the results are robust to dropping the first-quarter take-up of deregulated products, which may be driven by pent-up demand due to prior inflation. Fourth, the results are robust to estimation in levels and changes, suggesting that the timing of the take-up and the decline in inflation are closely aligned.

Local interest rate pass through. In our final analysis, we explore variation in the local passthrough of interest rates on inflation. We exploit the fact that S&Ls depended more on small time deposits, while commercial banks depended more on savings deposits and large time deposits. The reason was that the business model of S&Ls was focused on the provision of fixed-rate mortgages, which they matched by having long-term time deposits. In contrast, commercial banks provided more short-term lending, which they matched with short-term deposits. As a result, the average deposit rate paid by banks was somewhat more interest sensitive (though much less so than if Regulation *Q* was not binding) than the average deposit rate paid by S&Ls. Hence, areas dominated by S&Ls experienced an even lower deposit-rate passthrough than areas dominated by commercial banks. We use this fact to analyze the impact of deposit passthrough on inflation.

We find that MSAs with a high S&L share, which had lower deposit passthrough, experienced higher inflation whenever the Fed raised the funds rate. The effect is large: going from zero S&L share to 100% S&L share raises inflation by 3.2% on the eve of the repeal of Regulation Q. Since the difference in passthroughs is about 0.29, this effect is again about as large as the actual increase in aggregate inflation at the peak. We further find that the relationship between the S&L share and inflation disappears completely after 1978.III, when Regulation Q is phased out and the passthroughs of S&Ls' and banks equalize. This provides further evidence that deregulation, which increased deposit passthrough, brought inflation down.

We proceed as follows: Section 2 reviews the literature, Section 3 discusses the aggregate results, Section 4 discusses the data, Section 5 presents the analysis and results, and Section 6 concludes.

2 Literature

The conventional view is that the rise and fall of U.S. inflation was driven by a regime shift in the conduct of monetary policy. Central to this view is the importance of commitment for inflation expectations. Friedman (1968) famously argued that only *unexpected* changes in inflation influence unemployment. This was in contrast to central bank practice at the time, which was rooted in the static IS-LM model of Hicks (1937) and Hansen (1953). The IS-LM model provided for a stable Phillips curve, allowing policymakers to trade off inflation and unemployment in predictable fashion (Samuelson and Solow, 1960). Friedman (1968) made the case that attempts to exploit this tradeoff had led to monetary policy that was too loose; that all they did was raise inflation expectations without reducing unemployment. Once these expectations were set, inflation could only be reined in by sharply contracting monetary policy and forcing a recession. Kydland and Prescott (1977) and Barro and Gordon (1983) argued that central bankers would not be inclined to follow this path due to a lack of commitment. Lack of commitment thus makes high inflation expectations self-fulfilling and leads inflation to accelerate.

The conventional view attributes the fall in U.S. inflation to a restoration of commitment under Paul Volcker. Clarida, Gali and Gertler (1999) show that under Volcker the Fed reacted much more strongly to changes in inflation. In particular, the sensitivity of the Fed funds rate to inflation rose from below one to above one, as required by the stability criterion of Taylor (1993). Once this became known, the Fed's inflation-fighting credibly was re-established. This lowered inflation expectations and reversed the inflationary loop.

The policy shift appears to have taken place in fits and starts (Goodfriend and King, 2005).[6] First, in October 1979 Volcker embarked on an anti-inflationary push (Romer and Romer, 1989), sending the Fed funds rate above 17%. Yet inflation continued to rise, reaching 15% in March 1980 even as the economy dipped into recession. Volcker then sharply reversed course, allowing the Fed funds rate to fall to just 9%. Meltzer (2010) concludes that this pattern reinforced, rather than overturned, the Fed's perceived lack of credibility. He dates the real regime shift to December 1980, when Volcker embarked on yet another tightening cycle, this time refusing to let up even as the economy sank into a deep recession. Yet as Goodfriend and King (2005) document, inflation expectations actually rose over the following year and a half, suggesting that restored credibility was a long time coming. This was reflected in long-term rates, which remained above their December 1980 levels as late as August 1982. Expectations rose even as realized inflation fell rapidly, reaching 6% in August 1982. Thus, it is difficult to explain the bulk of the decline in realized inflation with a shift in expectations alone. Rather, the conventional view also requires a short-term Phillips curve tradeoff that explains the fall in realized inflation with the steep rise in unemployment during the Volcker recession.

Our contribution to this literature is to provide an entirely different explanation for the rise and fall of U.S. inflation. Instead of a regime shift in the conduct of monetary policy, this explanation is based on a regime shift in its transmission through the financial system. When Regulation Q became binding in 1965, this transmission was cut off, leaving rates effectively pegged too low. In this environment, policymakers were doomed to appear feckless and overly accommodative, no matter their efforts.[7] The staggered repeal of Regulation Q beginning in 1978 re-engaged monetary policy transmission and unpegged prevailing rates, causing them to snap back up to market rates. Under this view, it was this increase in the rates available to households, and not a change in expectations, that brought inflation to heel.

The conventional view of the rise and fall of U.S. inflation exerts a powerful influence over the practice of monetary policy today. Romer and Romer (2002) document how

[6] Sargent (1999) captures this in a learning framework, recalling earlier work on adaptive expectations. Orphanides (2003) and Primiceri (2006) also emphasize incomplete information and learning.

[7] In 1979, former Fed Chair Arthur Burns gave a well-known speech, "The Anguish of Central Banking" (1979), in which he lamented the impotence of monetary policy in the face of pervasive inflationary bias in the economy. In 1990, at the same conference, Volcker gave a rejoinder: "The Triumph of Central Banking?" (1990), in which, question mark notwithstanding, he reveled in the success of monetary policy since Burns' speech. The analysis in this paper suggests that the anguish of one Fed chair and the triumph of the other stemmed from preconditions that were already changing when Burns spoke.

central bankers grew pessimistic that monetary policy could be used to aggressively fight unemployment and instead focused on keeping inflation low.[8] A profound challenge to this consensus arose, however, in the aftermath of the 2008 financial crisis. Scholars of the Great Inflation, such as Allan Meltzer (2009; 2013) and John Taylor (2009), worried that low interest rates and Quantitative Easing would lead to a repeat of the 1970s. By contrast, scholars of the Great Depression, such as Ben Bernanke (2010), called for and implemented these active measures.[9] The explanation of the Great Inflation presented in this paper reconciles these views. Unlike under Regulation Q in the 1970s, today there is no constraint on the transmission of contractionary monetary policy, and hence much less likelihood of accelerating inflation.[10]

There is, however, a plausible constraint on the transmission of *expansionary* monetary policy: the zero lower bound (ZLB). This constraint was recognized by observers of Japan's "lost decade" in the 1990s, leading to the literature on the liquidity trap (Krugman, 1998; Eggertsson and Woodford, 2003; Svensson, 2003). The ZLB has since become at least occasionally binding also in the U.S. and much of Europe, raising the specter of prolonged periods of low inflation (Woodford, 2012; Summers, 2014; Farhi and Werning, 2016; Guerrieri and Lorenzoni, 2017). We note that there is a strong parallel between the ZLB and Regulation Q: one represents a floor on deposit rates, the other a ceiling.[11] And just as the floor is today blamed for the low inflation in the 2010s, we argue that the ceiling led to the high inflation in the 1970s. This again reconciles the Great Inflation with the other defining events in macroeconomic history.

Why has the literature so far overlooked the role of Regulation Q? One potential explanation can be found in Tobin (1970).[12] Our reading is that Tobin discarded the pos-

[8] Rogoff (1985) argued that it is optimal to appoint central bankers who place more weight on inflation and less weight on unemployment compared to a central planner.

[9] Reflecting the continued dominance of the conventional view even as it struggles to account for the recent behavior of inflation, Fed Chair Powell (2019) testified to Congress that "In our thinking, inflation expectations are now the most important driver of actual inflation." Former Fed Governor Tarullo (2017) offers a spirited critique of the unfalsifiability and lack of predictive power embedded in this thinking.

[10] This presents yet another example of the Lucas Critique (Lucas, 1976), which says that econometric analysis that ignores changes in the structure of the economy is subject to misspecification. Ironically, the Lucas Critique was first proposed to explain the stagflation of the 1970s.

[11] Moreover, both bind mainly for retail deposits as opposed to institutional ones (Altavilla et al., 2019).

[12] It reads as follows: "Is an increase in rate ceilings an easing or a tightening of monetary policy? Superficial arguments point in both directions. Raising the ceilings is after all an increase in interest rates, and is that not deflationary? But it also brings in deposits and promotes intermediation by banks and thrift institutions—is that not expansionary? The Federal Reserve, if one may judge from the tenacity with which it sticks to the present policy, adheres to the latter view" (Tobin, 1970, p.5).

sibility that Regulation Q was inflationary because he operated from the then-dominant monetarist perspective. According to this perspective, by making deposits unattractive, Regulation Q restrained money growth and was therefore helping in the fight against inflation. Tobin also argued that whatever its effect on inflation, it would be easy to neutralize by adjusting central bank reserves. Writing in the same issue, Friedman (1970) also discusses Regulation Q, but he too focuses on its implications for reserves. It thus seems that the monetarist view led researchers to believe Regulation Q was, if anything, anti-inflationary. In contrast, the later New Keynesian framework (Woodford, 2003; Galí, 2007) focuses on the Fed funds rate and abstracts entirely from money or deposits, and thus also from the implications of Regulation Q.

Regulation Q itself has been studied intensely in the banking literature (see Gilbert, 1986 and Santomero and Siegel, 1986 for overviews).[13] There are two main strands, one on the effects of Regulation Q on credit supply, the other on its impact on households. Wojnilower (1980) and Burns (1988) argue that by triggering outflows of deposits whenever it became binding, Regulation Q induced contractions in credit supply (Bordo and Haubrich, 2010, and Koch, 2015, find supporting evidence for this view). The term "credit crunch" itself originated in the first such episode in 1966, followed by two similar episodes in 1969 and 1974.At the time, some observers such as Samuelson and Skidmore (1967) viewed credit crunches as a useful tool in the Fed's inflation-fighting arsenal, making them part of the official rationale for maintaining Regulation Q. This rationale is strongly contradicted by the results in this paper.

The literature shows that another important rationale for maintaining Regulation Q was the belief that it supported the housing market (Kane, 1970; Tobin, 1970; Friedman, 1970; Wojnilower, 1980). The basic idea was that low deposit rates translated into low mortgage rates.[14] Yet it was also apparent that low deposit rates restricted the quantity of deposits, which led to rationing. For this reason S&Ls, which specialized in mortgage lending, were allowed to pay slightly higher deposit rates than banks (about 0.25% to 0.5% higher). Over time, Regulation Q was re-directed toward protecting S&Ls by limiting the competition they faced from banks. Besides concern for the housing market, this equilibrium was maintained by strong lobbying from the S&L industry (Kane, 1970,

[13] White (1991) looks specifically at its impact on S&Ls.

[14] A more convincing argument is that stable deposit rates insulated banks and S&Ls from interest-rate risk (Tobin, 1970). Consistent with this argument, Drechsler, Savov and Schnabl (2017*a*) use recent data to show that insensitive deposit rates (due to market power) allow banks to hold more long-duration assets.

1978, is particularly scathing on this point).[15] By the late 1970s, large outflows of deposits due to surging interest rates and competition from money market funds destabilized this equilibrium and, together with pressure from consumer groups, initiated the staggered repeal of Regulation Q (Jaffee et al., 1979; Gilbert, 1986).

The impact of Regulation Q on households was substantial. Kane (1970) argues the costs of Regulation Q were disproportionately borne by small savers whose access to market-rate financial instruments was very limited (see also Lawrence and Elliehausen, 1981, and Clotfelter and Lieberman, 1978). Kane (1980) finds that small savers responded to this financial repression by investing more heavily in real estate and consumer durables, and concludes that this "helps to explain a number of anomalous features of the 1975–1979 macroeconomic recovery, particularly the dominant role of consumer spending, the unprecedented expansion of household debt, the boom in housing and declining flows of household savings into deposit institutions" (Federal Reserve Bank of Atlanta, 1982; Kane, 1985, see also). These patterns are implied by the mechanism of this paper.

The experience of Regulation Q is also relevant to the banking literature more broadly. The impact of Regulation Q on the banking system can be thought of as an amplified version of the "deposits channel" of Drechsler, Savov and Schnabl (2017*b*).[16] In the deposits channel, banks *choose* to keep deposit rates low and insensitive in order to profit from market power over retail deposits. Market power thus functions as a milder form of a deposit rate ceiling. Drechsler, Savov and Schnabl (2017*b*) find pass-throughs of market rates to deposit rates of about 0.4 (see also Neumark and Sharpe, 1992). By contrast, Regulation Q imposes a pass-through of essentially zero. Interestingly, when it was first repealed the pass-through jumped to nearly one (see Godfrey and King, 1979, for MMCs and Keeley and Zimmerman, 1985, for MMDAs). Thus the shock to deposit rate pass-through was very large, and it took the industry several years to converge to a new equilibrium with a more moderate pass-through.[17] By then, inflation had been conquered.

[15]Dann and James (1982) find that S&L stocks experienced large negative abnormal returns of between -7% and -10% around the introduction of Money Market Certificates (MMCs) in 1978, just one of the deregulatory steps and not a fully unanticipated one.

[16]See also Xiao (2019); Kurlat (2019); Wang et al. (2019); and Drechsler, Savov and Schnabl (2018, 2019).

[17]The likely explanation for this is the need to cover the large operating costs associated with running a deposit franchise, see Drechsler, Savov and Schnabl, 2017*a*.

3 Aggregate analysis

Figure 1 plots the evolution of several key variables of interest from 1960 to 1988: the Fed funds rate (blue), inflation (red), the ceiling rate on savings deposits (black), and the interest rates on two different types of deregulated deposit products (also black).[18] The Fed funds series is the one-year forward-looking average of the Fed funds rate beginning with the current quarter (i.e., quarters t through $t+3$). The inflation rate is the forward-looking change in the Consumer Price Index (CPI) over the following year. The figure also plots four vertical lines that mark three important events in our analysis: 1965.I, when the savings deposit ceiling first becomes binding; 1978.III and 1979.III, the introduction of the deregulated MMCs and SSCs, respectively; and 1980.IV, the start of Volcker's sustained rate increase.

As Figure 1 shows, the Great Inflation period is characterized by three successive up-and-down cycles in inflation and the Fed funds rate, the first beginning in 1965. The cycles are long, each lasting over four years. Underlying them is a clear upwards trend, with both peaks and troughs increasing over time. Thus, annual inflation peaked at 5.9% in the first cycle, 11.5% in the second, and 13.55% in the third. It is in this sense that inflation appeared to be spiraling up over time.

Prior to 1965, inflation had been low and stable going back to the end of the Korean war in 1953. As shown in Figure 1, from 1960 to 1964 inflation hovered at around only 1%, and the Fed funds rate was also very low, dipping to 1.7% in mid-1961. From this point on, the Fed gradually raised the funds rate so that it stood at 4% in 1965. At this time there was an uptick in inflation, as the economy was growing very rapidly and the government was spending significantly in the buildup to the Vietnam war. This uptick is viewed historically as the spark that set off the Great Inflation.

This was also the very first time that the Fed allowed the ceiling rate on savings accounts to bind by leaving it unchanged as it raised the Fed funds rate. Prior to 1965, the Fed had intentionally kept the rate ceilings from binding. As the figure shows, it continued this practice into the 1960s by adjusting the ceilings upwards whenever it raised the funds rate. However, in 1965.I it abruptly changed course and allowed the Fed funds rate to rise above the ceiling rate (first vdertical line from left).[19]

[18] We use savings deposits because they are the single largest category. The ceiling rate is that for banks. S&Ls generally had between 0.25% and 0.5% higher ceilings. The ceilings rates on time deposits were also slightly higher. See Table A.1 for details.

[19] The Fed continued adjusting the ceiling for CDs (time deposits) for another year, until in 1966.III, when

The initial episode of binding ceilings was brief, but when inflation soon increased again, and the Fed responded by increasing the Fed funds rate again, it quickly exceeded the deposit ceilings by a large margin. Indeed, by 1969.III the Fed funds rate stood at 9%, whereas the savings deposit ceiling remained at 4%.

As the figure shows, tightly binding ceilings remained an almost permanent fixture for the first two and a half cycles of the Great Inflation era. For example, at the peak of the second cycle in 1974, the Fed funds rate and inflation were both about 12%, while savings deposit rates remained stuck at 5%. Thus, the figure documents two important characteristics of the Great Inflation period. First, the passthrough of the Fed funds rate to deposit rates was effectively zero. As a result, even though the Fed was raising rates aggressively, it wasn't actually reaching depositors. And second, the returns to holding deposits were abysmal, providing a strong incentive to spend rather than save.

This dynamic changed dramatically with the introduction of the deregulated MMCs in 1978.III (second vertical line). As the figure shows, the interest rate on MMCs shot up immediately, increasing from the old ceiling rate of about 5% to 8.3% in the same quarter and 9.3% the following quarter, a tremendous increase. Importantly, as the figure clearly shows, the passthrough of the Fed funds rate also increased abruptly from zero to nearly one, instantly reconnecting the Fed's policy rate with the interest rate faced by household savers.

Similarly, the rate on SSCs jumps when the they are introduced in 1979.III (third vertical line). Whereas MMCs had a $10,000 minimum denomination, SSCs had no such minimum, allowing smaller savers to access deregulated rates. Again, their rate spikes dramatically, increasing almost 5% within one quarter, and the passthrough of the Fed funds rate jumps from zero to nearly one.[20]

Our hypothesis is that the introduction of these deregulated accounts was responsible for the end of the Great Inflation. The time series of inflation is consistent with this hypothesis. As Figure 1 shows, annual inflation peaks in 1979.III, concurrent with the

it intentionally caused the ceiling on time deposits to bind as well by lowering it at the same time that it raised the Fed funds rate.

[20] A third major new account, the Money Market Deposit Accounts (MMDAs), was created to deregulate ordinary savings deposits. It was introduced in 1982.IV, and saw a similar jump as MMCs and SSCs. We do not focus on MMDAs because their introduction occurred after depositors had already transferred two thirds of their deposits to deregulated accounts, and the bulk of disinflation had occurred. Nevertheless, the creation of MMDAs was an important event. It increased the share of deregulated deposit further to three quarters, and led to substantial transfers within the class of deregulated accounts, as some depositors returned to holding savings accounts now that their return was competitive.

introduction of the SSCs. This peak is also five quarters before Volcker's 1980.IV rate hike (fourth vertical line). Indeed, by the quarter prior to this hike, annual inflation had already fallen from 13.6% to 9.33%, a substantial decline.

To take a closer look at the timing, Figure 2 zooms in on this time period and plots the data at the quarterly frequency: inflation is given by the annualized percentage change in the seasonally adjusted CPI over the quarter while the Fed funds rate is that quarter's average. The figure also shows the share of deposits in deregulated accounts (black) and the yield on the 10-year Treasury bond (yellow). This yield provides a measure of investor's long-term inflation expectations, since this is the main component of investors' ten-year expectations of interest rates.

The figure shows that households responded en masse to the higher returns offered by MMCs and SSCs. Within a year of their introduction, MMCs accounted for 22% of all small time and savings deposits. By the time of Volcker's rate hike in 1980.IV, households had transferred half of their small time and savings deposits, or \$462 billion, to MMCs and SSCs. This was equal in magnitude to 16.2% of GDP, or \$3.48 trillion in 2019 dollars. This represents an enormous reallocation of funds within the banking system. Thus, the repeal of Regulation Q had a huge impact on the rates of return earned by depositors, making saving via deposits much more attractive and decreasing the pressure to spend.

The figure shows that the peak of quarterly inflation over the whole Great Inflation era, 15.8%, takes place on 1980.I, three quarters before Volcker's rate hike. Moreover, by 1980.III, one quarter prior to Volcker's hike, inflation had already dropped to 7.5%, its lowest level in more than 3 years. This downwards trend continued until inflation hit zero in 1983.I. Thus, the picture that appears in Figure 2 is one in which inflation turns in 1980.I and then descends steadily until 1983.I. Nothing happens to inflation that makes the timing of Volcker's rate hike appears special. More apparently relevant is the contemporaneous dramatic increase in the deregulated deposit share, which goes from zero to 77% over this period.

According to the standard narrative, Volcker was able to bring down inflation by re-establishing the Fed's credibility, which lowered the public's long-term inflation expectations. The behavior of the ten-year yield around this time period does not accord with this view. As the figure shows, the ten-year rate was still above its 1980.III level as late as 1982.IV. The peak of the ten-year rate is in 1981.II, two quarters *after* Volcker's hike, and the ten-year rate remains close to its high pre-Volcker-hike level well into 1985, almost five years after the hike, and more than two years after inflation had already hit zero. Thus, investors' long-term inflation expectations did not decrease for a long time. Rather, investors appear to have viewed the fall in inflation as part of another cycle, and expected that inflation would rise again, as it had done so many times before.

Yet, there was a big change in an important fundamental. Figure 3 adds the real Fed funds rate (yellow) and the average real rate on non-demand deposits (black). The average real deposit rate is computed by taking the ratio of deposit interest expense to non-demand deposits (which gives the average deposit rate) and subtracting inflation. The rate plotted at time t is the average rate earned by depositors over the current and following three quarters, (t to $t+3$).[21]

As Figure 3 shows, in the years prior to when Regulation Q became binding, the average real return on non-demand deposits was between 1% and 2%. After the rate ceilings became binding in 1965, the real return became increasingly negative, following a mirror image of the cycles in inflation. For example, at the lows of the second inflation cycle in 1974, the real deposit rate dropped to an abysmal -5.6%![22] Ironically, this coincided with the Fed raising the funds rate to what was its highest point ever at that time, nearly 12%, again illustrating that the Fed's interest-rate decisions were unable to reach most savers. Seen in this light, the title of Fed chair Arthur Burns' missive, "The Anguish of Central Banking" (1979), becomes much more relatable.

As Figure 3 shows, the real non-demand deposit rate hit its low point, -5.8%, in 1979.II, one quarter before the introduction of SSCs and less than a year after the introduction of MMCs. From this point on the real deposit rate took off. It was back to zero already by the quarter before Volcker's hike, an increase of almost 6% in just one year. This increase was the result of a combination of the increase in the average deposit rate, and the simultaneous fall in inflation. A little more than a year after that, the real deposit rate was up to $+6\%$, meaning that in two years it had increased by almost 12%, an enormous amount.

To summarize, Figure 3 shows that the introduction of MMCs and SSCs coincided with a large and rapid increase in the real deposit rate. This is consistent with our explanation for how the disinflation happened: the repeal of Regulation Q made deposit

[21]The average deposit rate is smoother than the deposit rate ceiling because it reflects the rates paid on old deposit accounts as well as changes in the shares of different deposit products. In addition, it includes interest paid on large time deposits (denominations over $100,000), which were deregulated in 1973.

[22]The average real rate on all deposits (including demand deposits) was an even worse -7.5%!

rates more attractive, increasing the incentive to save and hence decreasing the upwards pressure on prices; in turn this further increased real deposit rates, thereby reinforcing the disinflation.

In contrast, the standard narrative argues that inflation rose because the Fed was not aggressive enough in raising the Fed funds rate, i.e. because of a low real Fed funds rate. Figure 3 provides several challenges to this narrative. First, it shows that while the real Fed funds rate did decline during the Great Inflation era, it never dropped below -1.6% and in general hovered in a small range around -1% for the second half of the era, nowhere near as low as real deposit rates. Second, the real Fed funds rate was *not* low in the first half of the Great Inflation, and remained positive until mid 1973. In fact, the real Fed funds rate was actually quite *high* during the first cycle of the Great Inflation, as the Fed actually did raise the funds rate more than one-for-one with inflation. Indeed, the real Fed funds rate rose to 2.8% during this cycle, a historically high value. This observation does not fit well with the standard narrative that the Fed's policy was lax, but it aligns easily with our theory, since the real deposit rate was dropping to new lows at this time due to the effect of Regulation Q.

The final question we address in this section is whether deposits were large enough to have a substantial impact on inflation, especially given the fact that their real rates were so unattractive. One way to think about the importance of deposits to households is to note that in 1979.II, when the real return on non-demand deposits was -5.8%, their size was equal to 69% of total personal consumption expenditures (93% for total deposits). Thus, if we view the dollar cost of Regulation Q to depositors as based on the real deposit rate's shortfall below zero, then the annual cost of Regulation Q to depositors in 1979.II was approximately 4% of personal consumption ($-5.8\% \times 69\%$).[23]

In other words, rate ceilings were costing depositors 4% of their consumption *per year*, a huge loss. This shows that households found few alternatives to saving via deposits, despite deposits paying very low returns. Note that our estimate is quite conservative, since the real return on deposits both before and after binding ceilings was 1–2%, not zero. If we use the same approach to calculate the cost to depositors of all deposits, in-

[23]This calculation ignores the liquidity services and implicit interest depositors received during this period. The value of these can be measured using non-interest expenses. These were on average 2.5% for banks and 1.5% for S&Ls. The number for banks is higher because demand deposits are costlier to service. Since we do not include demand deposits in our calculations, the 1.5% number from S&Ls is more appropriate. Even this number is likely too high as some of these expenses are incurred on the lending side and hence do not provide services to depositors.

cluding demand deposits (which paid no interest), then we obtain that Regulation Q cost depositors an astounding 8% of consumption per year.

Figure 4 plots this cost, which we label the real payoff of deposits relative to personal consumption (in black). Because the ratio of deposits to personal consumption does not change much over this time, this series closely tracks the real average deposit rate in Figure 3. For instance, at the low of the real rate in 1974, non-demand deposits cost depositors 3.9% of consumption per year. Thus, it is clear that most households did not have a serious alternative to deposits, and that the low deposit rates enforced by Regulation Q imposed a very large burden on households. The lifting of deposit ceilings quickly decreased this cost, and deposits returned to earning households a positive real payoff on their savings.

4 Data and summary statistics

4.1 Data

We use aggregate and cross-sectional data. The Federal funds rate is monthly from the Federal Reserve's H.15 release. We convert it to quarterly by averaging over the quarter. The national inflation rate is from the Bureau of Labor Statistics (BLS). We use the Consumer Price Index (CPI) for all items and all urban consumers, also averaged over the quarter. We take the seasonally unadjusted CPI to be consistent with the available MSA-level data. To avoid any seasonality in our tests we always take the year-over-year growth rate in the CPI as our measure of inflation.[24]

Our MSA-level inflation data is also from the BLS, which provides consumer price indexes for the largest metropolitan areas in the U.S. as far back as 1914. While initially only a handful cities are covered, by 1965 the number rises to 25 and remains there for most of our sample (Miami enters in 1978). This gives us a balanced panel which we refer to as the 25 BLS MSAs.[25] This panel has been used in cross-sectional analysis by Hooper,

[24]The seasonally adjusted and unadjusted year-over-year national inflation rates are 99.96% correlated. We used the seasonally adjusted CPI in Figure 2 where we looked at quarterly inflation.

[25]They are: Anchorage, Atlanta, Baltimore, Boston, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Honolulu, Houston, Kansas City, Los Angeles, Milwaukee, Minneapolis, New York, Philadelphia, Pittsburgh, Portland, San Diego, San Francisco, Seattle, St. Louis, and Washington, D.C. One issue is that the boundaries of MSAs have changed over time and it is not always clear which delineation is being used in any given year. To deal with this issue we simply use the 1990 MSA definitions as provided by the Office of Management of the Budget (OMB). We do this because our wage data uses the 1990 definitions and

Mishkin and Sufi (2019) and McLeay and Tenreyro (2019), among others.

To extend the analysis to a broader cross section, we follow Kumar and Orrenius (2016) and Hooper, Mishkin and Sufi (2019), among others, and use MSA-level data on nominal wages from the Quarterly Census of Employment and Wages (QCEW), which is also from the BLS. The QCEW provides data on the average weekly wages of private-sector employees. The data are based on the tax filings of all employers registered with the unemployment insurance system, making coverage nearly universal. The QCEW dataset contains 307 MSAs in 1975, rising to 316 by 1979 (out of a possible 320).

The main drawback of the QCEW is that it only starts in 1975, whereas some of our tests (e.g., the NOW account experiment in New England) require us to go back further. We therefore supplement the QCEW with the Current Employment Statistics (CES) dataset, also from the BLS. Unlike the QCEW which is based on administrative data, the CES data is based on a survey of a sub-sample of employers. In addition, the CES dataset covers only manufacturing employees.[26] The data are monthly and we convert them to quarterly by averaging over the quarter. There are 132 MSAs in 1972 and 169 in 1979.

We obtain data on employment and population from the Regional Economic Accounts of the Bureau of Economic Analysis (BEA). The data are annual and we use interpolation to fill in the missing quarters. Employment growth is the year-over-year percentage change in total nonfarm employment. The data cover all 320 MSAs since 1969.

Our banking data comes from two sources, bank Call Reports and Savings and Loans (S&L) Financial Reports. Bank Call Reports are available back to 1976 from the Federal Reserve Bank of Chicago. We obtained historical Call Reports going back to 1959 through a Freedom of Information Act (FOIA) request with the Federal Reserve Board. The earlier reports are somewhat less detailed, for example there is no split between large and small time deposits prior to 1974 and no split between time and savings deposits prior to 1969. Moreover, until 1972 banks filed semi-annually, which forces us to interpolate deposit amounts in odd-numbered quarters. In addition, before 1976 interest expense was only reported annually in the fourth quarter, and from 1976 to 1982 semi-annually in even-numbered quarters, again necessitating interpolation. Finally, we note that prior to 1976 banks were "called" to report at random times throughout the quarter, hence the numbers are not necessarily from quarter end.

because fixing the MSAs reduces the likelihood of error stemming from changing boundaries.

[26]The data includes other sectors as well but historical coverage is extremely sparse making it unusable (manufacturing makes up 92% of the non-missing observations).

The S&L Financial Reports were filed semi-annually until 1983 with the Federal Home Loan Bank Board (a kind of Federal Reserve Board for S&Ls) and then quarterly after 1984 with the Office of Thrift Supervision (the industry regulator). They are now housed with the National Archives and are available for download from 1966 to 1983 and for purchase after 1984. There are two sets of semi-annual reports. The first is for even-numbered quarters and it includes balance sheet and income statement information similar to the Call Reports (though less detailed on the asset side). The second set is for odd-numbered quarters and focuses specifically on deposits, providing information on both amounts and interest rates by type of deposit. This includes the main products introduced during deregulation such as Money Market Certificates (MMCs), Small Saver Certificates (SSCs), and NOW Accounts. We interpolate these amounts for even-numbered quarters. The odd-numbered quarter reports do not, however, provide information on total assets or non-deposit liabilities. For that we use a third set, the Monthly Financial Reports (also from the National Archives), which are very coarse, providing information only on total assets, liabilities, and deposits. After 1984, all three sets are superseded by the quarterly reports, which are very similar to the bank Call Reports.

The bank and S&L data are at the level of the individual institution. To match them to our inflation and wage data, we aggregate them up to the MSA level using a county-MSA mapping based on the 1990 MSA definitions from the OMB. Implicit in this aggregation is the assumption that banks take in retail deposits locally, near their headquarters. This is clearly not the case at present, when many banks operate widely within and across state lines. This was not the case, however, during our sample period. Interstate banking was banned prior to 1992 except in Maine after 1978 and Alaska and New York after 1982, as discussed by Kroszner and Strahan (2014). They also note that intrastate banking (allowing banks to operate multiple branches in the same state) was also rare: it was allowed in just twelve states as of 1970 and nineteen states as of 1980. Thus, for all intents and purposes there was no interstate banking during the Great Inflation and intrastate banking was also heavily restricted, lending credence to our aggregation method. Of course, to the extent that retail deposits were not always locally sourced, there may be measurement error in our regressors.

4.2 Summary statistics

Table 1 provides summary statistics for our combined dataset. Our main sample is the twenty-year period from 1966.I to 1986.I. The beginning of this period is dictated by the availability of S&L data. It also lines up well with the beginning of the Great Inflation, which is usually dated to 1965 (Meltzer, 2005). The end date is chosen to provide a comparison period after the repeal of Regulation Q and after the end of the Great Inflation. It is also dictated by the onset of the S&L crisis, which is usually dated to 1986 (Curry and Shibut, 2000).

Panel A focuses on interest rates, inflation, and wages. The first three columns cover the entire sample period while the remaining ones split the sample into a Regulation Q period and a post-Regulation Q period. There is no single date on which Regulation Q was lifted but the process began in earnest with the introduction of Money Market Certificates (MMCs) in 1978.III (see the timeline in Table A.1). MMCs were six-month deposits with minimal denomination of \$10,000 that paid competitive market rates. They were followed in 1979.III by Small Saver Certificates (SSCs), which had no minimum denomination but a longer thirty-month maturity. Taken together, MMCs and SSCs brought about the effective deregulation of small time deposits, which is why we take 1978.III as the end of our Regulation Q period.

The first two rows of Panel A look at the Fed funds rate and aggregate U.S. inflation. The Fed funds rate is higher in the post-Reg Q sample, which coincides with the Volcker tightening. On the other hand, inflation was on average the same in the two sub-samples. This may seem surprising at first glance but it is easily explained by the fact that inflation rose only gradually during the Reg Q period, which is twice as long as the post-Reg Q period. This is why when we look at changes, the average decrease in inflation in the post period is twice as big as the average increase in the pre-period.

The third row of Panel A looks at MSA-level inflation. The sample size here is much smaller, reflecting the fact that BLS inflation is only available for the 25 largest MSAs. Note, however, these MSAs are economically very important, comprising 68 million people as of 1978.III, or about 30% of U.S. population. As expected, MSA-level inflation tracks aggregate U.S. inflation well in terms of means. More interesting for our cross-sectional analysis is the standard deviation of MSA-level inflation, which is 3.4%, compared to 3.0% for U.S. inflation. This shows that there is cross-sectional variation for our tests to exploit. To get a better sense of this variation, the following row looks at the difference in inflation between each MSA and the U.S. aggregate. This variable has a standard deviation of 1.3% in levels and 1.8% in changes, which amount to 43% and 75%, respectively, of the corresponding standard deviations of U.S. inflation. Thus, there is comparable variation in the cross section of inflation as in the aggregate during this volatile period.

The next two rows look at nominal wage growth from the QCEW. The sample here is about six times larger than the BLS sample (its population coverage is 76%), despite the later starting date of the QCEW dataset in 1975. Post-1975, the QCEW sample is twelve times larger. Thus, used as a proxy for inflation, wage growth offers a much larger cross section than inflation alone.

The use of nominal wage growth as a proxy for inflation goes back to the original work of Phillips (1958). Galí (2011) shows that this interpretation remains valid within the New Keynesian framework. Yet, as Gordon (1997*a*) points out, wage growth also responds to real shocks such as the tightness of the labor market. To control for such shocks we include employment growth in our regressions. Panel A of Table 1 shows that employment growth was slightly lower in the post-Reg *Q* period, reflecting the severe recession that took place from 1981.III to 1982.IV.

Panel B of Table 1 looks at our banking variables. The first two rows show that banks dominate MSAs overall, accounting for 19 of 27 institutions on average and \$2.3 of \$3.3 billion in deposits, or about 70%. Banks have a somewhat lower deposit growth rate, 10.7% versus 14.5% for S&Ls. Both of these results are explained by the fact that only banks offered demand deposits, which made up 38% of their total deposits but grew more slowly during this period in part because they did not pay any interest.

To facilitate the comparison with S&Ls, we exclude demand deposits from the remaining measures. This causes banks' market share to drop to 56% versus 44% for S&Ls, i.e. they are roughly equal. There is, however, a lot of variation in these market shares, with a standard deviation of 0.2. Panel A of Figure 5 provides a map of this variation. It shows that while some MSAs have an S&L share close to zero, for others it is close to one. Areas with a high concentration of S&Ls include southern California and southeast Florida, while areas with a low concentration include Dallas and Detroit. There is no obvious regional pattern. For example, the S&L share is 16% in San Francisco, 68% in Los Angeles, and 81% in San Diego; versus 17% in New York, 37% in Philadelphia, and 59% in Washington D.C.

Back to Table 1, banks had a slightly lower interest expense rate on non-demand deposits than S&Ls (6.0% versus 6.6%). This is partly explained by the fact that S&Ls were allowed to pay slightly higher rates than banks under Regulation Q (0.25% for most of the period). In addition, as the table shows, S&Ls had a somewhat higher share of time deposits, whose ceiling rates were slightly higher than for savings deposits. They also had more *long-term* time deposits, whose rates were higher still.

The last row looks at our main deregulated deposit product, MMCs (unfortunately, SSCs are not available in our bank-level data). The observations here are fewer simply because deregulation occurs relatively late in the sample. Yet the numbers make clear that the take-up of deregulated deposits was very large. MMCs accounted for 29% of S&L deposits and 22% of bank deposits on average (this includes the initial quarters when they were just getting started). The standard deviation of the MMC share is 9%, hence there is again a large amount of cross-sectional variation. Panel B of Figure 5 provides a map of this variation, which again shows no obvious regional pattern.

5 Empirical results

This section presents our cross-sectional results. We focus on several events surrounding the introduction and repeal of Regulation Q which impacted different areas differently. We proceed chronologically then conclude with an overview analysis of the full period.

5.1 Regulation Q first becomes binding

Regulation Q was introduced through the Banking Acts of 1933 and 1935. For the first 30 years of its existence, Regulation Q was not binding because the Fed set deposit ceiling rates significantly above market rates. The objective of this policy was to avoid interfering with market rates while preventing especially aggressive banks from offering high deposits rates that could lead to bank failure. The Federal Reserve implemented this policy by keeping deposit ceiling rates on savings and time deposits significantly above the Fed funds rate. The result was that the average deposit rates paid on savings and time deposits were well below the respective ceiling rates.

In 1965, the Fed changed its Regulation Q policy and started to impose binding deposit ceilings (Tobin, 1970).[27] The change in policy was triggered by concerns about the

[27] Tobin (1970) summarizes Regulation Q policy as follows:"The general [Regulation Q] policy since 1965 has been to keep the lid on these [deposit] rates while market interest rates have risen dramatically.".

availability of housing credit. Proponents of Regulation Q argued that lower deposit rates would reduce the cost of residential mortgages. The Fed increased the Fed funds rate from 3.9% in January 1965 to 5.4% in September 1966. At the same time, the Fed kept the ceiling rate on savings deposits at 4%, thereby allowing the Fed funds rate to rise above the ceiling rate in March 1965. Thus, Regulation Q was binding on savings deposits starting in Spring 1965. The Fed continued to adjust the ceiling rate on time deposits with an increase of the ceiling rate to 5.5% in December 1965. After that, the Fed kept ceiling rates on both savings and time deposits constant and Regulation Q became fully binding in Summer 1966.[28]

Importantly, Regulation Q initially did not apply to S&Ls. S&Ls were exempt from Regulation Q (Gilbert, 1986) because S&Ls were regulated by the Federal Home Loan Bank Board (FHLBB), not the Fed.[29] Indeed, S&Ls had an average deposit rate that was 0.84% higher than that of commercial banks in the second quarter of 1966 (excluding demand deposits which paid no interest). However, policy makers were concerned that higher deposit rates at S&Ls would increase the cost of mortgages and in September 1966 Congress granted the FHLBB the right to impose deposit ceilings to "dampen rate competition for funds" (Clements, 1966). The FHLBB immediately expanded Regulation Q to S&Ls by imposing binding deposit ceiling rates, which remained in place until the repeal of Regulation *Q* in the last 1970s.

Did the change in Regulation Q cause higher inflation? The aggregate evidence suggests the answer could be yes. The new Regulation Q policy coincides with a large increase in inflation which, in hindsight, inaugurated the Great Inflation. Annual inflation rose from 1.1% in January 1965 to 3.8% in October 1966, exactly at the time that Regulation Q became binding. More importantly, the stepwise introduction of Regulation Q provides an almost ideal natural experiment to test the impact of deposit rate ceilings on inflation. Since the policy change in 1965 applied to commercial banks only, we can exploit variation in the local deposit market share of S&Ls relative to banks ("S&L share") to examine the effect of deposit rate ceilings on inflation. The impact should disappear once Regulation Q was expanded to S&Ls in September 1966. Hence, this setting features both an exogenous policy change and its reversal for empirical identification.

Our main hypothesis is that areas with a higher S&L share should have seen a smaller

[28]The Fed initially focused on savings deposits because savings deposits accounted for 63% of total savings and time deposits.

[29]The FHLBB tried to influence S&Ls through moral suasion but this was ineffective.

increase in inflation after Regulation Q becomes binding and that this effect disappeared once Regulation Q is expanded to cover S&Ls. The identification assumption is that the S&L share is uncorrelated with other variables that could influence local inflation, for instance local economic conditions. This assumption is reasonable because the S&L share is extremely slow-moving due to the brick-and-mortar nature of the deposit business and the prevailing prohibitions on branching. Indeed, at the horizon of the events we study the S&L share is essentially pre-determined. This makes it less likely that it is picking up shocks to local economic conditions.[30] These shocks would also need to materialize as the Fed imposed binding Regulation Q and disappear once regulation was expanded to S&Ls, which is unlikely. Of course, we add controls for local economic shocks to evaluate this possibility empirically.

The data shows that there is significant variation in the distribution of S&Ls shares across the United States. Panel A of Figure 5 provides a map of the S&L share of non-demand deposits at the MSA level (we exclude demand deposits because S&Ls did not offer them). The S&L share varies widely, including within region and across the 25 BLS MSAs, which are labeled in red. There is no evidence of geographic clustering. Our understanding is that this variation is driven by long-run variation in local housing markets. S&Ls are focused on residential mortgage provision and higher average levels of housing activity naturally translate into a higher S&L share in deposit markets. From the identification perspective, there is no reason to believe that this variation driven by local housing markets is correlated with inflation during the analysis period.

As a first step, we examine the dynamic effect of the S&Ls share on inflation using a standard panel regression. Our sample consists of the 25 BLS MSAs. To smooth out noise, we measure inflation over two years, from year $t-1$ to $t+1$, and rolled over each quarter. We measure the S&L share as of 1966.III. In equation form, we are estimating the following OLS regression:

$$\pi_{i,t-1\to t+1} \quad = \quad \alpha_t + \beta_t \left(\text{S\&L Share}\right)_{i,1966.\text{III}} + \epsilon_{i,t}. \tag{1}$$

Panel A of Figure 6 plots the coefficients β_t from this regression with a 90% confidence interval. We find that there is no difference in inflation between high and low S&L

[30]For instance, it avoids potential reverse causality whereby households in areas with higher inflation are more likely to move their deposits to S&Ls in search of higher rates. This mechanism would induce a positive correlation between the S&L share and inflation, which could mask the impact of Regulation Q.

share MSAs while Regulation Q is not binding. In fact, the coefficients are close to zero, precisely estimated, and there is no pre-trend. In early 1965, inflation in high S&L share areas starts to dip relative to low S&L share MSAs. This is precisely when the Fed funds rate crosses 4%, the ceiling rate on savings deposits, which made Regulation Q binding in areas dominated by banks but not binding in areas dominated by S&Ls. The gap in inflation then widens, reaching -2.8% in 1966.I and -2.4% in 1966.II (-1.4% and -1.2% per year, respectively), before closing in 1966.III and remaining closed thereafter. The timing of the reversal precisely coincides with the expansion of Regulation Q to S&Ls. Taken together, these results indicate that deposit rate ceiling imposed under Regulation Q increased inflation.

Next, we examine the impact of the S&L share in the cross section. We focus on the first quarter of 1966 since we expect the impact to be largest in the months prior to the expansion of Regulation *Q*. Panel B of Figure 6 shows a scatter plot of inflation against the S&L share in 1966.I (as in regression (1)). The figure shows a clear negative pattern, with a wide spread in both the S&L share and the inflation rate. Low S&L share MSAs like Detroit, Dallas, and Portland have higher inflation rates than high S&L share MSAs like Cincinnati, San Diego, and Los Angeles.

A formal test of this relationship is presented in Table 2. The first column recovers the coefficient of -2.8% from Panel A of Figure 6. The estimate is significant at the 5% level and the R^2 is relatively high at 19.8%. Columns (2) and (3) of Table 2 add deposit growth and asset growth as controls. These controls help to rule out the following alternative explanation. As mentioned in Section 2, the events of 1966 inspired the phrase "credit crunch" as rising interest rates triggered outflows of deposits and a contraction in lending. By controlling for deposit growth and asset growth we can rule out the hypothesis that the credit crunch is somehow correlated with the S&L share and that this is what is causing high S&L share areas to have lower inflation.[31]

The table shows that the credit crunch does not explain our results. The coefficient on the S&L share is remarkably stable, rising slightly to -2.9% in column (2) then dipping slightly to -2.7% in column (3). The coefficients on deposit growth and asset growth are positive, consistent with a credit crunch having some impact on inflation, but they are insignificant, and their impact on the R^2 is small.

[31] The controls are computed from 1966.I to 1967.I. because our S&L data is not available prior to 1966. This is arguably the right timing anyway because Wojnilower (1980) dates the credit crunch to 1966.

The last three columns of Table 2 replace the S&L share with the deposit rate of local banks and S&Ls. The deposit rate is simply interest expense on deposits divided by non-demand deposits. We take it as of 1966.II, just before Regulation Q was imposed on S&Ls. Note that this regression is subject to reverse causality. Unlike the S&L share which is pre-determined, the deposit rate could itself be driven by higher inflation as households demand compensation. The deposit expense rate is also a noisy proxy for the rate available at any point in time since it reflects past deposit rates as well.

We find that areas with higher deposit rates experienced lower inflation. Column (4) finds a univariate coefficient of -1.644, significant at the 5% level. Thus, a one percentage point increase in the deposit expense rate predicts 1.644% lower inflation over two years or 0.82% per year. To compare this number to column (1), note that S&Ls paid about 0.84 percentage points more than banks at this time, so the comparable coefficient in column (1) is $-0.028/0.84 = -3.33\%$ or -1.67% per year, which is about double. This could be either because of the reverse causality issue discussed above or noise in the deposit rate. Nevertheless, the estimates are comparable. As shown in columns (5) and (6), they are also stable when adding controls for deposit and asset growth. This again shows that the credit crunch does not explain the results.

Overall, the results suggest that Regulation Q contributed significantly to the onset of the Great Inflation. In fact, a simple back of the envelope calculation suggests that it can explain all of it. From Table 2, going from an S&L share of one (all S&Ls, no banks) to an S&L share of zero (all banks, no S&Ls) raises inflation by 2.8% over two years. If we interpret S&Ls as completely unaffected by Regulation Q and banks as fully affected by it, then the implied aggregate impact of Regulation Q on inflation over this period is 2.8%. This is roughly the same as the actual increase of inflation, which rose by 2.6% from 1965.I to 1966.IV. Note that this calculation takes the path of the Fed funds rate as given. Thus, contrary to the conventional view, there is no indication that the Fed acted inappropriately, just that its efforts were made futile by a broken transmission system.

5.2 The NOW account experiment in New England

The next episode to afford us cross-sectional variation in exposure to Regulation Q is the "NOW account experiment in New England" (Kimball, 1980; Frodin and Startz, 1982). The story goes as follows. Ronald W. Haselton, president of Consumers Savings Bank of Worcester, MA, recalls overhearing a customer ask why she could not write checks on her savings account at his mutual savings bank (Ross, 1980). Haselton wondered himself, and eventually began offering what he called a NOW (Negotiable Order of Withdrawal) account, which was effectively the first interest-bearing checking account. His real break came in 1972 when the Massachusetts Supreme Court deemed it legal. Commercial banks in Massachusetts soon began to worry about losing checking accounts to mutual savings banks, which led them to lobby Washington to be allowed to offer NOW accounts themselves. Congress gave its blessing in 1974.I for Massachusetts and New Hampshire, and in 1976.I for the remaining New England states. New York and New Jersey were next in 1978.IV and 1979.IV, followed by the rest of the U.S. in 1980.IV (Santomero and Siegel, 1986).

The staggered introduction of NOW accounts across U.S. states provides a natural experiment that allows us to estimate the impact of an increase in deposit rates on inflation. Arguably, the rollout across states was driven by competitive forces in local deposit markets, independent of other economic variables such as local inflation or economic activity. Massachusetts and New Hampshire were deregulated in the same year because they have a significant overlap in local banking markets, prompting banks from both states to lobby for NOW accounts. The rest of New England followed two years later as local banks experienced the effect of increased competition for branches located close to Massachussets and New Hampshire. The same dynamic prompted the neighboring states of New York and New Jersey to loosen regulation and eventually NOW accounts were expanded to the entire country. Hence, the rollout of NOW accounts was driven primarily by a "domino effect" transmitted through competition in local banking markets that was independent of local economic conditions.

NOW accounts proved extremely popular in New England: their penetration rate reached 80 accounts per 100 households in Massachusetts, 75 per 100 in New Hampshire, and between 15 and 35 per 100 in the later states (Kimball, 1980).[32] Their popularity was due to the fact that they offered the same interest rate as a savings account (5% at the time) without giving up the convenience of a checking account. As regular checking accounts paid no interest, this amounted to a substantial increase in the rate on a large and important class of deposits (checking accounts were about a third of total deposits in 1973.IV).

[32] Kimball (1980) attributes the lower penetration in the later states to market power. Essentially, since there was no first mover like the mutual savings banks in Massachusetts, banks in the later states were not as aggressive in offering NOW accounts.

The NOW account experiment, which we interpret as a partial repeal of Regulation Q, allows us to test the impact of Regulation Q on inflation. The identification assumption is that the staggered introduction of NOW accounts across the Northeast was uncorrelated with unobserved variables such as economic conditions that could affect inflation by other mechanisms. The particular history of this episode makes this unlikely since it could have just as easily happened somewhere other than Massachusetts (at least as far as inflation is concerned), and since the states that followed Massachusetts were its neighbors within a progressively expanding radius.

We implement this test using a staggered difference-in-differences methodology (e.g., Jayaratne and Strahan, 1996):

$$\pi_{i,t-1\to t+1} = \alpha_t + \gamma_i + \beta\,\text{Deregulated}_{i,t} + X_{i,t} + \epsilon_{i,t+1}, \tag{2}$$

where $\text{Deregulated}_{i,t}$ switches from zero to one whenever the state in which a given MSA is located permits NOW accounts (this includes all states post 1980.IV). We start the event window in 1971.I, three years before the first event, and end it in 1983.IV, three years after the last one. In some columns we replace the MSA fixed effects γ_i with regional indicators for New England and New York/New Jersey to see if inflation was just running lower in these regions throughout the sample (as opposed to only following deregulation). Finally, we report Newey-West standard errors with eight lags to account for autocorrelation induced by overlap in the data.[33]

Table 3 presents the results. From column (1), MSAs in deregulated states had 2.407% lower two-year inflation than MSAs in non-deregulated states. The coefficient is statistically significant at the 5% level. The regional indicators show that this result is not explained by pre-trends in inflation in the deregulated regions: the indicator for New England is positive and insignificant while the one for New York/New Jersey is negative and insignificant. From column (2), the coefficient on the deregulation indicator remains unchanged when we replace the regional indicators with MSA fixed effects. Column (3) adds employment growth as a control for economic conditions. As expected, employment growth positively predicts inflation. However, the coefficient on the deregulation indicator again remains unchanged. Its economic magnitude is large given the fact that

[33]We do so because clustered standard errors are known to be unreliable with fewer than thirty clusters (Cameron, Gelbach and Miller, 2008). We use clustered standard errors when we use wage growth as a proxy for inflation as wage growth is available in almost every MSA.

NOW accounts represent only a partial repeal of the rate ceiling on one type of deposit. Thus, the results support the view that Regulation Q had a large impact on inflation.

The NOW account experiment covers a period for which we have wage data in addition to inflation (this was not the case for the analysis in Section 5.1 which covered 1965–67). By using nominal wage growth as a proxy for inflation, we can broaden our cross section significantly beyond the 25 BLS MSAs (and cluster standard errors at the MSA level). It is particularly important, however, to control for slack in the labor market to make sure we are not picking up real wage effects. We again do so using employment growth. The additional identification assumption is that unobserved productivity shocks, which could impact wages beyond labor market slack, are not correlated with the introduction of NOW accounts.

Columns (4)–(6) of Table 3 replace inflation with the growth in wages from the QCEW data, which starts in 1975. This gives us 315 MSAs, 37 of which are in the early deregulation states. The resulting sample is about eight times larger than the 25 BLS MSAs.[34] From column (4), deregulated MSAs had 2.873% lower wage growth than non-deregulated MSAs. The estimate is significant at the 1% level. It remains stable when we add in MSA fixed effects in columns (5) and (6). The coefficient on employment growth in column (6) is positive but has almost no impact on the coefficient of the deregulation indicator.

Columns (7)–(9) replace total wage growth with manufacturing wage growth from the CES dataset, which allows us to cover the initial deregulation in Massachusetts and New Hampshire in 1974. This data contains 173 MSAs, 21 of which are in the early deregulation states. This gives about five times as many observations as with the 25 BLS MSAs. Column (7) shows that deregulated MSAs had 2.09% lower manufacturing wage growth than non-deregulated MSAs. The coefficient is significant at the 1% level. It remains stable when we include MSA fixed effects and when we control for employment growth in columns (8)–(9). Remarkably, our estimates are extremely stable in the range of 2% to 3% across all nine columns and three independent proxies for inflation.

Figure 7 plots the coefficient on the deregulation indicator over time to give us a sense of the dynamics of these results. We use wage growth as the outcome variable since it has MSAs in each of the early deregulation states. As before, we take it over two years to smooth out some of the noise. Also shown are vertical lines that mark each of the

[34] Unlike in many later tests we do not weight by population because Boston dominates New England by population, hence we would not be significantly expanding our cross section.

staggered deregulation dates.

Panel A looks at total wage growth from the QCEW, which excludes the initial deregulation episode in 1974. Nevertheless, it shows that the MSAs in deregulated states had consistently lower nominal wage growth the deregulation period. This confirms the results of Figure 7. Perhaps more interesting is the timing. There is a clear dip in the coefficient at each of the vertical lines for the early deregulation states.

Panel B of Figure 7 looks at manufacturing wage growth from the CES, which allows us to include the 1974 deregulation episode. The figure again shows a consistent negative coefficient that dips and becomes more negative at each deregulation event. The biggest dip is the first one, when Massachusetts and New Hampshire were deregulated. The coefficient in that case drops to -6% (-3% per year). This is consistent with the fact that these two states had the highest take-up of NOW accounts within New England.

Why does the coefficient on deregulation revert back somewhat after each dip? Recall that NOW accounts paid a higher rate but still a fixed one. It therefore makes sense to think of the NOW account experiment as a one-time rate shock, not as a shock to the pass-through of monetary policy. The effect of such a one-time shock understandably fades over time. Fully restoring the monetary transmission mechanism thus requires the elimination of interest rate ceilings so that deposit rates can float with market rates. We take up such an episode next.

5.3 Deregulation of small time deposits

The beginning of the end for Regulation Q was the effective deregulation of small time deposits at the national level. As interest rates rose in the late 1970s, banks and S&Ls faced significant outflows of deposits due in part to competition from money market funds (Gilbert, 1986). As in New England, this made them more willing to support changes to Regulation Q. The result was the introduction of Money Market Certificates (MMCs) in 1978.III. MMCs had maturity of six months and a minimum denomination of $10,000. They grew extremely rapidly, to $68 billion after just one quarter and $431 billion within three years in 1981.III. At the same time, their relatively high minimum denominations exacerbated the implicit discrimination against small savers under Regulaton Q (Kane, 1970). To address it, Congress authorized Small Saver Certificates (SSCs) in 1979.III. SSCs had no minimum denomination but a maturity of at least thirty months. They grew to $8 billion after one quarter and $126 billion by 1981.III.

Thus, within three years of the introduction of MMCs, there were \$557 billion of deregulated small time deposits at banks and S&Ls, with MMCs accounting for about three quarters of the total.[35] To put this number in perspective, it represented 80% of all small time deposits, 41% of all non-demand deposits, and 21% of total personal income.

The massive growth of deregulated small time deposits occurred around the same time as the drop in aggregate U.S. inflation. To see if deregulation can explain this drop, we regress the post-deregulation drop in inflation at the MSA level on the local take-up of MMCs. Specifically, we run

$$\Delta\pi_{i,1978.\text{III}\rightarrow t+1} \quad = \quad \alpha_t + \beta_t \ (\text{MMC share})_{i,t} + \epsilon_{i,t+1}, \tag{3}$$

where $\Delta\pi_{i,1978.\text{III}\rightarrow t+1}$ is the cumulative change in inflation in MSA i between 1978.III and $t+1$, and MMC share is the ratio of MMC deposits to total non-demand deposits of banks and S&Ls.[36] Panel A of Figure 8 plots the coefficients β_t over a four-year window until 1982.III, together with their 90% confidence interval. Also shown is a vertical line marking the introduction of MMCs in 1978.III.

The figure shows that the coefficient on MMC share is negative throughout the period. In other words, MSAs with a higher take-up of deregulated small time deposits saw a larger drop in inflation. In terms of magnitude, the coefficient is very large, peaking at -0.4 in 1980.IV. Thus, going from a take-up of zero to a take-up of one is predicted to decrease inflation by 40% after about two years (26% after one year). Since the aggregate MMC share in 1980.IV was 0.28, a back-of-the-envelope calculation tells us that the deregulation of small-time deposits can explain an 11% drop in aggregate U.S. inflation. This is about the same as the actual drop under Volcker. Our cross-sectional estimates thus suggest that the deregulation of small time deposits can explain all of it.

As is well known, aggregating from cross-sectional estimates ignores general equilibrium effects and other spillovers (e.g., Nakamura and Steinsson, 2014; Beraja, Hurst and Ospina, 2016). Which way are such spillovers likely to go? First, it is clearly difficult to sustain large differences in inflation rates within an integrated economy such as the U.S.

[35] As their name suggests, MMCs were designed in part to compete with money market funds. Yet retail money market funds had just \$126 billion as of 1981.III, up from \$3.9 billion in 1978.III. Thus, the vast majority of MMCs did not come from money market funds. In fact, the two grew together.

[36] We focus on MMCs because they are by far the largest and because disaggregated SSC amounts are only available for S&Ls and not banks. Our results are robust to including S&L SSCs, as well as to imputing bank SSCs from either S&L SSCs or aggregate bank SSCs.

This would tend to shrink our estimates and understate the aggregate impact of deregulation. Yet it is likely to do so after a while, as inflation rates take time to converge. Consistent with this, the coefficient in Figure 8 Panel A reverts toward zero after about three years. This could also be due to the fact that low take-up areas eventually catch up in terms of deregulation.

Another potential spillover would occur if the higher take-up of deregulated deposits in one area came at the expense of a lower take-up in another. This seems unlikely given the prohibitions on interstate banking and the limits on branching discussed in Section 4. Finally, in many settings there is the concern that monetary or fiscal policy might endogenously counteract the aggregate effect of a given shock, leaving only its cross-sectional impact. In this case the concern would apply if Volcker would have tightened by *more* absent the repeal of Regulation Q, in which case our estimates should be interpreted as applying conditional on the path of monetary policy.

Panel B of Figure 8 shows a snapshot of regression (3) as of 1980.IV. Although there are only 25 BLS MSAs, there is plenty of variation in both inflation and the MMC share. There is also a clear negative relationship (as mentioned, the slope is -0.4), which is significant at the 1% level and robust to the exclusion of any one MSA.

A formal test is presented in Table 4. Rather than estimating a separate coefficient for each quarter, we run panel regressions from 1978.III to 1981.III when, as Figure 8 shows, the impact of MMCs dissipates. Standard errors are Newey-West with eight lags to account for overlap in the data.

The univariate coefficient in Panel A column (1) is -0.240 and is highly significant at the 1% level. As expected, this number is about the average value of the coefficient in Panel A of Figure 8 over the same period. In column (2), we control for any pre-trends in inflation by including the two-year inflation rate ending in 1978.III. The pre-trend is not significant and the coefficient on the MMC share ticks up slightly to -0.273. Column (3) adds MSA fixed effects, which absorb the inflation pre-trend. The coefficient on the MMC share, which is now identified solely from time series variation, remains unchanged at -0.259. Finally, in column (4) we control for the contemporaneous growth in employment in order to make sure that the coefficient is not picking up economic conditions which could affect inflation independently of the repeal of Regulation Q. The coefficient on the MMC share is again essentially unchanged at -0.268.

In terms of magnitude, these coefficients again suggest that the deregulation of small time deposits can account for the entire Volcker disinflation. To see why, we must take into account the fact that the coefficient is averaged over a three-year period. The aggregate MMC share averaged 22.5% over this period. Multiplying it by the coefficient in column (1), deregulation can explain about a 5.4% average decline in aggregate inflation. Since actual aggregate inflation dropped by 11% from peak to trough, it was on average 5.5% below peak during the disinflation. Thus, the implied aggregate impact and the actual aggregate decline line up very closely.

Panel B of Table 4 runs the regression in Panel A in annual first differences. Similar to an MSA fixed effect, this takes out permanent differences in the MMC share and inflation across MSAs. It also takes a strong stand on the exact timing of the relationship between the MMC share and inflation. Perhaps because of this, the coefficients are slightly smaller than in Panel A but nevertheless quite similar. For instance, the univariate coefficient in column (1) is -0.176. It again remains highly stable and significant as we add controls, rising slightly to -0.210 in column (4). Thus, the impact of the MMC share on inflation is robust to specifications in both levels and first differences.

A natural question stemming from this analysis is what drives variation in the MMC share? A simple starting point is that since MMCs are small time deposits, their take-up is likely to be higher in areas that have more small time deposits to begin with. The idea is that since checking, savings, and small time deposits are each a little different in terms of their maturity and liquidity, they are imperfect substitutes. It follows that MMCs are most substitutable with other small time deposits, whose characteristics they share. Hence, we should expect more MMCs in areas that previously had more small time deposits.

Panel A of Table 5 shows that this is indeed the case. The panel presents the first stage of an instrumental variables regression where we instrument the MMC share with the share of small time deposits as of 1975.III. We pick this date, which is three years before the introduction of MMCs, because it is sufficiently far back to rule out reverse causality and other unobserved variation that might have arisen during the three years leading up to deregulation.[37]

The panel shows that the small deposit share strongly predicts the MMC take-up three years out. From column (1), the univariate coefficient is 0.314 and highly significant. This coefficient implies that a one-standard-deviation increase in the small-time deposit share

[37] Our data on bank small time deposits starts in 1974.II and our results are robust to using this slightly earlier date. We use 1975.III for our main specification because it coincides with a relative low point in inflation (inflation was "only" 5.5% over the following year).

induces a 0.3 standard deviation increase in the MMC take-up. The number is essentially unchanged when we add controls in columns (2)–(4). Note that we do not include MSA fixed effects since they would absorb the instrument. This is why in column (4) we include both the inflation pre-trend and employment growth as controls. The coefficient again remains the same.

Panel B of Table 5 shows the second stage. The instrumented MMC share has a strong negative impact on inflation. The univariate coefficient in column (1) is -0.243 and highly significant. Remarkably, this number is almost identical to the corresponding OLS coefficient in Table 4. It again changes very little as we add controls in columns (2) and (3), then ticks up slightly to -0.354 in the most stringent specification in column (4). The last two rows of Panel B display an F-statistic for weak identification and a p-value for under-identification. The F-statistic ranges between 58 and 89 and the p-values are all essentially zero. Thus, the 1975.III small-time deposit share is a powerful instrument. Overall, the IV results in Table 5 support the view that deregulated small time deposits led to a decline in inflation.

To extend these findings to a broader cross section, we again turn to wages. Panel A of Table 6 is analogous to Panel A of Table 4 but with wage growth replacing inflation. The regressions are weighted by population, which reduces the impact of small MSAs.[38] In addition, given the larger cross section, we are now able to cluster standard errors by MSA (there are 303 MSA clusters).

The panel shows that the MMC share predicts nominal wage growth negatively, which confirms and extends the results in Table 4. The univariate coefficient in column (1) is -0.086 and highly significant. It remains unchanged when we control for pre-trends in wage growth in column (2) but decreases to -0.047 when we include MSA fixed effects in column (3) and when we further control for employment growth in column (4). In terms of magnitude, the coefficients are smaller than in Table 4 but still imply a large aggregate effect. The reason is that the decline in aggregate nominal wage growth was about 4%, less than half that for inflation. As a result, multiplying the coefficient in column (1) by the average MMC share over the period, we get an implied aggregate impact of about 2%, or half the observed aggregate decline.

Panel B of Table 6 reruns the IV regressions in Table 5 with wage growth as the depen-

[38]The unweighted results are in Table A.2 in the Appendix. See Chodorow-Reich (2019) for a discussion of population weighting in cross-sectional tests with aggregate implications.

dent variable. Here we see that the univariate coefficient increases to -0.159 and remains stable across all columns as we control for pre-trends, employment growth, or both.[39] As a result, the implied aggregate impact nearly doubles to 3.6%. Thus, based on the IV regressions MMC take-up can explain nearly all of the decline in aggregate nominal wage growth during the Volcker disinflation.

Our tests so far exploit both time series and cross-sectional variation in MMC take-up. To get a closer look at the dynamics of inflation in high take-up cities, we now fix take-up as of 1981.III, three years out from the initial reform, and project backward in time. The results are presented in Figure 9 Panel A for inflation and Panel B for wage growth. Dashed lines depict aggregate inflation (Panel A) and aggregate wage growth (Panel B).

Panel A confirms the result in Figure 8 that high MMC share predicts inflation negatively following the introduction of MMCs in 1978.III. Moreover, it shows a clear turning point precisely in 1978.III. This precise timing is strong evidence in favor of the hypothesis that the deregulation of small time deposits induced a decline in inflation. The reason is that there is no obvious alternative event that occurred at that time. For instance, as the dashed line shows, aggregate inflation peaked three quarters later, in 1979.II. This rules out the alternative hypothesis that high take-up MSAs happen to have a higher exposure to aggregate inflation. Under this alternative, the cross-sectional effect would coincide with the aggregate, whereas in practice it leads it by three quarters.

How is this lead consistent with the hypothesis that deregulation reduced aggregate inflation? Suppose that there is a small amount of inertia in inflation as is well documented in the literature (Gordon, 1997*b*; Mankiw and Reis, 2002). Then aggregate inflation will still trend up for a few quarters even as high take-up MSAs separate from others in the cross section.

Consistent with this view, Panel B of Figure 9 shows that the cross-sectional effect in nominal wage growth also coincides precisely with deregulation and leads the aggregate. Although the data here is noisier, the lead appears to be slightly longer, between one and two years. It is plausible that wages have stronger inertia than consumer prices, which would naturally explain this fact.

In addition to the precise timing, Figure 9 also allows us to examine pre-trends more closely (recall we controlled for them in Tables 4–6). Panel A shows evidence of a positive

[39]It is plausible that the IV coefficient is larger than the OLS one because of measurement error. Our measure of local deposits is likely to be less accurate for small MSAs where there are fewer local banks. This would also explain why the unweighted coefficients in Table A.2 in the Appendix are also smaller.

pre-trend: high take-up areas experienced somewhat higher inflation in the pre-period. This trend ends abruptly in 1978.III, right at the time of deregulation. Hence, relative to trend, there is an even bigger drop in inflation in high take-up versus low take-up areas. Panel B, on the other hand, shows no pre-trend in wage growth: high and low take-up areas have very similar wage growth in the pre-period. Overall, the pattern in Figure 9 supports the parallel trend assumption required in a difference-in-difference analysis.

Table 7 presents the results of this analysis. Note that we take inflation in levels instead of relative to 1978.III so that the pre-trend shows up in the standalone coefficient on the MMC share, which is again fixed as of 1981.III. We define the pre-period as the four quarters ending in 1978.III and the post period as the four quarters ending in 1981.III. The reason we leave out the intervening period is that, as Figure 9 shows, it takes time for the level of inflation to come down.[40]

As column (1) of Table 7 shows there is a large negative coefficient on the interaction of the MMC share with the post-period indicator. The coefficient is highly significant and its magnitude, -0.218, is close to the panel regression in Table 4. The coefficient dips slightly to -0.165 and remains significant in column (2) when we control for employment growth which enters with a significant positive coefficient, consistent with the existence of a Phillips curve. However, this effect disappears when we include MSA fixed effects in column (3), while the effect of the MMC share is robust and actually increases in magnitude to -0.254. Thus, the diff-in-diff analysis shows that inflation fell in high take-up areas relative to low take-up areas once MMCs were introduced, which supports the view that deregulation led to a drop in inflation.

The standalone coefficient on the MMC share in columns (1) and (2) shows the positive pre-trend we observed in Figure 9 (the pre-trend is subsumed by the MSA fixed effects in column (3)). It is interesting to ask, what drives this pre-trend? A natural hypothesis is that households in areas with higher inflation as of 1978.III were more eager to invest in MMCs as they experienced more negative real rates under Regulation Q. Under this view, the pre-trend in inflation should be more strongly correlated with the initial take-up of MMCs than with take-up in subsequent periods.

To test this prediction, in column (4) of Table 7 we control for the initial take-up of MMCs. We measure it as the MMC share as of 1978.IV, which is just one quarter after

[40] This does not apply in changes. Results in changes are presented in the appendix and are very similar (see Table A.3 for inflation and Table A.4 for nominal wages).

MMCs were introduced. We allow for separate coefficients in the pre and post period. Conditional on the initial take-up, the coefficient on the main MMC share captures the impact of MMCs issued after 1978.IV.

Column (4) shows that the pre-trend in inflation almost completely disappears when we control for the initial MMC take-up. This supports the interpretation that the initial take-up was a result of high inflation. Yet while controlling for it removes the pre-trend, it has essentially no impact on the main effect of MMCs in the post period. The coefficient on the interaction of the MMC share and the post-period indicator, -0.215, is almost identical to that in column (1). It remains stable when we control for employment growth in column (5) (employment growth itself is insignificant) and when we add MSA fixed effects in column (6). Thus, the initial take-up of MMCs is explained by high past inflation but the post-period negative impact of MMCs on inflation is independent of this selection effect.

Columns (7)–(9) of Table 7 provide a different way of getting at the pre-trend. This is achieved by controlling for the S&L share of non-demand deposits (taken as of 1978.III). The columns show that conditional on the S&L share there is again no inflation pre-trend. Moreover, the negative impact of MMCs in the post period remains and is indeed strengthened by the control: the coefficient in column (7) rises to -0.269 and is again stable as we add controls in columns (8) and (9). Thus, inflation was running hotter in S&L-dominated areas. It is in these areas that the initial take-up of MMCs was consequently higher. Nevertheless, the overall negative impact of MMCs on inflation in the post period is again independent of this selection.[41]

5.4 Inflation and the S&L share

What explains the positive relationship between the S&L share and inflation on the eve of the repeal of Regulation Q? Our theory says that the high inflation at the time was itself the result of Regulation Q, which was strongly binding. In this section we examine the relationship between Regulation Q, the S&L share, and inflation as a further test of the dual hypothesis that Regulation Q explains both the rise and fall of U.S. inflation.

Figure 10 compares the interest expense rate of banks and S&Ls. The interest expense rate is calculated as total interest expense divided by non-demand deposits (recall

[41] Table A.5 in the Appendix reproduces Table 7 but with wage growth as the dependent variable. The results are the same, except as we already saw in Figure 9 there is no pre-trend in the first place.

demand deposits paid no interest during this time). We plot it with a two-quarter lead because it is inherently backward-looking (interest payments are based on rates that were contracted in the past). A vertical line marks 1978.III, which marks the introduction of MMCs and thus the beginning of the end of Regulation *Q*.

As the figure shows, there is a large upward shock to deposit expense rates following the repeal of Regulation *Q*. Notice that the shock is almost exactly equal for banks and S&Ls: both see their expense rates rise from about 6% in 1978.III to over 11% at their peak in 1981.III.

The deposit expense rates of banks and S&Ls behave differently prior to the repeal of Regulation *Q*. In particular, the expense rate of banks is significantly more volatile, rising and falling—albeit much less than one for one—with the Fed funds rate. The deposit expense rate of S&Ls, on the other hand, is essentially completely unresponsive to these fluctuations, only steadily creeping up as ceiling rates are occasionally bumped up and as depositors shift from savings accounts to time deposits which had slightly higher ceilings. Thus, during the period when Regulation *Q* was binding, banks had a slightly higher passthrough of Fed funds rate changes than S&Ls.

The reason for this difference in passthroughs is that banks and S&Ls differed significantly in the duration of their assets. Whereas banks were free to make both long- and short-term loans and to buy and sell securities, S&Ls were required to invest in mortgages, which were primarily long-term and fixed-rate. As explained by Stigum (1983, p.97), this led S&Ls to have a lower deposit passthrough than banks.

Intuitively, holding mortgages made S&Ls have a much lower asset-side passthrough than banks (see Figure A.1 in the Appendix). Whenever interest rates rose, S&Ls would see little increase in their interest income because most of it came from existing mortgages whose rates were fixed for term and whose term was long. As a result, they had to ensure that their deposit expense did not increase much either, i.e. they had to have a low deposit passthrough. This argument is a straight-forward application of Drechsler, Savov and Schnabl (2017*a*), who show that high-duration banks have lower deposit passthroughs in order to immunize their balance sheet.

How did S&Ls achieve a lower passthrough? One way was to have more time deposits in general (see Table 1) and more long-term time deposits in particular (CDs with maturity as long as ten years were common). Another was to have almost no large-time deposits, which were exempt from Regulation *Q* throughout most of the 1970s (see Table

A.1 in the Appendix). Banks, on the other hand, offered large-time deposits precisely as a way to avoid Regulation *Q*, which raised their deposit passthrough. Finally, banks offered higher "implicit interest". This is because unlike S&Ls, banks had a lot of demand deposits which offered the highest implicit interest in the form of free checking services and convenient branch locations (Klein, 1978; Board of Governors, 1977). Note that although implicit interest does not show up in the interest passthroughs in Figure 10, it is part of the overall return depositors receive.

The difference in passthroughs between banks and S&Ls provides us with cross-sectional variation in the extent to which monetary policy was transmitted to households during the Regulation *Q* era. In particular, when the Fed tightened, households in areas dominated by S&Ls experienced smaller rate increases than those in areas dominated by banks. As a result, these areas should have had higher inflation. Conversely, when the Fed loosened, these same areas had smaller rate decrease, hence they should have had lower inflation. Moreover, this relationship should disappear once Regulation *Q* was repealed and the interest passthroughs of banks and S&Ls became equal.

Figure 11 looks at these predictions. Panel A plots the coefficients β_t from the regression

$$\Delta\pi_{i,t-1\rightarrow t+1} = \alpha_t + \beta_t \left(\text{S\&L share}\right)_{i,t} + \epsilon_{i,t+1}, \tag{4}$$

where $\Delta\pi_{i,t-1\rightarrow t+1}$ is the two-year change in annual inflation and S&L share is the ratio of S&L deposits to total non-demand deposits in MSA i. We use the two-year change in inflation in order to smooth out some of the noise in the estimation of β_t. The dashed black line shows the Fed funds rate averaged over the following year ($t+1$). Panel B provides a scatter plot of the relationship on the eve of deregulation in 1978.II.

Consistent with our predictions, the figure shows that high-S&L share areas experienced a greater increase in inflation whenever the Fed funds rate rose during the Regulation *Q* era. This is especially prominent in the late 1970s, when areas with only S&Ls are predicted to have as much as 6.5% higher two-year increase in inflation than areas with only banks. By contrast, in the mid 1970s, when the Fed funds rate was declining, high-S&L areas are predicted to have as much as 2% lower two-year change in inflation. A similar pattern is seen at other points throughout the Regulation *Q* period. This result provides strong evidence that a low deposit passthrough reduced the ability of monetary policy to contain inflation.

Also consistent with our predictions, the relationship between the S&L share and inflation completely disappears after 1978.III when Regulation Q is phased out and bank and S&L passthroughs equalize. Since the equalization amounts to a bigger increase in passthrough for S&Ls, this result provides strong evidence that deregulation, which raised passthroughs across the board, led to a decline in inflation.

Figure 11 sheds further light on our finding from Figure 9 that areas with higher MMC take-up had a larger run-up in inflation going into 1978.III when MMCs were introduced. Recall from Table 7 that this difference disappears when we control for the initial (first-quarter) take-up of MMCs or for the S&L share. Combining these results with Figure 11, the following picture emerges: S&Ls had lower passthroughs than banks, which explains why inflation was running higher in high-S&L areas on the eve of MMC introduction. Higher inflation also increased the initial take-up of MMCs as depositors rushed to escape severely negative real rates. Yet holding the S&L share and hence deposit passthroughs fixed, or holding the initial take-up fixed, there is no longer any difference in prior inflation between high and low take-up areas. Nevertheless, MMC take-up is still strongly negatively related to future inflation, implying that the repeal of Regulation Q played an important role in bringing inflation down.

Table 8 provides a formal test of the patterns in Figure 11. To see if the relationship between the S&L share and inflation is increasing in the Fed funds rate, we replace the time-varying coefficient β_t in (4) with the interaction of the S&L share and the Fed funds rate:

$$\pi_{i,t+1} = \alpha_t + \delta_i + \beta\,(\text{S\&L share})_{i,t} + \gamma\,(\text{S\&L share})_{i,t} \times (\text{Fed funds})_{t+1} + \epsilon_{i,t+1}. \quad (5)$$

We run the regression both in levels (Panel A) and annual first differences (Panel B). In columns (3) and (4) we replace the MSA fixed effects δ_i with the lagged inflation rate π_t. As before, we use Newey-West standard errors with eight lags to account for overlap in the data.

Column (1) of Panel A shows a significant positive coefficient of 0.452 on the interaction of the S&L share and the Fed funds rate. Thus, areas with more S&Ls had higher inflation whenever the Fed tightened. The coefficient rises to 0.527 when we control for employment growth in column (2) and dips to 0.408 when we control for lagged inflation in column (3) (lagged inflation is a fairly strict control since inflation and the Fed funds rate are highly persistent in levels). Finally, the coefficient settles at 0.478 when we control for both employment growth and lagged inflation. In terms of magnitude, this implies that going from an S&L share of zero to an S&L share of one raises inflation by 0.478% per year per 1% increase in the Fed funds rate, a substantial number given the moderate difference in passthroughs between banks and S&Ls.

Panel B confirms these results in first differences. The coefficient in column (1) is 0.331 and significant. It rises to 0.453 when we control for employment growth in column (2) and to 0.389 when we control for lagged inflation in column (3). Thus, both controls increase the coefficient relative to baseline, which is why it increases further to 0.575 in our most stringent specification in column (4). Overall, the numbers in Panel B are very similar to those in Panel A despite the fact that running the regressions in first differences imposes a very strict timing assumption on the effect of monetary policy on inflation. The benefit is that linking the two more tightly strengthens the evidence that differences in deposit passthroughs impact the dynamics of inflation.

To further test this hypothesis, in Table 9 we use the S&L share as an instrument for the deposit passthrough itself. Panel A presents the first stage where we regress the MSA-level deposit interest expense rate (excluding demand deposits) on the S&L share and its interaction with the Fed funds rate. The results are consistent with Figure 10. From column (1), the stand-alone coefficient on the S&L share is 0.019, indicating that high-S&L areas have higher deposit rates when the Fed funds rate is low. The interaction, however, is strongly negative and significant (-0.301). It shows that there is a 0.3 difference in passthroughs between banks and S&Ls. As a result, when the Fed funds rate crosses about 6%, deposit rates in high S&L areas fall below those in low-S&L areas. These relationships are highly stable across columns as we add controls. Hence, the S&L share provides a powerful instrument for differences in deposit passthroughs across MSAs.

Panel B of Table 9 presents the second stage, where we regress inflation on the instrumented deposit expense rate. The coefficient in column (1) is -1.503 and significant. It remains very similar as we add controls in columns (2) and (3), reaching -1.637 in column (4) which controls for both employment growth and lagged inflation. Thus, a 1% increase in deposit expense rates is predicted to lower inflation by 1.6%. This is a very substantial number. To illustrate, the Fed funds rate rose by about 5% over the two years leading up to the introduction of MMCs. At the same time, deposit expense rates rose by just 0.8%, i.e. the aggregate passthrough was 0.16. Based on the numbers in column (4), if the passthrough had instead been one, inflation would have been about 7% lower on the eve of the repeal of Regulation Q. This would have left it at just 4% (actual inflation was 11%), hardly unusual by historical standards.

Table 10 reproduces Table 9 in first differences instead of levels. The passthrough estimates are again very similar at about 0.3 despite the strict timing assumption. The second-stage estimates are also very similar, ranging from -1.351 in column (1) to -1.929 in our most stringent specification in column (4). Based on this number, inflation would have been 8% lower on the eve of deregulation, or just 3%. Thus, the results in Tables 9 and 10 provide evidence that low deposit passthroughs under Regulation Q can explain most of the rise in inflation in the late 1970s and perhaps all of it.

6 Conclusion

We offer a new explanation for the rise and fall of the Great Inflation in the U.S. In 1965, the Fed for the first time allowed deposit rate ceilings under Regulation Q to become binding. Faced with a suppressed return to saving, households increased their spending demand, which pushed inflation higher. Higher inflation further suppressed the return to saving, setting off an inflation spiral. The result was that by 1978 households were earning a -5.75% real return on their savings and small time deposits. The dam finally broke in 1978–79, when Regulation Q began to be repealed. This sent the real return on deposits into positive territory and ultimately to as high as 4.4%. The shock arrested the inflation spiral and restored price stability.

We test this explanation in the aggregate time series and the cross section of U.S. cities. The aggregate time series shows that the imposition and removal of deposit rate ceilings lines up closely with the rise and fall of the Great Inflation. Yet it cannot completely rule out alternative explanations such as the prevailing narrative which centers on the Fed's loss of inflation-fighting credibility and its restoration under Paul Volcker.

The cross section allows us to address this challenge. We show that inflation initially went up more in areas where Regulation Q went into effect earlier. Later on, inflation declined in areas where regulators allowed Regulation Q to be partially repealed by authorizing NOW accounts. And when Regulation Q was lifted at the national level, inflation fell more in areas with more deregulated deposits. In all cases, the cross-sectional results are large enough to account for the observed aggregate changes in inflation.

Our results imply that the financial system plays a key role in the transmission of monetary policy to inflation. Regulation Q blocked this transmission, and this led inflation to accelerate. In this environment, the Fed's policy rule becomes much less important. Paradoxically, however, if one overlooks transmission, the Fed's policy rule appears to become *more* important. After all, the Fed raised rates substantially throughout the period, but as inflation failed to respond many observers concluded it had not raised rates enough. This conclusion was vindicated by Volcker's apparent success in bringing inflation down.

While the credibility view and the transmission view can both account for inflation spirals, they have vastly different policy ramifications. These came to a head in the aftermath of the 2008 financial crisis. As the Fed cut rates to zero and vastly expanded its balance sheet to fight the downturn, those steeped in the credibility view feared that 1970s-style inflation was just around the corner. The transmission view, on the other hand, implies that these fears were overstated since there was no blockage to the transmission of interest rate increases through the financial system. If anything, the blockage was on the other side: the zero lower bound, effectively a deposit rate *floor*, prevents interest rate *decreases* from being transmitted. Thus, the transmission view provides a natural explanation for the persistently low inflation since 2008.

At the broadest level, the experience of the Great Inflation led economists to lose faith in their ability to steer the economy through active monetary policy. If the Fed tried to do too much, its credibility to fight inflation would be sacrificed, and its efforts would become self-defeating. Under this view, the best the Fed could do was focus on inflation, and the economy would right itself. This stands in sharp contrast to the Great Depression, when economists concluded that the Fed had been too passive, and that active policy could greatly improve economic outcomes. The results of this paper help to reconcile these two outlooks: active policy can work, but it requires a functioning transmission through the financial system.

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Table 1: Summary statistics

This table reports summary statistics. The sample is from 1966.I to 1986.I. Each observation is an MSA-quarter. Panel A presents macroeconomic variables. Inflation, wage growth, and employment growth are calculated over the following year. They are also presented in yearly changes. Excess inflation is the difference between MSA inflation and national inflation. Also shown are sample splits before and after the end of Regulation Q, which we set here to 1978.III when small time deposits were effectively deregulated by the introduction of MMCs. Panel B presents bank and S&L characteristics. The last five rows exclude demand deposits.

Panel A: Macroeconomic variables

	All (1966.I–86.I)			Reg Q (1966.I–78.III)		Post Reg Q (1978.IV–86.I)	
	Obs.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Levels:							
Fed funds rate	25,920	0.082	(0.034)	0.063	(0.020)	0.112	(0.030)
Inflation U.S.	25,920	0.060	(0.030)	0.061	(0.024)	0.061	(0.039)
Inflation, MSA	2,059	0.061	(0.034)	0.061	(0.027)	0.062	(0.043)
Excess inflation, MSA	2,059	0.000	(0.013)	0.000	(0.010)	0.000	(0.016)
Wage growth	14,161	0.063	(0.037)	0.077	(0.029)	0.057	(0.038)
Employment growth	21,120	0.024	(0.031)	0.030	(0.031)	0.018	(0.030)
Changes:							
Δ Fed funds rate	25,920	0.002	(0.029)	0.002	(0.025)	0.002	(0.034)
Δ Inflation, U.S.	25,920	−0.001	(0.024)	0.005	(0.022)	−0.009	(0.024)
Δ Inflation, MSA	2,055	−0.001	(0.029)	0.006	(0.025)	−0.010	(0.033)
Δ Excess inflation, MSA	2,055	−0.000	(0.018)	0.001	(0.012)	−0.001	(0.024)
Δ Wage growth	12,896	−0.004	(0.043)	0.004	(0.043)	−0.006	(0.042)
Δ Employment growth	19,840	0.001	(0.028)	0.004	(0.029)	−0.003	(0.026)

Panel B: Bank and S&L characteristics

	Banks and S&Ls			Banks		S&Ls	
	Obs.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Total deposits:							
Institutions per MSA	25,920	27.623	(42.489)	19.201	(29.823)	8.423	(16.648)
Deposits ($ billions)	25,762	3.269	(10.714)	2.301	(8.397)	1.025	(3.474)
Deposit growth	24,475	0.107	(0.195)	0.107	(0.225)	0.145	(2.211)
Demand deposits share	25,762	0.255	(0.118)	0.378	(0.129)	0.000	(0.002)
Non-demand deposits:							
Market share	24,922	1.000	(0.000)	0.564	(0.204)	0.436	(0.204)
Interest expense rate	22,270	0.066	(0.021)	0.060	(0.021)	0.066	(0.021)
Savings deposits share	21,957	0.390	(0.133)	0.428	(0.150)	0.374	(0.175)
Time deposits share	21,957	0.610	(0.133)	0.572	(0.150)	0.626	(0.175)
MMC share	6,023	0.251	(0.093)	0.224	(0.094)	0.290	(0.163)

Table 2: The S&L share and inflation: 1966

Results from cross-sectional regressions of inflation on the S&L share and deposit rate in 1966. The inflation rate is over two years from 1965.I to 1967.I for the 25 BLS MSAs. The S&L share is based on the non-demand deposits of S&Ls and banks as of 1966.III when S&Ls became regulated under Regulation Q. The deposit expense rate is the interest expense rate on non-demand deposits of S&Ls and banks as of 1966.II, the last quarter before S&Ls became regulated. Deposit and asset growth are from 1966.I to 1967.I (the data for S&Ls are not available prior to 1966.I).

	Inflation					
	(1)	(2)	(3)	(4)	(5)	(6)
S&L share	-0.028^{**}	-0.029^{**}	-0.027^{**}			
	(0.012)	(0.012)	(0.012)			
Deposit expense rate				-1.644^{**}	-1.647^{**}	-1.585^{**}
				(0.770)	(0.788)	(0.758)
Deposit growth		0.035			-0.014	
		(0.092)			(0.093)	
Asset growth			0.136			0.142
			(0.102)			(0.104)
Constant	0.063^{***}	0.061^{***}	0.054^{***}	0.115^{***}	0.116^{***}	0.104^{***}
	(0.005)	(0.007)	(0.008)	(0.030)	(0.031)	(0.031)
Obs.	25	25	25	25	25	25
R^2	0.198	0.203	0.257	0.165	0.166	0.231

Table 3: NOW Account deregulation in New England

Results from panel regressions of inflation and wage growth on an indicator for the deregulation of NOW Accounts in New England and the rest of the U.S. Inflation and wage growth calculated over two years, from $t-1$ to $t+1$. Inflation is for the 25 BLS MSAs, total wage growth is from the QCEW, and manufacturing wage growth is from the CES. The QCEW data begins in 1976. Deregulation occurred in 1974.I in MA and NH; 1976.I in CT, ME, RI, and VT; 1978.IV in NY; 1979.IV in NJ; and 1980.IV in the rest of the U.S. All columns include time fixed effects; columns (2)–(3), (5)–(6), and (8)–(8) also include MSA fixed effects, while columns (1), (4), and (7) replace them with indicators for New England and NY/NJ. Columns (3), (6), and (9) further control for employment growth taken over the same period as inflation and wage growth. Standard errors are Newey-West with eight lags for inflation and clustered by MSA for wage growth. The sample is from 1971.I to 1983.IV.

	Inflation			Wage growth			Manu. wage growth		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Deregulated (×100)	−2.407**	−2.407***	−2.456***	−2.873***	−2.800***	−2.624***	−2.090***	−2.143***	−2.193***
	(0.935)	(0.851)	(0.812)	(0.346)	(0.364)	(0.272)	(0.483)	(0.509)	(0.488)
New England (×100)	0.449			2.348***			0.181		
	(0.786)			(0.378)			(0.339)		
NY, NJ (×100)	−0.845			0.180			−0.756*		
	(0.650)			(0.297)			(0.402)		
Employment growth			0.173***			0.407***			0.192***
			(0.035)			(0.034)			(0.057)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Obs.	1,300	1,300	1,300	10,021	10,021	10,021	6,833	6,833	6,833
MSAs	25	25	25	315	315	315	173	173	173
R^2	0.888	0.903	0.910	0.510	0.603	0.665	0.406	0.502	0.511

Table 4: Deregulation of Small Time Deposits

Panel regressions of inflation on the MMC share of non-demand deposits from 1978.III to 1981.III. Inflation is measured over the following year, subtracting its value in 1978.III. Pre-period inflation is over 1976.III–1978.III. Panel B runs the regressions in annual first differences. Standard errors are Newey-West with eight lags.

Panel A: Inflation

	Inflation (1978.III = 0)			
	(1)	(2)	(3)	(4)
MMC share	−0.240***	−0.273***	−0.259***	−0.268***
	(0.064)	(0.067)	(0.076)	(0.078)
Inflation, pre-period		0.200		
		(0.140)		
Employment growth				−0.068
				(0.110)
Time FE	Yes	Yes	Yes	Yes
MSA FE	No	No	Yes	Yes
Obs.	300	300	300	300
R^2	0.577	0.588	0.835	0.836

Panel B: Δ Inflation

	Δ Inflation			
	(1)	(2)	(3)	(4)
Δ MMC share	−0.176**	−0.177**	−0.210**	−0.210**
	(0.085)	(0.085)	(0.087)	(0.087)
Δ Inflation, lag		0.032		0.024
		(0.106)		(0.105)
Δ Employment growth			−0.233	−0.232
			(0.143)	(0.144)
Time FE	Yes	Yes	Yes	Yes
Obs.	300	300	300	300
R^2	0.580	0.580	0.587	0.588

Table 5: Deregulation of Small Time Deposits, IV

Instrumental variables regressions of inflation on the MMC share of non-demand deposits from 1978.III to 1981.III. The instrument is the share of small time deposits as of 1975.III. Panel A shows the first stage. Inflation is measured over the following year, subtracting its value in 1978.III. Pre-period inflation is over 1976.III–1978.III. Standard errors are Newey-West with eight lags.

Panel A: First stage

	MMC share			
	(1)	(2)	(3)	(4)
Small time share, 1975.III	0.314***	0.319***	0.290***	0.296***
	(0.033)	(0.038)	(0.035)	(0.039)
Inflation, pre-period		−0.052		−0.068
		(0.187)		(0.184)
Employment growth			−0.311*	−0.315*
			(0.174)	(0.174)
Obs.	300	300	300	300
R^2	0.885	0.885	0.890	0.890

Panel B: Second stage

	Inflation (1978.III = 0)			
	(1)	(2)	(3)	(4)
$\widehat{\text{MMC share}}$	−0.243***	−0.312***	−0.286***	−0.354***
	(0.086)	(0.095)	(0.100)	(0.108)
Inflation, pre-period		0.227		0.215
		(0.148)		(0.147)
Employment growth			−0.174	−0.183
			(0.159)	(0.158)
Time FE	Yes	Yes	Yes	Yes
Obs.	300	300	300	300
Weak IV F-stat	89	71	68	58
p-val	0.000	0.000	0.000	0.000

Table 6: Deregulation of Small Time Deposits: Wage Growth

Panel regressions of wage growth on the MMC share of non-demand deposits from 1978.III to 1981.III. Wage growth is measured over the following year, subtracting its value in 1978.III. Pre-period wage growth is over 1976.III–1978.III. The regressions are weighted by population. Panel A is based on ordinary least squares. Panel B instruments the MMC share with the share of small time deposits as of 1975.III. Standard errors are clustered by MSA.

Panel A: Wage growth

	Wage growth (1978.III = 0)			
	(1)	(2)	(3)	(4)
MMC share	−0.086***	−0.083***	−0.047**	−0.047**
	(0.022)	(0.022)	(0.019)	(0.019)
Wage growth, pre-period		−0.036		
		(0.047)		
Employment growth				0.044
				(0.064)
Time FE	Yes	Yes	Yes	Yes
MSA FE	No	No	Yes	Yes
Obs.	3,615	3,555	3,615	3,615
R^2	0.224	0.225	0.594	0.638

Panel B: Wage growth, IV

	Wage growth (1978.III = 0)			
	(1)	(2)	(3)	(4)
$\widehat{\text{MMC share}}$	−0.159***	−0.157***	−0.144***	−0.143***
	(0.026)	(0.027)	(0.026)	(0.028)
Wage growth, pre-period		−0.015		−0.008
		(0.048)		(0.045)
Employment growth			0.137**	0.138**
			(0.057)	(0.057)
Time FE	Yes	Yes	Yes	Yes
Obs.	3,615	3,555	3,615	3,555
Weak IV F-stat	72	81	77	86
p-val	0.009	0.005	0.004	0.002

Table 7: Deregulation of Small Time Deposits: Diff-in-diff

Panel regressions of inflation on the MMC share of non-demand deposits pre and post MMC introduction. The pre period is the four quarters ending in 1978.III and the post period is the four quarters ending in 1981.III. Inflation and employment growth are measured over the following year. The MMC Share is measured in 1981.III. The Initial MMC Take-up is the MMC share as of 1978.IV. The S&L share is the non-demand deposit share of S&Ls as of 1978.III. Standard errors are Newey-West with eight lags.

	Inflation								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MMC share$_{1981.III}$	0.142***	0.138***		0.050	0.058		0.064	0.075	
	(0.049)	(0.048)		(0.058)	(0.058)		(0.060)	(0.060)	
Post × MMC share$_{1981.III}$	−0.218***	−0.165**	−0.254***	−0.215***	−0.185**	−0.255***	−0.269***	−0.239***	−0.299***
	(0.070)	(0.072)	(0.058)	(0.082)	(0.085)	(0.071)	(0.085)	(0.087)	(0.071)
Initial MMC Take-up$_{1978.IV}$				0.411**	0.366**				
				(0.159)	(0.163)				
Post × Initial MMC Take-up$_{1978.IV}$				−0.010	−0.019	0.001			
				(0.225)	(0.224)	(0.176)			
S&L share$_{1978.III}$							0.039**	0.032	
							(0.020)	(0.020)	
Post × S&L share$_{1978.III}$							0.025	0.027	0.023
							(0.028)	(0.028)	(0.022)
Employment growth		0.213**	−0.150		0.114	−0.150		0.136	−0.141
		(0.093)	(0.114)		(0.094)	(0.115)		(0.091)	(0.114)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	No	No	Yes	No	No	Yes	No	No	Yes
Obs.	200	200	200	200	200	200	200	200	200
R^2	0.537	0.561	0.741	0.593	0.599	0.741	0.598	0.607	0.744

Table 8: The S&L share and inflation

Results from panel regressions of inflation on the S&L share interacted with monetary policy during Regulation Q. Inflation and the Fed funds rate are taken over the following year for the 25 MSAs. The S&L share is based on the non-demand deposits of S&Ls and banks. Panel A is in levels, Panel B in first differences. All columns include time fixed effects; columns (1) and (2) also include MSA fixed effects, while columns (3) and (4) replace them with the one-year lag of inflation. Newey-West standard errors with eight lags to account for overlap in the data. The Regulation Q period is from 1966.I to 1978.III, when MMCs were introduced.

Panel A: Inflation

	Inflation			
	(1)	(2)	(3)	(4)
S&L share	0.036*	0.033	−0.019	−0.024*
	(0.021)	(0.022)	(0.012)	(0.012)
S&L share × Fed funds	0.452***	0.527***	0.408**	0.478***
	(0.171)	(0.168)	(0.173)	(0.174)
Employment growth		0.178***		0.145***
		(0.036)		(0.026)
Inflation, lag			0.195***	0.128**
			(0.056)	(0.058)
Time FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	No	No
Obs.	1,079	904	1,075	900
R^2	0.066	0.148	0.067	0.166

Panel B: Inflation, changes

	Δ Inflation			
	(1)	(2)	(3)	(4)
S&L share	0.043***	0.039*	0.006	0.005
	(0.016)	(0.022)	(0.004)	(0.004)
S&L share × Δ Fed funds	0.331**	0.453***	0.389**	0.575***
	(0.155)	(0.172)	(0.152)	(0.170)
Δ Employment growth		0.168***		0.190***
		(0.045)		(0.042)
Δ Inflation, lag			−0.464***	−0.453***
			(0.045)	(0.051)
Time FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	No	No
Obs.	1,075	800	1,075	800
R^2	0.025	0.066	0.199	0.233

Table 9: The deposit expense rate and inflation

Results from regressions of inflation on the instrumented deposit expense rate. The instrument is the interaction of the S&L share and the Fed funds rate. Inflation and the Fed funds rate are taken over the following year for the 25 BLS MSAs. The S&L share is based on the non-demand deposits of S&Ls and banks. All columns include time fixed effects; columns (1) and (2) also include MSA fixed effects, while columns (3) and (4) replace them with the lag of inflation. Newey-West standard errors with eight lags to account for overlap in the data. The sample covers the Regulation Q period from 1966.I to 1978.III.

Panel A: First stage

	Deposit expense rate			
	(1)	(2)	(3)	(4)
S&L share	0.019***	0.015***	0.020***	0.020***
	(0.005)	(0.004)	(0.004)	(0.003)
S&L share × Fed funds	−0.301***	−0.296***	−0.301***	−0.292***
	(0.045)	(0.034)	(0.058)	(0.046)
Employment growth		0.000		0.005
		(0.007)		(0.008)
Inflation, lag			−0.010	−0.020
			(0.019)	(0.016)
Obs.	1,079	904	1,075	900
R^2	0.890	0.879	0.850	0.902

Panel B: Second stage

	Inflation			
	(1)	(2)	(3)	(4)
S&L share	0.064***	0.060***	0.008**	0.010**
	(0.018)	(0.019)	(0.004)	(0.004)
$\widehat{\text{Deposit expense rate}}$	−1.503**	−1.779***	−1.357**	−1.637***
	(0.619)	(0.590)	(0.642)	(0.631)
Employment growth		0.179***		0.153***
		(0.038)		(0.028)
Inflation, lag			0.181***	0.094
			(0.063)	(0.064)
Time FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	No	No
Obs.	1,079	904	1,075	900
Weak IV F-stat	45	74	26	40
p-val	0.000	0.000	0.000	0.000

Table 10: The deposit expense rate and inflation, changes

Results from regressions of the change in inflation on the instrumented change in the deposit expense rate. The instrument is the interaction of the S&L share and the change in the Fed funds rate. Inflation and the Fed funds rate are taken over the following year for the 25 BLS MSAs. The S&L share is based on the non-demand deposits of S&Ls and banks. All columns include time fixed effects; columns (1) and (2) also include MSA fixed effects, while columns (3) and (4) replace them with the lag of inflation. Newey-West standard errors with eight lags to account for overlap in the data. The sample covers the Regulation Q period from 1966.I to 1978.III.

Panel A: First stage

	Δ Deposit expense rate			
	(1)	(2)	(3)	(4)
S&L share	−0.003	0.007	0.000	0.000
	(0.004)	(0.005)	(0.001)	(0.001)
S&L share × Δ Fed funds	−0.278***	−0.300***	−0.277***	−0.298***
	(0.038)	(0.035)	(0.038)	(0.035)
Δ Employment growth		0.005		0.005
		(0.009)		(0.009)
Δ Employment growth				
Δ Inflation, lag			−0.010	−0.006
			(0.012)	(0.011)
Obs.	1,000	800	1,000	800
R^2	0.413	0.436	0.738	0.818

Panel B: Second stage

	Δ Inflation			
	(1)	(2)	(3)	(4)
S&L share	0.038**	0.050**	0.007**	0.005
	(0.018)	(0.022)	(0.004)	(0.004)
Δ $\widehat{\text{Deposit expense}}$ rate	−1.351**	−1.509**	−1.537***	−1.929***
	(0.590)	(0.586)	(0.577)	(0.587)
Δ Employment growth		0.175***		0.199***
		(0.046)		(0.044)
Δ Inflation, lag			−0.465***	−0.465***
			(0.049)	(0.053)
Time FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	No	No
Obs.	1,000	800	1,000	800
Weak IV F-stat	53	74	52	73
p-val	0.003	0.000	0.000	0.000

Figure 1: Fed Funds Rate, Inflation, and Deposit Rates

The figure plots the Fed funds rate in blue, inflation in red, the interest rate ceiling on savings deposits in black, and the rates on Money Market Certificates (MMCs) and Small Saver Certificates (SSCs), also in black. For the ceiling rates on other types of deposits, see Table A.1. Vertical lines mark (i) 1965.I, when the savings deposit rate ceiling first became binding; (ii) 1978.III, the introduction of MMCs; (iii) 1979.III, the introduction of SSCs; and (iv) 1980.IV, the start of Volcker's sustained rate hike.

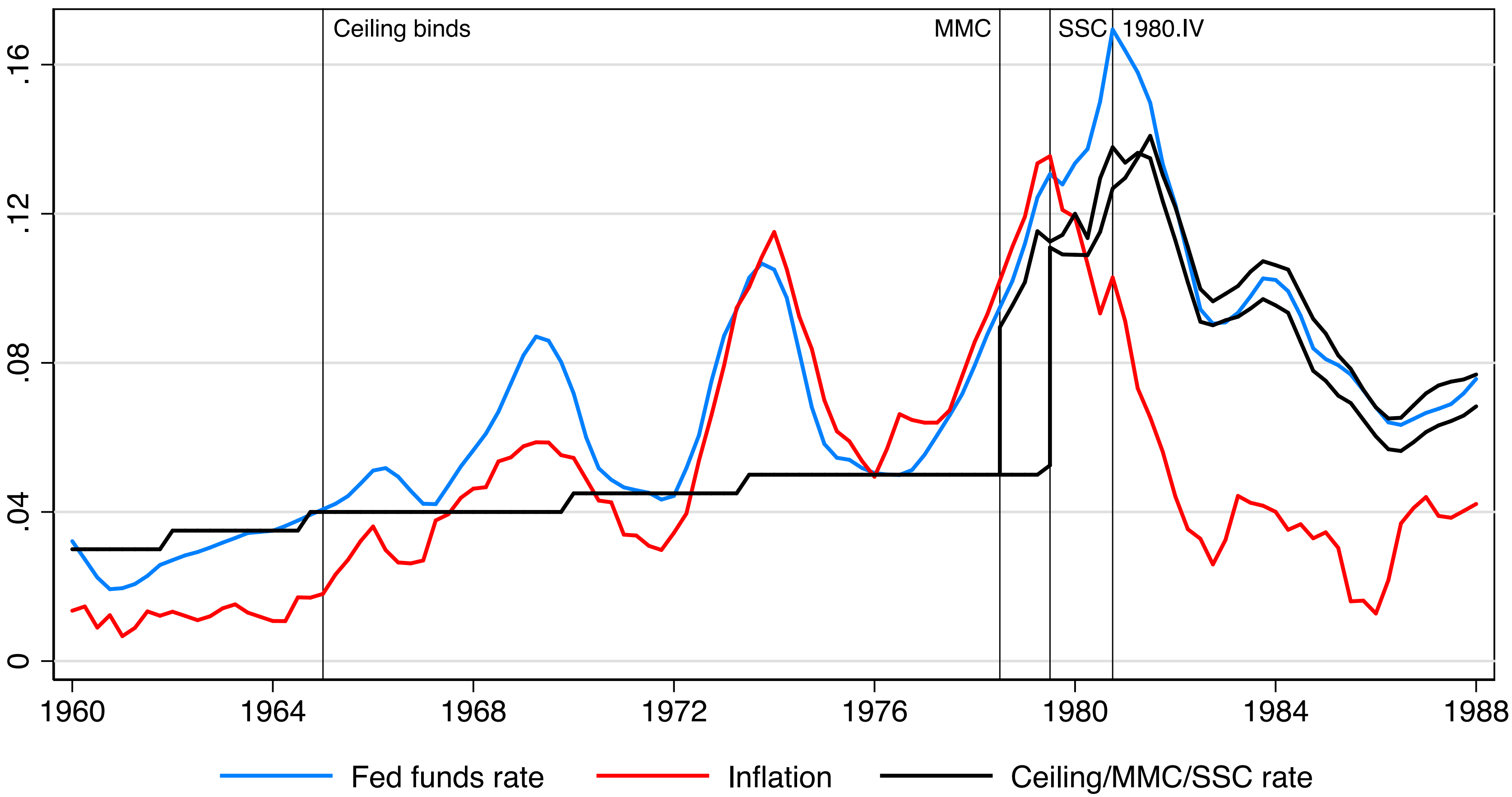


Figure 2: Regulation Q Repeal, Interest Rates and Inflation

The figure plots the quarterly annualized Fed funds rate (blue), the quarterly annualized inflation rate (red), the 10-year constant-maturity Treasury yield (yellow), and the fraction of households deposits held in deregulated accounts (black) from 1976 to 1986. Vertical lines mark (i) 1978.III, the introduction of MMCs; (ii) 1979.III, the introduction of SSCs; and (iii) 1980.IV, the start of Volcker's sustained rate hike.

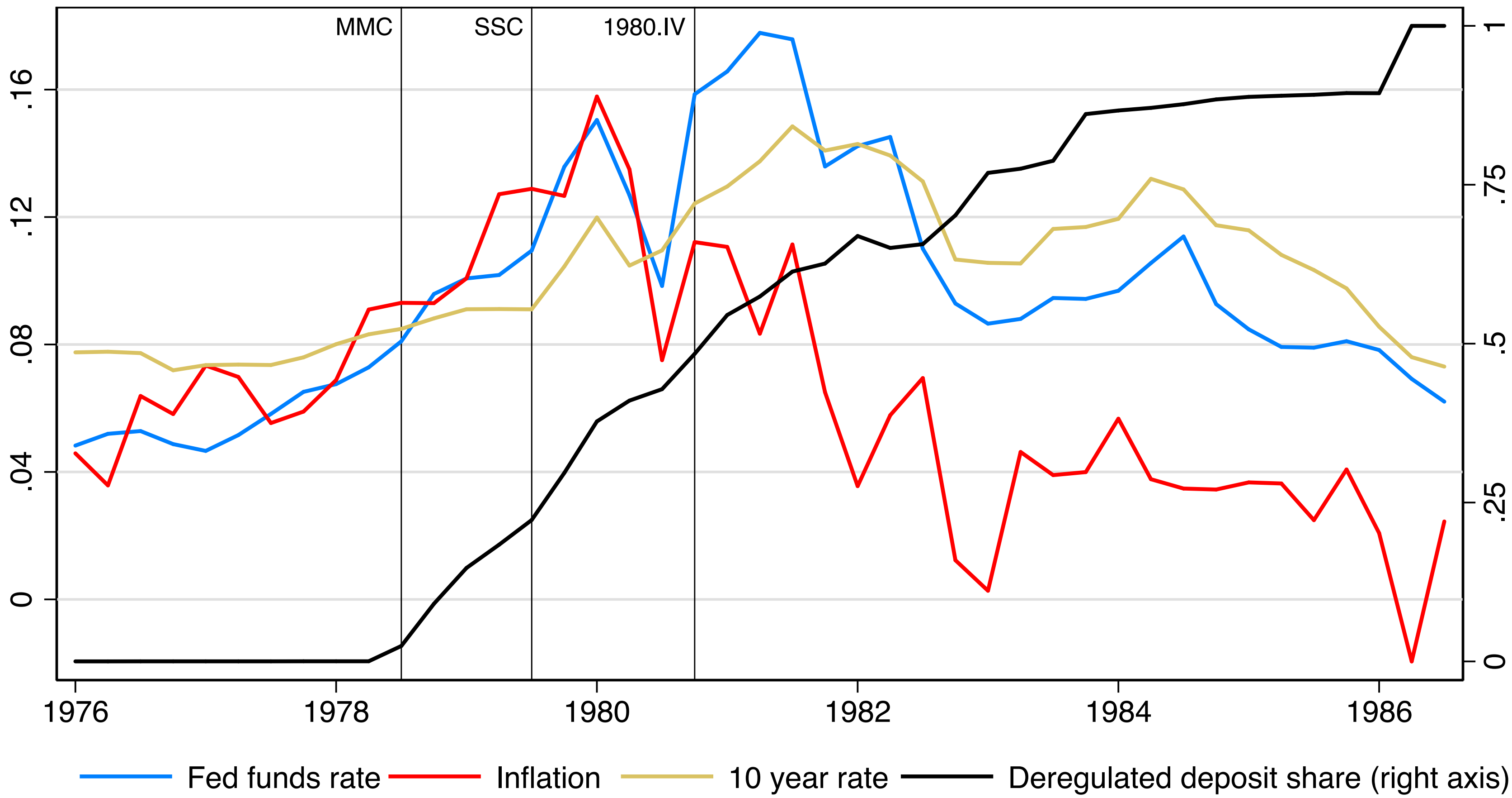


Figure 3: The Real Average Deposit Rate and the Real Fed Funds Rate

The figure plots the Fed funds rate (blue), inflation (red), the real fed funds rate (yellow), and the real average rate on non-demand deposits (black). The real average rate on non-demand deposits is calculated by taking the ratio of interest expense over non-demand deposits and subtracting inflation. Vertical lines mark (i) 1965.I, when the savings deposit rate ceiling first became binding; (ii) 1978.III, the introduction of MMCs; (iii) 1979.III, the introduction of SSCs; and (iv) 1980.IV, the start of Volcker's sustained rate hike.

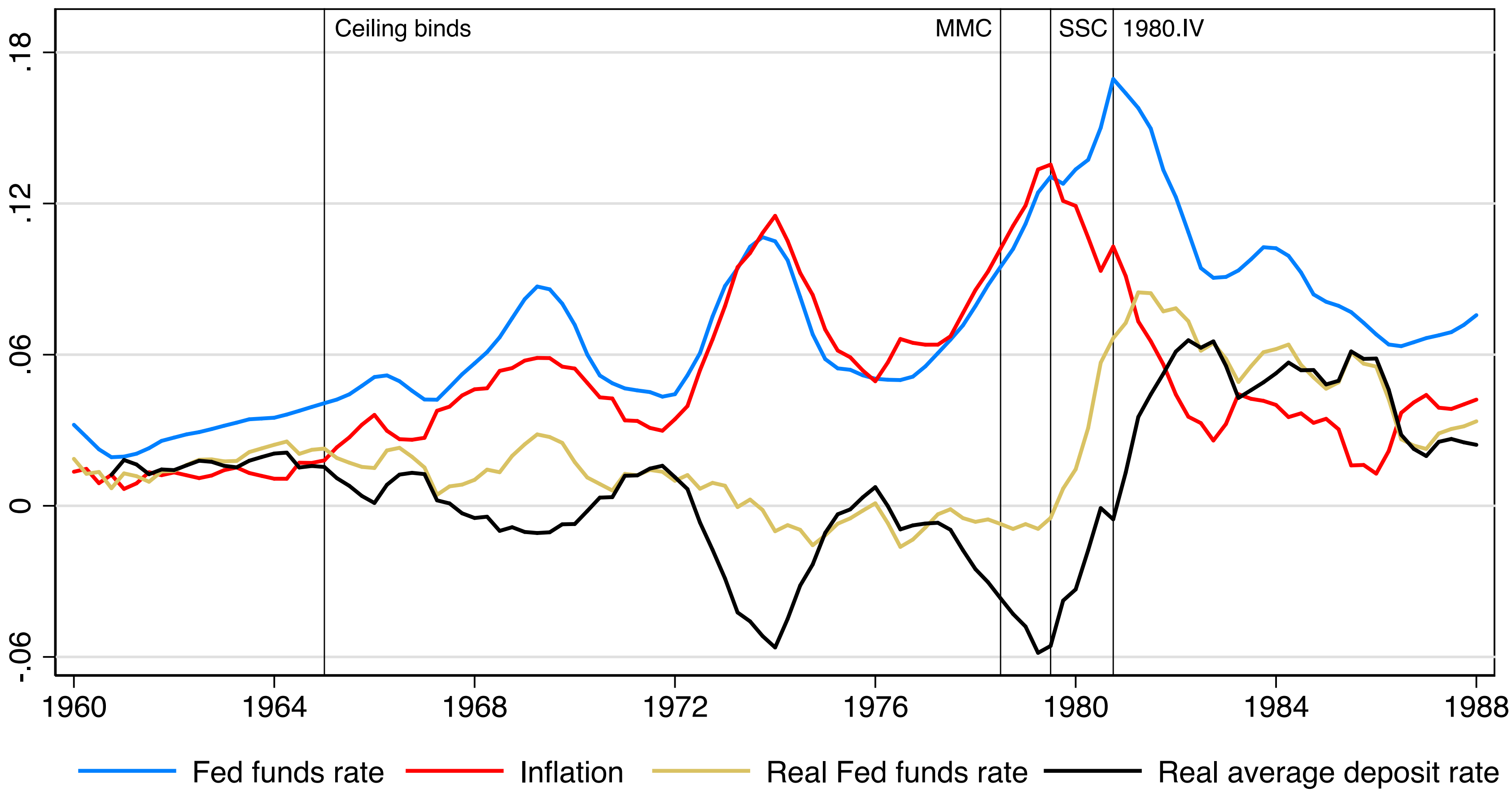


Figure 4: The Real Deposit Payoff over Consumption

The figure plots the Fed funds rate (blue), inflation (red), and the real payoff on non-demand deposits normalized by personal consumption expenditure (black). The real payoff on non-demand deposits is the real average deposit rate multiplied by non-demand deposits and divided by personal consumption expenditure. Vertical lines mark (i) 1965.I, when the savings deposit rate ceiling first became binding; (ii) 1978.III, the introduction of MMCs; (iii) 1979.III, the introduction of SSCs; and (iv) 1980.IV, the start of Volcker's sustained rate hike.

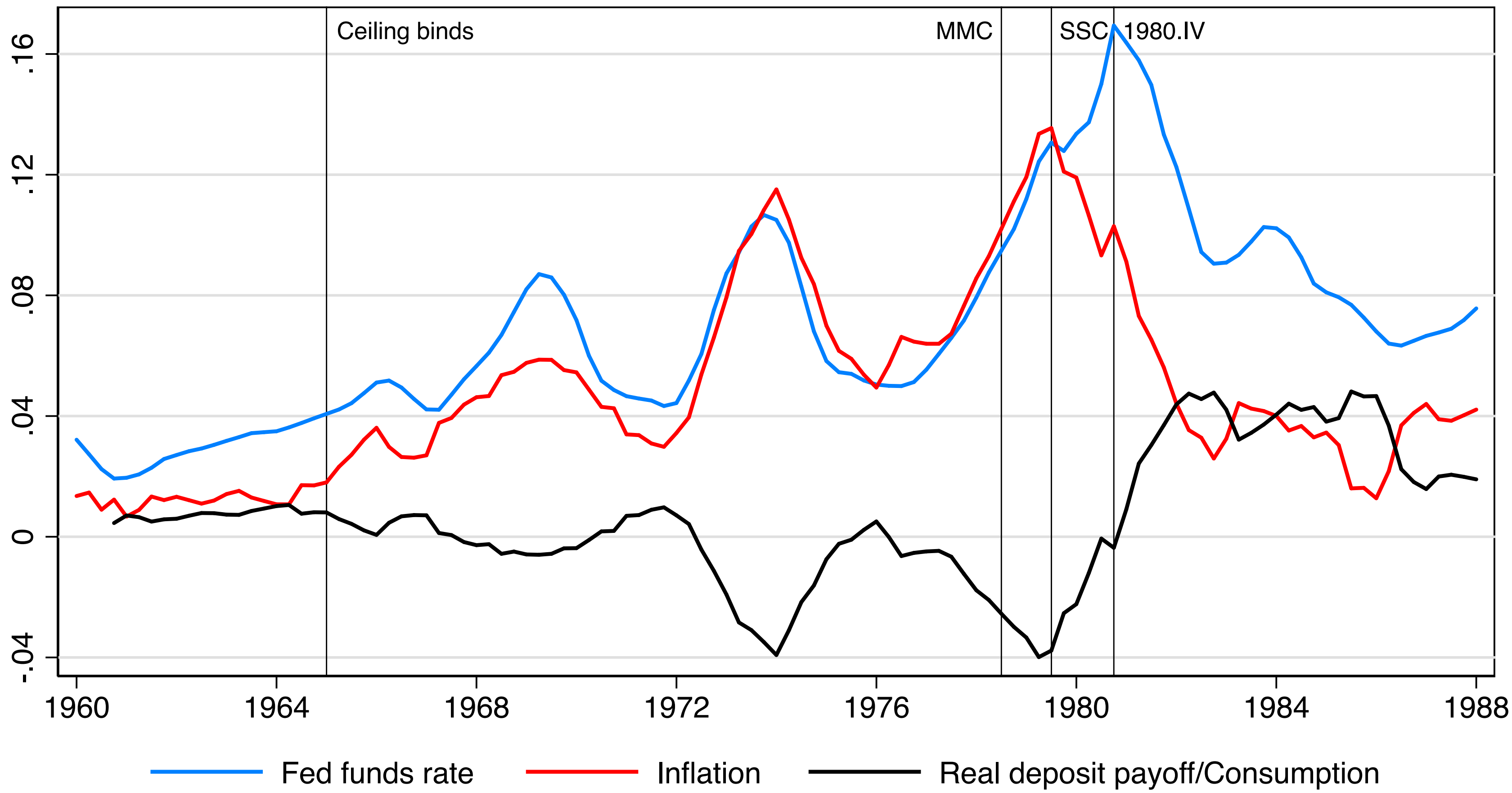
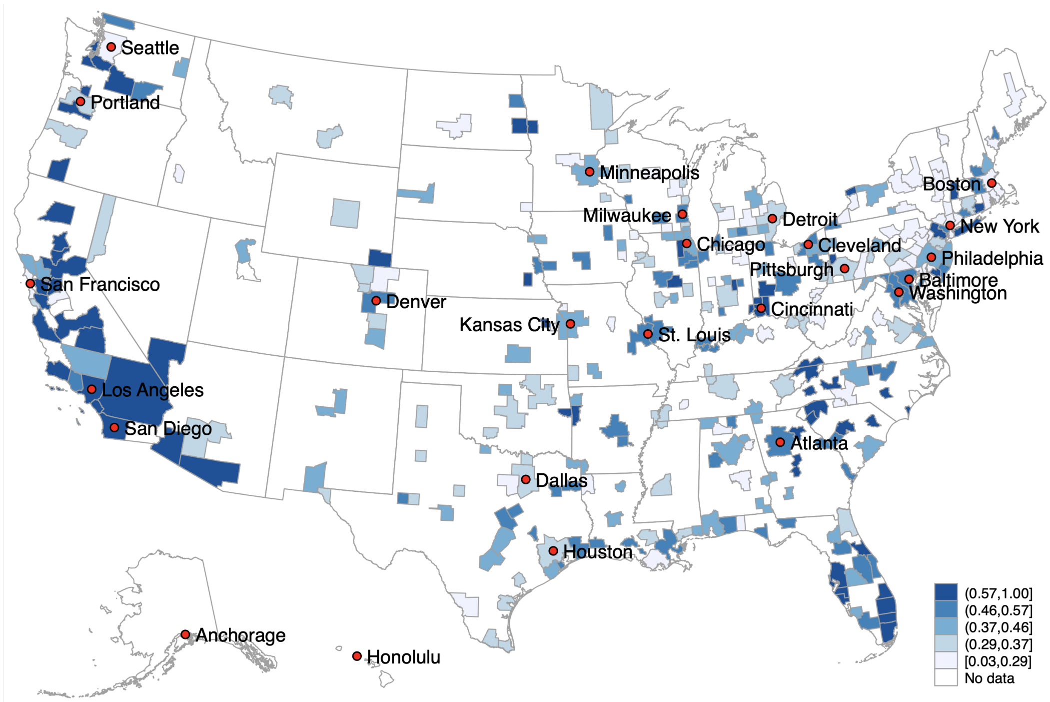


Figure 5: The S&L share and MMC share

The figure shows maps of the S&L share and MMC share by MSA. The S&L (MMC) share is S&L (MMC) deposits divided by total non-demand deposits. The S&L share is averaged over 1966.I–86.I and the MMC share is as of 1981.III. The 25 BLS MSAs are shown in black.

Panel A: S&L share



Panel B: MMC share

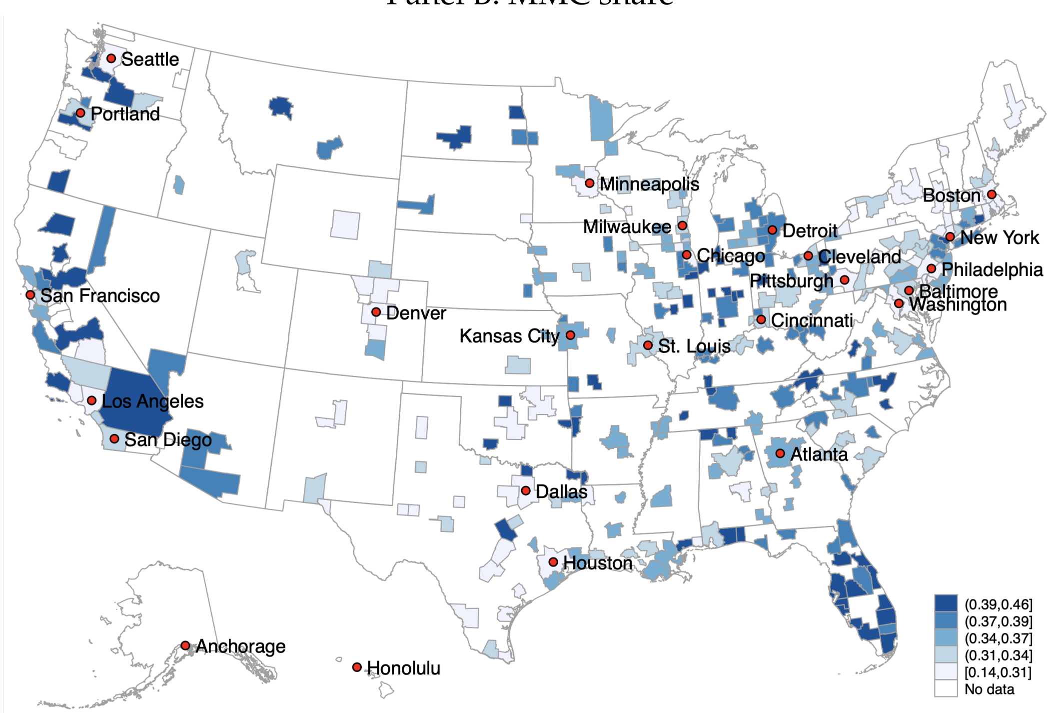
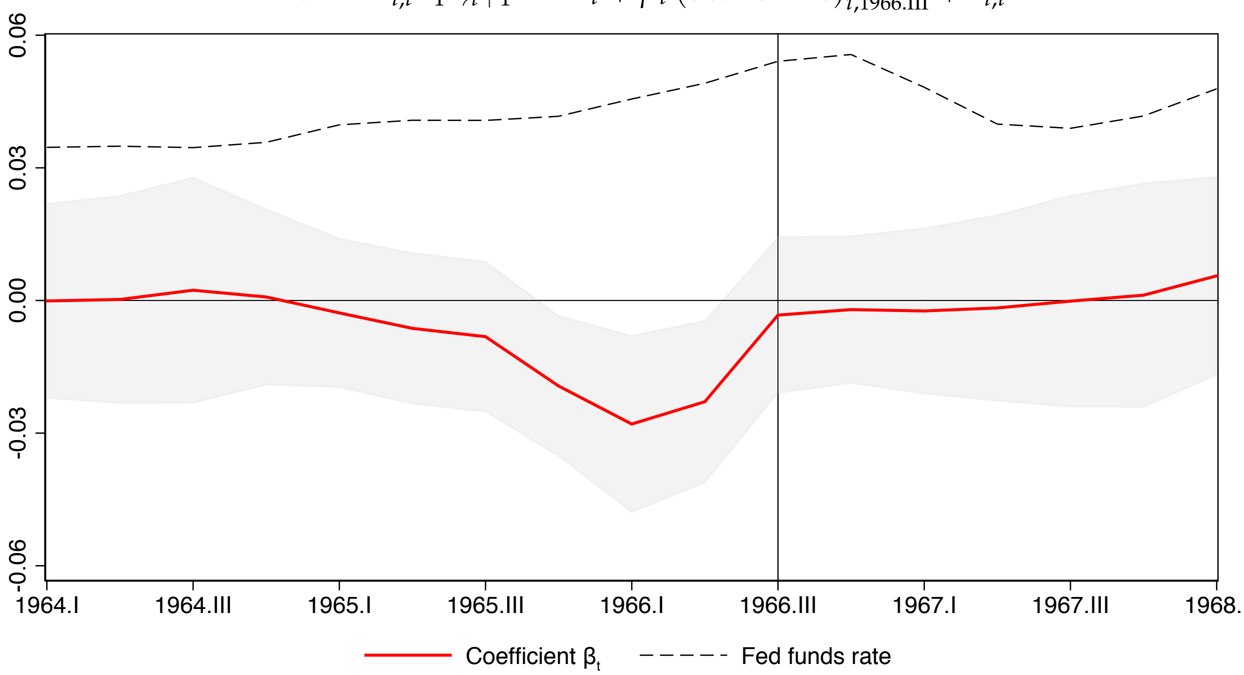


Figure 6: S&L share and inflation: 1966

Panel A plots the coefficients from quarterly cross-sectional regressions of the two-year inflation rate on the S&L share of non-demand deposits in MSA i. The S&L share is taken as of 1966.III. The two-year inflation rate at t is calculated from $t-1$ to $t+1$ for the 25 BLS MSAs. Dashed line shows the Fed funds rate. Gray shading indicates the 90% confidence interval. Vertical line marks 1966.III when S&Ls became regulated under Regulation Q. Panel B shows a scatter plot for 1966.I.

Panel A: $\pi_{i,t-1\to t+1} \; = \; \alpha_t + \beta_t \, (\text{S\&L share})_{i,1966.\text{III}} + \epsilon_{i,t}$



Panel B: Scatter plot, 1966.I

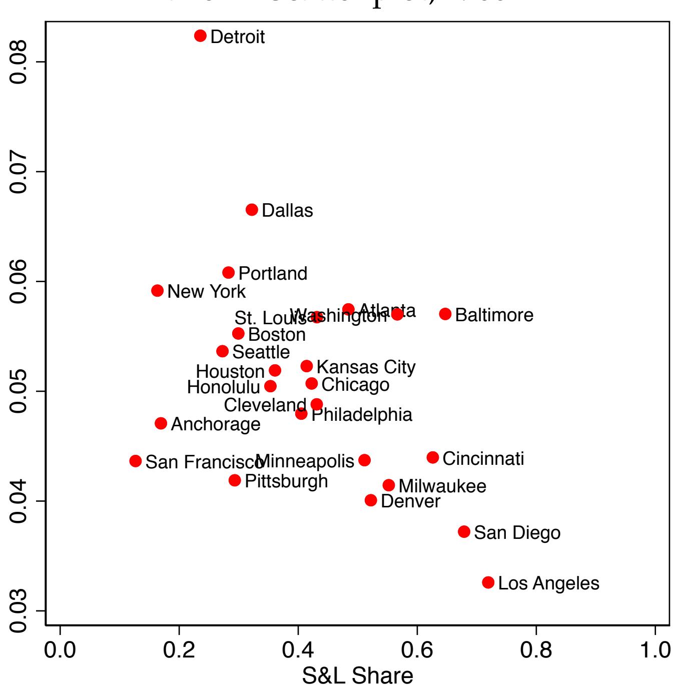


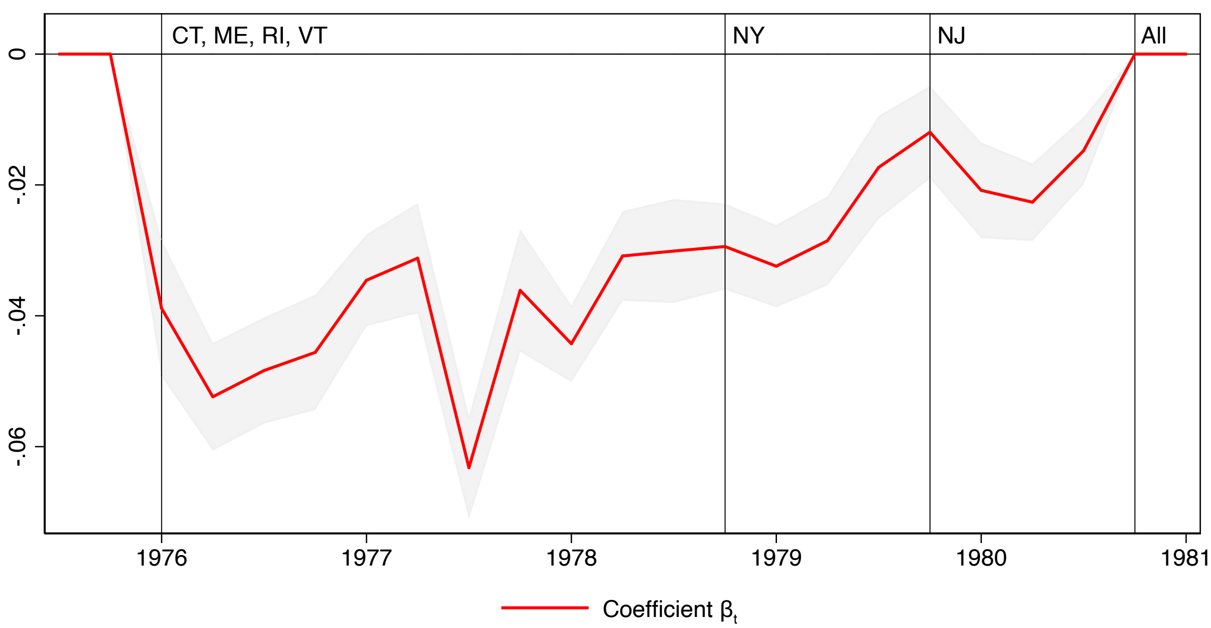
Figure 7: NOW Account experiment in New England

Quarterly coefficients β_t from panel regressions of wage growth on an indicator for the deregulation of NOW Accounts in New England, New York, and New Jersey:

$$\text{Wage growth}_{i,t-1\to t+1} = \alpha_t + \gamma_i + \beta_t \text{Deregulated}_{i,t} + \epsilon_{i,t}$$

Wage growth is calculated over two years, from $t-1$ to $t+1$. Deregulation occurred in 1974.I in MA and NH; 1976.I in CT, ME, RI, and VT; 1978.IV in NY; 1979.IV in NJ; and 1980.IV in the rest of the U.S. Panel A uses total wages from the QCEW, which starts in 1976.I. Panel B uses manufacturing wages from the CES. Gray shading indicates the 90% confidence interval.

Panel A: Wage growth



Panel B: Manufacturing wage growth

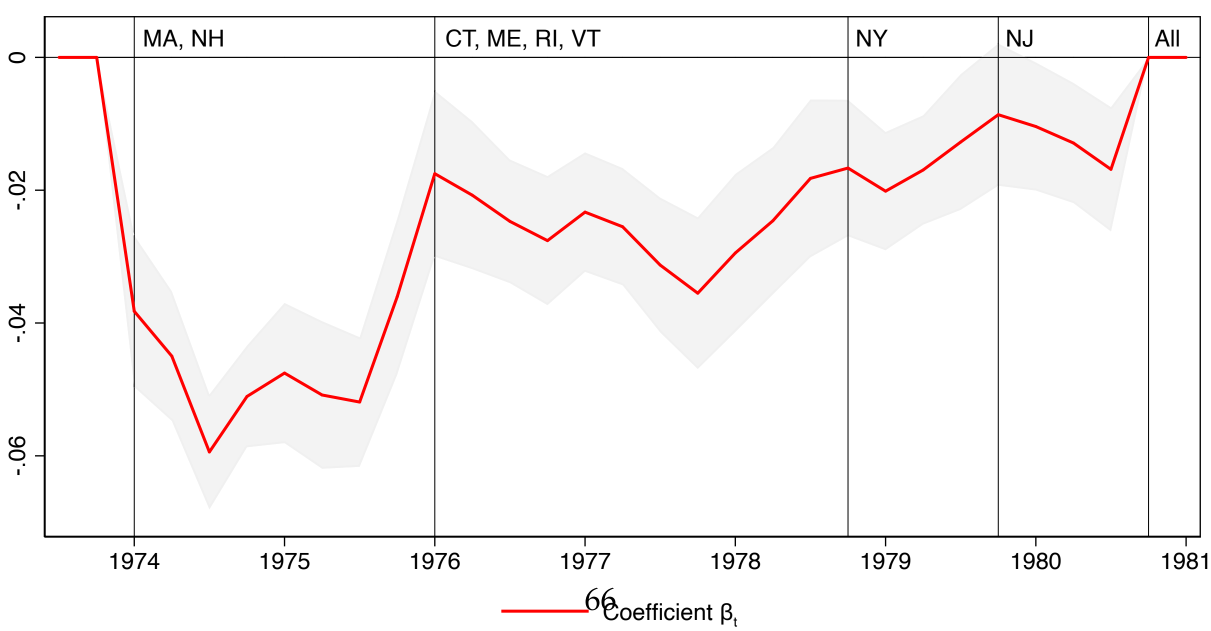


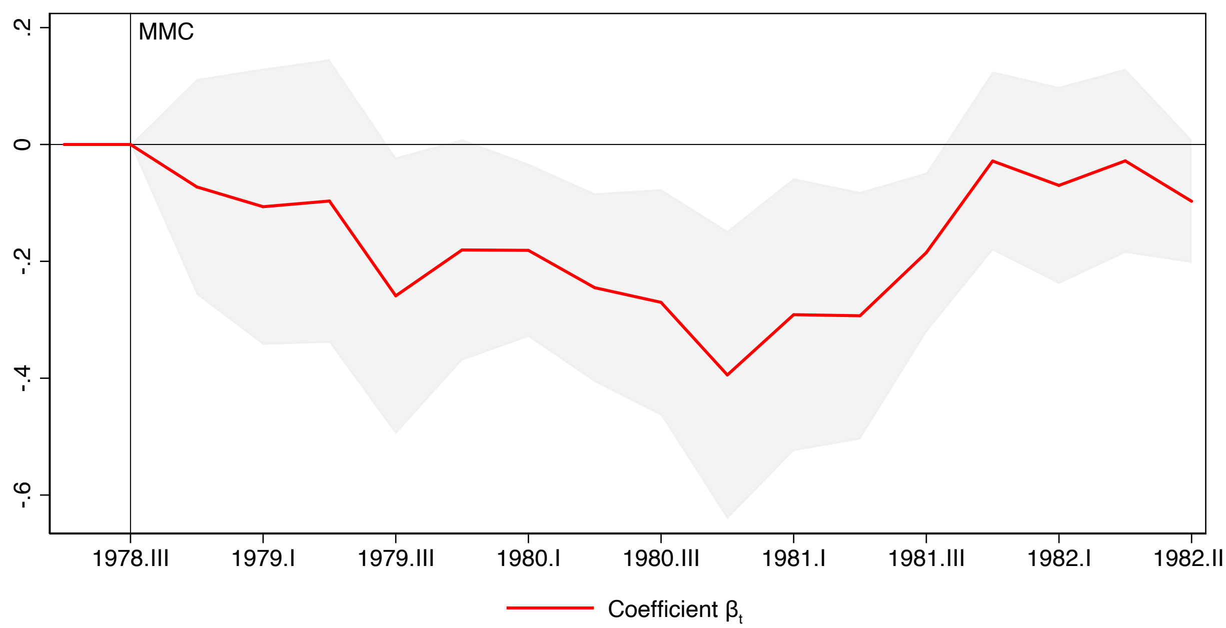
Figure 8: Deregulation of Small Time Deposits

Panel A plots the coefficients from quarterly cross-sectional regressions of the cumulative change in inflation since 1978.III on the MMC share of non-demand deposits in each MSA from 1978.III to 1982.III.

$$\Delta\pi_{i,1978.\text{III}\to t+1} = \alpha_t + \beta_t \text{MMC share}_{i,t} + \epsilon_{i,t+1}$$

Gray shading indicates 90% confidence intervals. Vertical line marks 1978.III, when MMCs were introduced. Panel B shows a scatter plot for 1980.IV.

Panel A: Coefficients β_t



Panel B: Scatter plot, 1980.IV

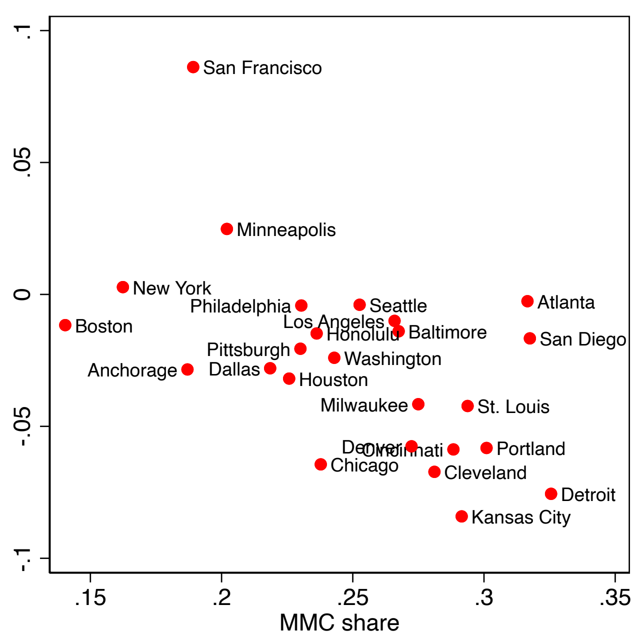


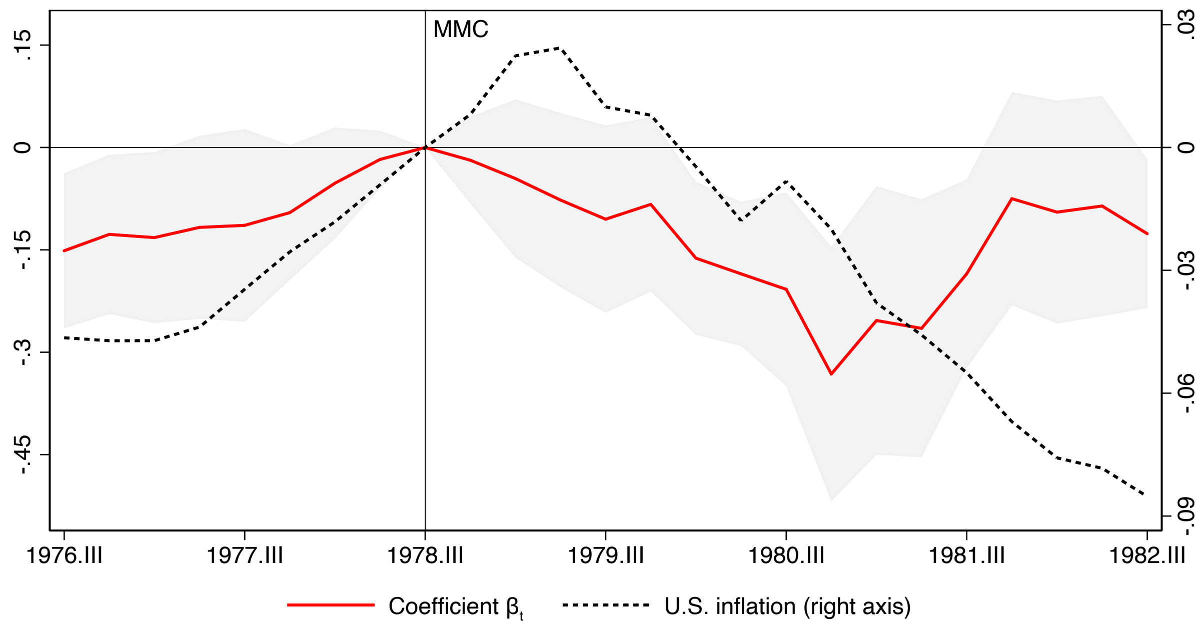
Figure 9: Deregulation of Small Time Deposits: Fixed MMC share

Panel A plots the coefficients from quarterly cross-sectional regressions of the cumulative change in inflation since 1978.III on the MMC share of non-demand deposits in each MSA as of 1981.III.

$$\Delta\pi_{i,1978.\text{III}\rightarrow t+1} \;=\; \alpha_t + \beta_t \text{MMC share}_{i,1981.\text{III}} + \epsilon_{i,t+1}$$

Dashed line shows the cumulative change in aggregate U.S. inflation. Panel B replaces inflation with nominal wage growth and weights by population. Gray shading indicates 90% confidence intervals. Vertical line marks 1978.III, when MMCs were introduced.

Panel A: Inflation



Panel B: Wage growth

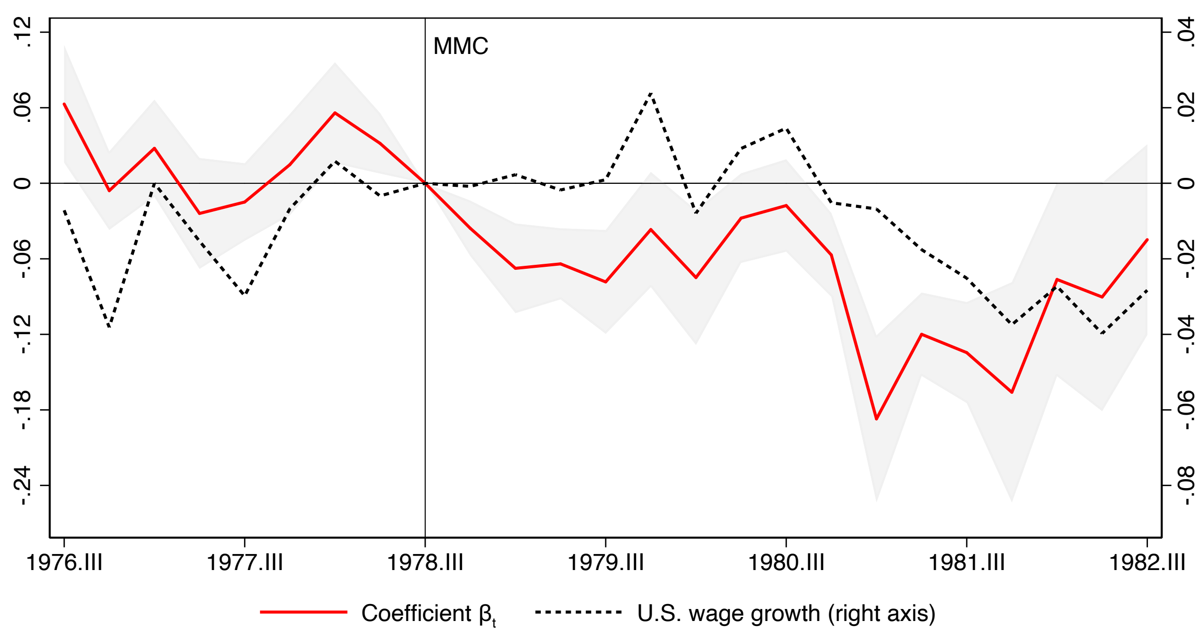


Figure 10: Deposit rate passthrough for banks and S&Ls

The figure plots the interest expense rate on non-demand deposits (interest expense divided by non-demand deposits) for commercial banks (red) and S&Ls (blue). Also shown is the Fed funds rate (black). The interest expense rate is shown with a two-quarter lead because it is backward-looking. Vertical line marks 1978.III, when MMCs were introduced. The sample is from 1968.I to 1986.I.

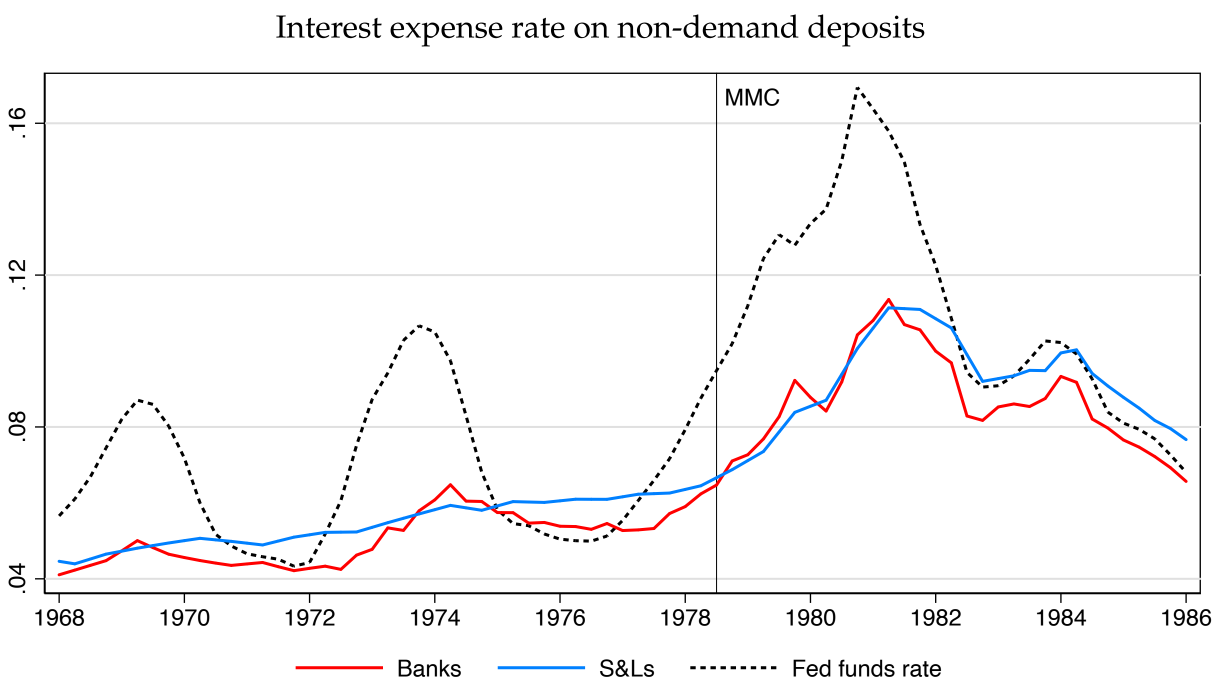
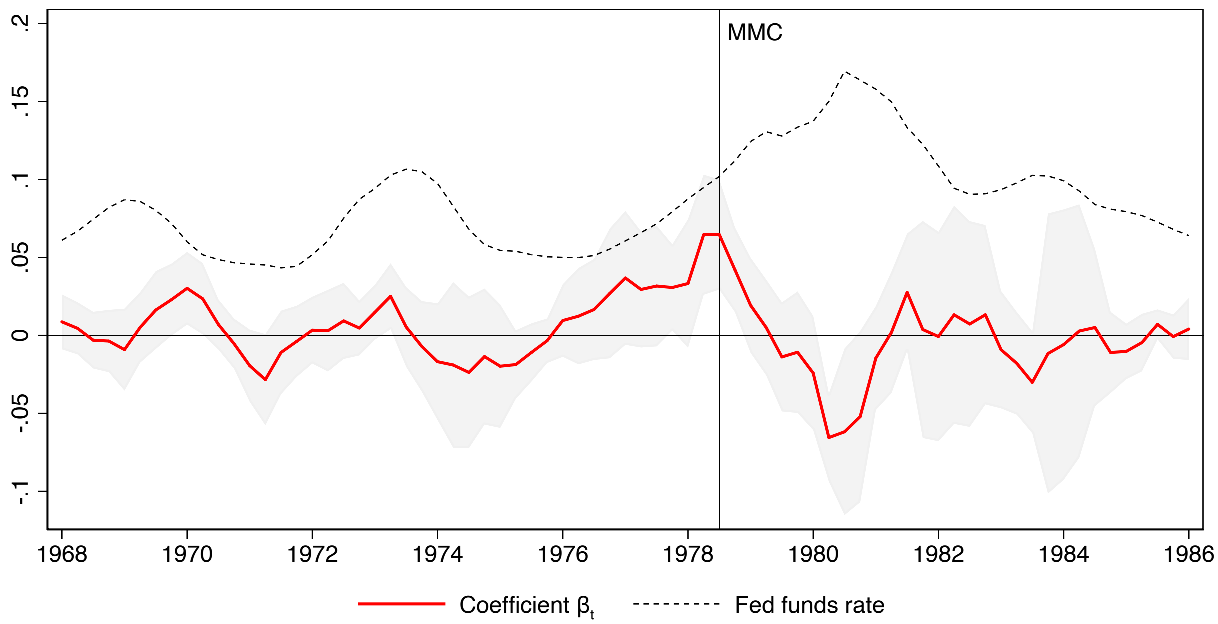


Figure 11: The S&L share and inflation

Panel A plots the coefficients from quarterly cross-sectional regressions of the two-year change in annual inflation on the S&L share of non-demand deposits in MSA i. Inflation is measured over the following year. Also shown is the Fed funds rate, calculated in the same way. Gray shading indicates the 90% confidence interval. Panel B shows a scatter plot for 1978.II. Inflation is measured using the BLS data, which covers 25 MSAs. Vertical line marks 1978.III when MMCs were introduced. The sample is from 1968.I to 1986.I.

Panel A: $\Delta\pi_{i,t-1\to t+1} = \alpha_t + \beta_t \left(\text{S\&L share}\right)_{i,t} + \epsilon_{i,t+1}$



Panel B: Scatter plot, 1978.II

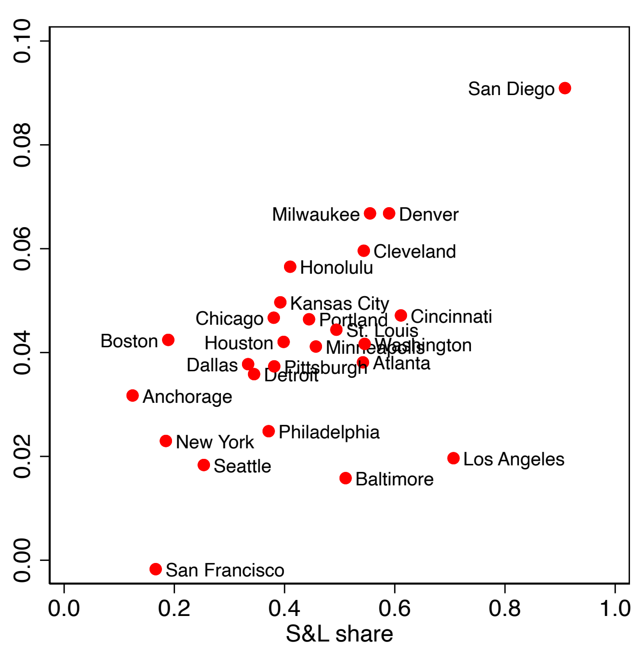


Table A.1: Regulation Q timeline

This table shows a simplified timeline of changes to Regulation Q. The ceiling rates shown are for banks, those for S&Ls were typically between 0.25% and 0.5% higher. For more details, see Ruebling et al. (1970); Gilbert (1986); Santomero and Siegel (1986), and the Federal Reserve Board Bulletin, 1975–1986.

Date	Regulation Q change	Bank rate ceilings
1933.II	Regulation Q imposed on commercial banks under the Banking Acts of 1933 and 1935.	Savings: 3% Small time: 3% Large time: 3%
1966.III	Regulation Q imposed on S&Ls under the 1966 Interest Rate Act. Rate ceilings raised.	Savings: 4% Small time: 5% Large time: 5.5%
1970.I	Rate ceilings raised.	Savings: 4.5% Small time: 5–5.75% Large time: 6.25–7.75%
1970.II	Rate ceilings removed on 30–90 day large time CDs (denominations of $100,000 or more).	
1973.II	Rate ceilings removed on all large time CDs.	
1973.III	Wild Card Experiment: rate ceiling removed on CDs with maturity of 4 years or more and denominations of $1,000 or more. Ceiling reimposed 4 months later. Regular rate ceilings raised.	Savings: 5% Small time: 5–6.5%
1974.I	NOW experiment in New England: NOW accounts authorized in MA and NH in 1974.I and in the rest of New England in 1976.I. Rate set to 5%.	
1978.III	MMC accounts authorized: Money Market Certificates with maturity of 6 months and denominations of $10,000 or more. Ceiling tied to T-Bill rates. First deregulation of small time deposits	
1979.III	SSC accounts authorized: Small Saver Certificates with maturity of 30 months and any denominations. Ceiling tied to T-Bill rates. Regular rate ceilings raised.	Savings: 5.25% Small time: 5.25–7.75%
1980.IV	Depository Institutions Deregulation Act: Set timeline for orderly repeal of Regulation Q. NOW accounts authorized in all states, rate set to 5.25%.	
1982.IV	MMDA accounts authorized: Money Market Deposit Accounts with minimum denominations of $2,500. No rate ceiling. First deregulation of non-transaction savings accounts.	
1983.I	Super NOW: rate ceiling removed on NOW accounts with denominations of $2,500 or more.	
1983.IV	Rate ceilings removed on all time deposits with maturity of 31 days or more or denominations of $2,500 or more. Regular rate ceilings raised.	Savings: 5.5% Small time: 5.5%
1986.II	Rate ceilings removed on all NOW accounts, savings and small time deposits. Interest on demand deposits remains prohibited.	
2011.III	End of Regulation Q: interest on demand deposits permitted under Dodd-Frank.	

Table A.2: Deregulation of Small Time Deposits: Wage Growth (unweighted)

Panel regressions of wage growth on the MMC share of non-demand deposits from 1978.III to 1981.III. Wage growth is measured over the following year, subtracting its value in 1978.III. Pre-period wage growth is over 1976.III–1978.III. Panel A is based on ordinary least squares. Panel B instruments the MMC share with the share of small time deposits as of 1975.III. Standard errors are clustered by MSA.

Panel A: Wage growth (unweighted)

	Wage growth (1978.III = 0)			
	(1)	(2)	(3)	(4)
MMC share	−0.052***	−0.052***	−0.029***	−0.027**
	(0.020)	(0.019)	(0.010)	(0.011)
Wage growth, pre-period		−0.023		
		(0.054)		
Employment growth				0.178***
				(0.058)
Time FE	Yes	Yes	Yes	Yes
MSA FE	No	No	Yes	Yes
Obs.	3,615	3,555	3,615	3,615
R^2	0.224	0.225	0.594	0.638

Panel B: Wage growth, IV (unweighted)

	Wage growth (1978.III = 0)			
	(1)	(2)	(3)	(4)
$\widehat{\text{MMC share}}$	−0.165**	−0.175**	−0.159**	−0.171**
	(0.065)	(0.068)	(0.064)	(0.069)
Wage growth, pre-period		−0.013		−0.014
		(0.056)		(0.051)
Employment growth			0.191***	0.198***
			(0.060)	(0.061)
Time FE	Yes	Yes	Yes	Yes
Obs.	3,615	3,555	3,615	3,555
Weak IV F-stat	71	60	72	63
p-val	0.000	0.000	0.000	0.000

Table A.3: Deregulation of Small Time Deposits: Diff-in-Diff, changes

Panel regressions of the change in inflation on the MMC share of non-demand deposits pre and post MMC introduction. The pre period is from 1975.III to 1978.III and the post period is from 1978.IV to 1981.III. The change in inflation and employment growth are measured over the following year minus over the current year. The MMC Share is measured in 1981.III. The Initial MMC Take-up is the MMC share as of 1978.IV. The S&L share is the non-demand deposit share of S&Ls as of 1978.III. Standard errors are Newey-West with eight lags.

	Δ Inflation								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MMC share$_{1981.III}$	0.072***	0.076***		0.052	0.058*		0.050	0.052	
	(0.026)	(0.027)		(0.033)	(0.034)		(0.035)	(0.035)	
Post × MMC share$_{1981.III}$	−0.144***	−0.156***	−0.157***	−0.124**	−0.137***	−0.139***	−0.140***	−0.149***	−0.149***
	(0.038)	(0.040)	(0.039)	(0.048)	(0.050)	(0.049)	(0.051)	(0.051)	(0.051)
Initial MMC Take-up$_{1978.IV}$				0.088	0.081				
				(0.092)	(0.092)				
Post × Initial MMC Take-up$_{1978.IV}$				−0.092	−0.082	−0.080			
				(0.133)	(0.133)	(0.131)			
S&L share$_{1978.III}$							0.011	0.012	
							(0.011)	(0.011)	
Post × S&L share$_{1978.III}$							−0.002	−0.004	−0.004
							(0.017)	(0.017)	(0.016)
Δ Employment growth		−0.086	−0.097		−0.081	−0.094		−0.091	−0.099
		(0.076)	(0.078)		(0.076)	(0.078)		(0.076)	(0.078)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	No	No	Yes	No	No	Yes	No	No	Yes
Obs.	600	600	600	600	600	600	600	600	600
R^2	0.642	0.644	0.653	0.643	0.645	0.654	0.644	0.646	0.654

Table A.4: Deregulation of Small Time Deposits: Diff-in-Diff, changes, wage growth

Panel regressions of the change in wage growth on the MMC share of non-demand deposits pre and post MMC introduction. The pre period is from 1975.III to 1978.III and the post period is from 1978.IV to 1981.III. The change in wage growth and employment growth are measured over the following year minus over the current year. The MMC Share is measured in 1981.III. The Initial MMC Take-up is the MMC share as of 1978.IV. The S&L share is the non-demand deposit share of S&Ls as of 1978.III. The regression is weighted by population. Standard errors are clustered at the MSA level.

	Δ Wage growth								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MMC share$_{1981.III}$	0.002	0.002		−0.019**	−0.019*		−0.013	−0.013	
	(0.007)	(0.007)		(0.009)	(0.009)		(0.009)	(0.009)	
Post × MMC share$_{1981.III}$	−0.051***	−0.051***	−0.053***	−0.045***	−0.044***	−0.046***	−0.051***	−0.051***	−0.052***
	(0.008)	(0.008)	(0.008)	(0.011)	(0.011)	(0.011)	(0.009)	(0.009)	(0.009)
Initial MMC Take-up$_{1978.IV}$				0.100***	0.099***				
				(0.029)	(0.029)				
Post × Initial MMC Take-up$_{1978.IV}$				−0.032	−0.030	−0.034			
				(0.036)	(0.037)	(0.037)			
S&L share$_{1978.III}$							0.010***	0.010**	
							(0.004)	(0.004)	
Post × S&L share$_{1978.III}$							−0.000	−0.000	−0.000
							(0.005)	(0.005)	(0.005)
Δ Employment growth		0.027	−0.011		0.017	−0.023		0.018	−0.021
		(0.039)	(0.042)		(0.039)	(0.042)		(0.039)	(0.042)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	No	No	Yes	No	No	Yes	No	No	Yes
Obs.	6,842	6,842	6,842	6,819	6,819	6,819	6,819	6,819	6,819
R^2	0.328	0.328	0.351	0.333	0.333	0.354	0.333	0.333	0.354

Table A.5: Deregulation of Small Time Deposits: Diff-in-diff, wage growth

Panel regressions of inflation on the MMC share of non-demand deposits pre and post MMC introduction. The pre period is the four quarters ending in 1978.III and the post period is the four quarters ending in 1981.III. Wage growth and employment growth are measured over the following year. The MMC Share is measured in 1981.III. The Initial MMC Take-up is the MMC share as of 1978.IV. The S&L share is the non-demand deposit share of S&Ls as of 1978.III. The regression is weighted by population. Standard errors are clustered at the MSA level.

	Wage growth								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MMC share$_{1981.III}$	0.029**	0.014*		0.026*	0.039***		0.036**	0.036***	
	(0.014)	(0.009)		(0.015)	(0.011)		(0.014)	(0.010)	
Post × MMC share$_{1981.III}$	−0.149***	−0.119***	−0.114***	−0.191***	−0.170***	−0.164***	−0.193***	−0.167***	−0.161***
	(0.019)	(0.019)	(0.020)	(0.023)	(0.022)	(0.023)	(0.022)	(0.021)	(0.022)
Initial MMC Take-up$_{1978.IV}$				0.015	−0.124***				
				(0.031)	(0.032)				
Post × Initial MMC Take-up$_{1978.IV}$				0.205***	0.250***	0.262***			
				(0.049)	(0.049)	(0.051)			
S&L share$_{1978.III}$							−0.005	−0.015***	
							(0.004)	(0.004)	
Post × S&L share$_{1978.III}$							0.030***	0.033***	0.034***
							(0.007)	(0.007)	(0.007)
Employment growth		0.290***	0.324***		0.297***	0.362***		0.291***	0.345***
		(0.028)	(0.071)		(0.031)	(0.063)		(0.028)	(0.060)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	No	No	Yes	No	No	Yes	No	No	Yes
Obs.	2,399	2,399	2,399	2,391	2,391	2,391	2,391	2,391	2,391
R^2	0.247	0.342	0.480	0.275	0.359	0.498	0.271	0.362	0.501

Figure A.1: Interest Income Rate for banks and S&Ls

The figure plots the interest income rate (interest income divided by assets) for commercial banks (red) and S&Ls (blue). Also shown is the Fed funds rate (black). The interest income rate is shown with a two-quarter lead because it is backward-looking. Vertical line marks 1978.III, when MMCs were introduced. The sample is from 1968.I to 1986.I.