



Is the change in third-party debt collectors' law affecting the riskiness of single-family mortgages?

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ABSTRACT

Title: Is the change in third-party debt collectors' law affecting the riskiness of single-family mortgages?

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This paper performs an event study on the states in the United States of America with the most significant increase or decrease in third-party debt collector laws between 2000 and 2016 and observes whether this affects the riskiness related to single-family mortgages. This study utilizes a large panel data set of single-family mortgage loans from Fannie Mae. It employs a difference-in-difference strategy to examine the effect of change in debt collection legislation across five states and estimates the year-by-year effects. The analysis compares one law change from each of the states, Idaho, Colorado, North Dakota, Tennessee, and Connecticut. And further, compare data using the adjacent states which did not experience a law change in the two years prior and the two years after the legal changes as control variables. The findings of the study provide suggestive evidence of the effect of a legal change on the riskiness of mortgages. Still, no clear difference was observed between laws being loosened or tightened.

Keywords: Mortgage loans, third-party debt collector agencies, debt collector legislation, debt collection, risk.

ABSTRATO

Título: Está a alteração da lei dos cobradores de dívidas de terceiros a afetar o risco de hipotecas unifamiliares?

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Este artigo realiza um estudo de evento sobre os estados nos Estados Unidos da América com o aumento ou diminuição mais significativo nas leis de cobrança de dívidas de terceiros entre 2000 e 2016 e observa se isso afeta o risco relacionado com hipotecas unifamiliares. Este estudo utiliza um grande conjunto de dados de painel de empréstimos hipotecários unifamiliares da Fannie Mae. Ele emprega uma estratégia de differences-in-differences para examinar o efeito da mudança na legislação de cobrança de dívidas em cinco estados e estima os efeitos ano a ano. A análise compara uma mudança na lei de cada um dos estados, Idaho, Colorado, Dakota do Norte, Tennessee e Connecticut. Além disso, compara os dados usando estados adjacentes que não experimentaram uma mudança na lei nos dois anos anteriores e nos dois anos seguintes às mudanças legais como grupo de controlo. Os resultados do estudo fornecem evidências sugestivas do efeito de uma mudança legal na aversão ao risco de hipotecas, mas não foi observada nenhuma diferença clara entre leis sendo flexibilizadas ou restringidas.

Palavras-chave: Hipotecas, agências de cobrança de dívidas de terceiros, legislação sobre cobrança de dívidas, cobrança de dívidas, risco.

LIST OF ABBREVIATIONS

AL	Alabama
AR	Arkansas
AZ	Arizona
CO	Colorado
CT	Connecticut
GA	Georgia
ID	Idaho
KS	Kansas
KY	Kentucky
MA	Massachusetts
MN	Minnesota
MO	Missouri
MS	Mississippi
MT	Montana
NC	North Carolina
ND	North Dakota
NE	Nebraska
NM	New Mexico
NV	Nevada
NY	New York
OK	Oklahoma
OR	Oregon
RI	Rhode Island
SD	South Dakota
TN	Tennessee
UT	Utah
VA	Virginia
WA	Washington
WY	Wyoming

Table of Contents

1. INTRODUCTION	1
2. LITERATURE REVIEW.....	3
3. BACKGROUND & DATA	5
3.1 DEBT COLLECTION REGULATION.....	5
3.1.1 CHANGE IN LEGISLATION	6
3.1.2 MEASURES OF RISK	7
3.2 SAMPLE AND VARIABLE CONSTRUCTION	8
4. HYPOTHESES / EMPIRICAL STRATEGY	14
5. RESULTS	15
5.1 DEBT COLLECTION LAWS EFFECT ON MORTGAGE LOANS.....	15
5.1.1 TIGHTENING OF DEBT COLLECTION LAWS EFFECT ON MORTGAGE LOANS	16
5.1.2 LOOSENING OF DEBT COLLECTION LAWS EFFECT ON MORTGAGE LOANS.....	20
5.2 THE IMPACT OF LOAN PURPOSE ON MORTGAGE LOANS	23
6. CONCLUSION	26
REFERENCE.....	28
APPENDIX.....	32

1. INTRODUCTION

A mortgage is used by most homebuyers when purchasing their homes (Pew, 2022); as of 2016, the total mortgage debt outstanding in the U.S. was \$8.48 trillion, the largest component of household debt. Moreover, in the same year, 4.8% of outstanding debt was in some stage of delinquency (FRBNY, 2017). The debt collection industry is built around delinquent debt. When a loan becomes non-performing or delinquent, banks can take three actions to pursue the collection of a delinquent debt. Banks can either (1) pursue collection via an internal collection method, (2) use third-party agents to collect delinquent payments, or (3) sell the delinquent debt at a discount to a buyer who would use various methods to try to get the loan or asset to perform again. When mortgage debtors become delinquent on mortgage payments, mortgage creditors can attempt to minimize losses on the non-performing loan through debt collectors. Without the debt collection industry, the recovery rate for non-performing or defaulted loans would drop significantly, making creditors more risk-averse as their loss would increase, given a higher default rate. Therefore, lenders would likely view consumer credit as riskier. The increased perception of risk would translate into an increased credit risk premium for consumer credit—causing lenders to demand higher interest rates on consumer credit, which could decrease the available supply of consumer credit (ACA International, 2016). Hence, a change in the legal aspects of debt collection has a real effect on credit risk premiums, interest rates, debt behavior, and the decision process on borrowing.

Usually, banks acting as lenders are required to charge off consumer debt when the debt has been delinquent for more than 180 days, and in some instances, sooner, under the Uniform Retail Classification and Account Management Policy standards. These types of charge-offs harm the banks' earnings, specifically on the income statement. Banks with higher amounts of charge-offs as a ratio to their debt are considered riskier and could impact their credit rating and therefore increase their funding costs. Most of the debt which banks charge off and sell to debt buyers is credit card debt, but banks also sell non-performing student loans and mortgages (The Office of the Comptroller of the Currency, 2014). The purchase of distressed loans was common during the Great Financial Crisis (GFC), when many mortgages became non-performing, and debt buyers could purchase and resolve distressed loans at low dollar prices due to a perceived increase in credit risk.

As credit risk is essential in determining mortgage interest rates, mortgage terms and interest rates depend on the borrower's credit score. Credit scores are considered an indicator of a borrower's credit risk. Banks factor credit scores from consumer reporting companies into their credit risk models. In the United States, there are three leading consumer reporting companies, TransUnion, Equifax, and Experian, which publish credit scores ranging from 300-850. Conversely, credit scores are essential for borrowers as they help lenders determine borrowers' eligibility and the interest rate at which they can borrow. Therefore, a person's ability to grow and succeed financially, or stagnate and collapse, depends on the strength of their credit score. A good credit score and credit report allow a person to pursue opportunities for financial growth. This person's future success will be impacted by the benefits they receive from being wanted by lenders and employers. In contrast, a person with a fair or bad credit score will become stuck in a loop of expensive loan terms, costly down payments, high-interest rates, and rejections for jobs, contracts, and rental opportunities (Foohey and Greene, 2021). A study by the Urban Institute's Housing Finance Policy Center (HFPC) in 2017 found that 32% of applicants with less-than-perfect credit were denied mortgages (Goodman et al., 2018). When looking at the National Home Price index, one observes a continuous trend of rising prices if the 2007-2009 financial crisis is excluded (FRED, 2022). Additionally, rising house prices are not the only factor making it difficult to qualify for favorable mortgage terms; other debt, especially student debt, is compounding the debt-to-income ratio, which tightens the credit standard (Forbes & Richardson, 2019). Since 2003, the total student debt per capita has continued to increase yearly in the United States. For states with high student debt per capita, one could expect the debt-to-income ratio to be higher than those with lower student debt (FRBNY, 2022).

This paper studies the impact of changes in debt collection legislation on the riskiness of mortgage loans. It does so by utilizing the details from millions of single-family mortgage loans across five states and their neighboring states in the US, with information on original loan-to-value (LTV), combined loan-to-value (CLTV), debt-to-income (DTI), credit scores and interest rates. The five states each have a different number of adjacent states, so the number of mortgage loans will vary among the events, ranging between 5 million to 48 million mortgage loans for each event. This paper exploits time-series variation in state-level legislation changes for third-party debt collectors to evaluate the causal effect of third-party debt collection practices. I examine five regulatory changes across five states, two being the loosening of legislation and the other three being the tightening of legislation. I compare the riskiness of single-family

mortgage loans in the state that changed its third-party debt collection legislation to the riskiness of single-family mortgage loans of the neighboring states, which are not subject to the same state-level legislation.

The findings of the study provide suggestive evidence of the effect of a law change on the riskiness of mortgages. First, single-family mortgage loans see a significant change in the risk ratios LTV, CLTV, and DTI for several of the treated states, showing that there is a difference between the treated and control group (adjacent states) as an effect of the legislation change. Although I find suggestive evidence that the riskiness of a mortgage is affected in the case of third-party debt collector law change, I find no clear difference between laws being loosened or tightened. Second, I find no evidence of an effect on the borrowers' credit quality as a result of debt collector legislative changes until I separate the data based on the loan purpose. When separating the mortgage based on loan purpose, I find more significant effects across the risk measures. For instance, I find evidence of an effect on the borrowers' credit quality in two states where the loan is used for purchase and evidence in one state where the loan is used for the purpose of refinance.

The primary assumption for this empirical study is that without restrictions on debt collection, the riskiness of the loan in the treated and control group should be the same. This paper provides evidence for this assumption by analyzing the treatment and control group results before the law changed and finding no indication of pre-existing trends. To show that the results are robust, the states in the control group which had legislation changes during the treated state sample were excluded from the sample.

2. LITERATURE REVIEW

Even after the 2007 financial crisis, the literature on debt collection remains limited. A model proposed by Fedaseyeu and Hunt (2018) shows that in equilibrium, third-party debt collector agencies will employ harsher practices than creditors would use themselves, primarily due to reputational concerns. Dawsey et al. (2013) found that states with legislation that permits consumers' private right to legal action against abusive in-house collection practices are less likely to file for bankruptcy. Fedaseyeu (2020), in his research, analyses almost all changes in the regulation of debt collection and finds that on a state level, debt collector regulations lead to fewer new revolving lines of credit, fewer consumer lawsuits, and lower recovery rates.

Fonseca (2022) analyses the impact of debt collection on access to mainstream credit and payday loan usage, finding that as a result of changes in the law, restricting debt collectors results in a decline in access to mainstream credit, higher balances past due, and lower credit scores. Fonseca (2022) also notes an increase in payday borrowing when collection activities are restricted, and the supply of mainstream credit declines.

Fonseca (2022) looks at 32 regulatory changes that restrict collection practices across 20 states and the discontinuities at the state borders within the period 2000-2015, comparing consumers exposed to similar local economic factors by using the variation in legislation within pairs of counties that share a border, but are located in a different state (Holms 1998; Huang 2008; Dube et al. 2012). Fonseca (2022) analyses over 15 years of data and finds that state legislators introduce new restrictions on debt collections yearly. Additionally, Fonseca (2022) finds that states that restrict debt collection practices see a drop of 10 percent of the sample means in the number of debt collectors, shown in table 3 of the paper. Fedaseyeu (2020) observes 38 changes in 22 different states between 1999 and 2014 and found that states that restrict debt collection laws see a drop of 15% in the sample mean in the number of debt collectors. The study uncovers evidence that some creditors may be retaining their debt collection in-house due to tightening regulations. Both papers show a clear impact of fewer third-party debt collectors due to states' tightening laws regulating third-party debt collection, which demonstrates that it meaningfully impacts the collection industry at the state level.

Both Fedaseyeu (2020) and Fonseca (2022) examine the relationship between changes in debt collection legislation on the availability of mainstream credit and have certain similar findings. Both use a difference-in-difference empirical study to evaluate the causal effect of debt collection practice, a time-series variation in the restrictiveness of state-level legislation regarding debt collection. However, the two papers differ in focus and the specific market they examine. Fonseca (2022) focuses on the relationship between change in revolving credit availability and the use of payday loans and finds evidence to support the hypothesis that a decrease in revolving credit availability is associated with an increase in payday loan use. Fedaseyeu (2020) focuses on the presence of debt collection agencies (DCAs) and the supply of consumer credit and finds evidence to support the hypothesis that the presence of a DCA in a local market is associated with a decrease in the supply of new revolving credit. Fedaseyeu (2020) sees a reduction in recovery rates, increased revolving balance, fewer new revolving lines of credit, fewer consumer lawsuits, and no meaningful change in credit scores at a state

level. While Fonseca (2022) finds a statistically significant decline in revolving balances and credit scores

Regarding the debt collection literature, this study uses the evidence from Fedaseyeu (2020) and Fonseca (2022) as the basis for this paper's hypothesis, where they show that third-party legislation change affects the number of DCA. This paper looks both at states that loosen and states that tighten third-party debt collector legislation, which also was done in the paper by Fedaseyeu (2020), for the paper by Fonseca (2022), states that loosened restrictions were excluded. Further, similar to the method used in both papers, this paper uses a difference-in-difference method but uses adjacent states as control variables, not neighboring counties. Using a county-pair difference-in-difference strategy rather than a state-level difference-in-difference strategy, the underlying assumption is that consumers are more similar in a neighboring county rather than a consumer in a randomly chosen county.

3. BACKGROUND & DATA

3.1 DEBT COLLECTION REGULATION

The Fair Debt Collection Practices Act of 1977 (FDCPA) is a federal law that limits what actions debt collectors in the United States can take to collect debts¹. The law forbids harassment, misrepresentation, and so-called "unfair activities," such as attempting to collect any sum not explicitly stated in the contract that originated the debt or taking legal actions when not allowed by the law. The FDCPA applies to third-party debt collectors and creditors who purchased the defaulted debt from the initial creditor, intending to collect the debt but does not generally cover the original creditors. The law protects the collection of credit card debts, medical debt, mortgages, and any other debt related to family, personal, or household purposes. Additionally, all states are explicitly allowed to impose additional restrictions on debt collection practices, provided that such laws offer consumers better protection than is provided on a federal level. This is because the federal standard is considered the "minimum" standard, i.e., states can tighten their regulation on collection practices, but state regulation cannot be any weaker than federal regulations. Consequently, in most cases, this has made states much more consumer-friendly and protective of consumer rights concerning debt collection practices. As

¹ 15 U.S.C. §§ 1692-1692p.

of November 30, 2013, the Consumer Financial Protection Bureau's ("CFPB's") new Debt Collection Rule took effect. It interprets the FDCPA to clarify how debt collectors may use new communications technologies and what information they must disclose before beginning the debt collection process (CFPB, 2022a).

Although this Debt Collection Rule will not impact the data sample used in this paper, it is still worth mentioning because the CFPB is expected to treat the Rule as "significant" in relation to the Dodd-Frank Act. This financial regulation act is the most far-reaching Wall Street reform in history. The Dodd-Frank Act was created to prevent anything like the 2007 financial crisis from happening again. During President Trump's era, there were some provisions of the law and some regulatory areas which were loosened. Still, after Biden was elected president in 2020, the focus of the CFPB has been on rescinding rules initiated during the Trump Administration (U.S. Congress, 2018).

3.1.1 CHANGE IN LEGISLATION

This paper observes five events, each involving a change in third-party debt collection laws across five states at different periods; these law changes are described in Appendix B of Fedaseyeu's (2020) paper. The first event occurred in the State of Idaho on July 1, 2002. Idaho enacted a state law that further defined the prohibition of conduct by debt collectors involving discrimination and harassment, which empowered the Idaho Department of Finance director to review debt collection procedures and allow for the issuing of specific cease and desist orders. Additionally, there was an increase in the civil monetary penalties from \$1000 to \$2500 and an extension of the director's authority to bring legal action to enjoin certain violations.

The second event took place in Colorado on May 21, 2003. The State of Colorado loosened regulation by limiting the use of private remedies (such as class action lawsuits and damage provisions) and adding an affirmative defense if the debt collector had reasonable belief that the debtor was not a natural person.

The third event occurred in North Dakota on April 8, 2013. The State of North Dakota tightened licensing requirements by requesting more documentation from debt collection agencies, such as a credit report and any relevant criminal record, and by enabling the commissioner of Financial Institutions to collaborate with other states and the federal government in a multi-state information system to exchange data about debt collection and their background.

The fourth event occurred in Tennessee on April 23, 2013. The State of Tennessee loosened regulations by removing the requirement of obtaining a separate license for each location manager of a debt collection agency.

The fifth and most recent event occurred on June 3, 2014, when the State of Connecticut authorized the banking commissioner to check the criminal histories of each partner, member, officer, director, and principal employee of a debt collection agency. Additionally, the state expanded the scope of debt collection statutes to include debts purchased after being charged off, requiring separate licenses for debt collection agencies' main office and its branch offices and limiting their fees charged for services.

3.1.2 MEASURES OF RISK

This paper uses different risk measures to evaluate the riskiness of single-family mortgages. For example, the value of a person's loan-to-value ratio (LTV) is determined by the down payment; a high down payment gives a lower LTV ratio. The ratio is calculated by taking the loan amount at origination divided by the property's value (CFPB, 2020). The combined loan-to-value ratio (CLTV) is calculated in the same way but considers the amount of all known outstanding loans at origination and divides it by the value of the property. The debt-to-income ratio (DTI) indicates a person's ability to manage their monthly payments to repay the money that they have borrowed. This ratio is calculated by taking all monthly debt payments divided by the monthly gross income; the lower the DTI, the higher the likelihood of a creditor receiving their repayment. A debt-to-income that is considered good varies among banks, but a general rule of thumb is that one should keep the overall DTI ratio at or below 43% (JPMorgan Chase Bank, 2023).

Financial institutions' most common credit score model is the Fair Isaac Corporation Score (FICO), where credit scores range from 300-850. Equifax, TransUnion, and Experian are the top three major credit bureaus in the U.S. that dominate the credit market in analyzing, collecting, and distributing information about consumers. The FICO score ratings used are Poor (credit score < 579), Fair (credit score: 580-669), Good (credit score 670-739), Very Good (credit score: 740-799), and Exceptional (credit score > 850). The Fannie Mae data set uses the FICO to determine the credit score on single-family mortgage loans. The credit score in the

loan data set will allow for determining the borrower's risk profile (CFPB, 2019). The higher the score, the more secure the lender can be that the borrower will make payments on time, and it might help the lender qualify for a lower interest rate. A score below 620 is considered subprime and therefore is a more considerable risk for the lender to assume. The original interest rate tells you the cost of borrowing; the higher the rate, the higher the cost of the mortgage loans.

3.2 SAMPLE AND VARIABLE CONSTRUCTION

For the change in third-party debt collector laws, all changes to legislation were first identified by Fedaseyeu (2020) and are described in Appendix B of that work. The paper looked at changes in third-party debt collector laws in all U.S. states from 2000 until 2014 and based on their findings, this paper studies the states with the most significant increase and decrease in the same sample period. The states with the most significant increase in third-party debt collectors' laws were Idaho (ID), Connecticut (CT), and North Dakota (ND), and the states with the most significant decrease were Colorado (CO) and Tennessee (TN). These five states had, between the years 2000 to 2014, two or three changes in the law. This paper looks at one event from each of the five states. The other events were excluded due to either the lack of data available (e.g., the event taking place before 2002) or the event taking place during the 2007-2009 Great Financial Crisis. For all five states, the event selected was the one with the most recent changes in the law if the event did not occur during the period mentioned above.

This paper performs a double comparison for each of the five states using their neighbor states as control variables and referencing two years prior and two years after the event, but excluding the month of each event since the data is reported monthly and not daily. Ideally, it would have been compelling to compare counties in each of the five states with counties that shared a border but are located in a different state, i.e., each of the counties would be operating under different state regulations. This was not feasible because the data sample could not be filtered by zip code.

All states, besides North Dakota and Tennessee, have different sample periods due to the difference in the date of the law change; see Table 1 for the month of the law change and the sample period used for each state. Given the uneven number of neighbor states, the number of observations will vary among the five states, see Table 2A. Since the sample used by Fedaseyeu

(2020) only looks at changes in third-party debt legislation until 2014 and Fonseca (2022) samples until the first half of 2015, this paper has controlled for additional legal changes that occurred until the end of 2016 for all the states used in this sample. Consequently, Idaho had one neighboring state removed, Connecticut had two neighboring states removed, and North Dakota had one neighboring state removed from their sample due to the state having a change in third-party debt collection legislation in their sample period.

Table 1

State and law change overview

Treated State	Idaho	Colorado	North Dakota (ND)	Tennessee (TN)	Connecticut (CT)
Law change	Jul-02	May-03	Apr-13	Apr-13	Jun-14
Sample Period	07/2000–2004	05/2001–2005	04/2011–2015	04/2011–2015	06/2012–2016
Neighboring states	Montana Nevada* Oregon Utah Washington Wyoming	Arizona Kansas Nebraska New Mexico Oklahoma Utah Wyoming	Minnesota* Montana South Dakota	Alabama Arkansas Georgia Kentucky Mississippi Missouri North Carolina Virginia	Massachusetts New York* Rhode Island*
Excluded States	Nevada		Minnesota		Rhode Island New York
Law change	2001		2013		2014 2015

Note: The states marked with a star (*) are the states that were excluded from the sample due to having a law change during the sample period. The sample period excludes the month of the law change.

Table 2A

Summary Statistics: Risk Measures

This table reports summary statistics: Loan-to-value (LTV): Amount of the loan at origination divided by the value of the property (%). Combined loan-to-value (CLTV): Amount of all known outstanding loans at origination by the value of the property. Fannie Mae's max range is 36% for manually underwritten loans of the borrower's monthly stable income but can be exceeded up to 45% if the borrower meets certain requirements (%). Debt-to-income (DTI): Total monthly debt expense divided by the borrower's total monthly income at the time the loan was originated (%). Credit score: Uses the "classic" FICO score. Original interest rate: Original interest rate on a mortgage loan as identified in the original mortgage note. All the variables are monthly data. The adjacent states

are listed by postal code: Montana (MT), Oregon (OR), Utah (UT), Washington (WA), Wyoming (WY), Arizona (AR), Kansas (KS), Nebraska (NE), New Mexico (NM), Oklahoma (OK), South Dakota (SD), Alabama (AL), Arkansas (AR), Georgia (GA), Kentucky (KY), Mississippi (MS), Missouri (MO), North Carolina (NC), Virginia (VA), Massachusetts (MA).

Panel A: Risk Measures	N	Mean	Std. Dev.	Min	Max
Idaho					
Loan-to-value	2,584,518	73	15.84	4	97
Combined loan-to-value	2,584,518	73	16.05	4	126
Debt-to-income	2,584,518	32	12.95	1	64
Credit score	2,584,518	727	55.21	300	842
Original interest rate	2,584,518	5.91	0.78	3.75	9.88
Adjacent States (MT, OR, WA, UT, WY)					
Loan-to-value	36,962,491	68	17.11	1	97
Combined loan-to-value	36,962,491	69	17.31	1	180
Debt-to-income	36,962,491	31	12.64	1	64
Credit score	36,962,491	735	52.86	300	850
Original interest rate	36,962,491	5.79	0.74	3.63	11.00
Colorado					
Loan-to-value	12,063,734	65	17.65	3	97
Combined loan-to-value	12,063,734	66	17.99	3	158
Debt-to-income	12,063,734	32	12.86	1	64
Credit score	12,063,734	734	53.04	375	850
Original interest rate	12,063,734	5.78	0.63	3.75	8.88
Adjacent States (AZ, KS, NE, NM, OK, UT, WY)					
Loan-to-value	35,721,690	72	16.06	1	97
Combined loan-to-value	35,721,690	72	16.28	1	180
Debt-to-income	35,721,690	31	12.77	1	64
Credit score	35,721,690	729	55.09	360	850
Original interest rate	35,721,690	5.83	0.65	2.99	10.00
North Dakota					
Loan-to-value	1,240,882	73	15.55	10	97
Combined loan-to-value	1,240,882	74	15.59	10	97
Debt-to-income	1,240,882	31	9.04	1	50
Credit score	1,240,882	762	41.76	620	830
Original interest rate	1,240,882	3.68	0.60	2.25	6.25
Adjacent States (MT, SD)					
Loan-to-value	3,782,782	72	16.83	8	97
Combined loan-to-value	3,782,782	73	16.83	8	105
Debt-to-income	3,782,782	31	9.24	1	52
Credit score	3,782,782	765	42.34	605	834
Original interest rate	3,782,782	3.68	0.58	2.25	6.25
Tennessee					
Loan-to-value	5,468,010	73	16.03	9	97

Combined loan-to-value	5,468,010	74	15.91	9	114
Debt-to-income	5,468,010	31	9.42	1	51
Credit score	5,468,010	757	45.53	579	832
Original interest rate	5,468,010	3.84	0.60	2.25	6.63
Adjacent States (AL, AR, GA, KY, MS, MO, NC, VA)					
Loan-to-value	36,378,985	72	16.92	5	97
Combined loan-to-value	36,378,985	72	16.75	5	110
Debt-to-income	36,378,985	30	9.57	1	62
Credit score	36,378,985	760	44.90	519	840
Original interest rate	36,378,985	3.81	0.60	2.13	6.63
Connecticut					
Loan-to-value	4,436,081	70	18.46	2	97
Combined loan-to-value	4,436,081	72	18.13	2	105
Debt-to-income	4,436,081	32	9.06	2	55
Credit score	4,436,081	762	43.04	522	832
Original interest rate	4,436,081	3.64	0.56	2.13	5.88
Adjacent State (MA)					
Loan-to-value	10,489,831	68	19.30	3	97
Combined loan-to-value	10,489,831	69	18.93	3	105
Debt-to-income	10,489,831	32	9.04	2	51
Credit score	10,489,831	762	42.77	580	839
Original interest rate	10,489,831	3.64	0.54	2.25	6.00

To study the effect of riskiness on mortgages, this paper uses data from Fannie Mae, one of the two largest purchasers of mortgages in the secondary market. Fannie Mae is a government-sponsored enterprise (GSE) and a publicly traded company. Fannie Mae combines mortgages purchased in the secondary market into a mortgage-backed security (MBS). By doing so, Fannie Mae provides liquidity to lenders such as credit unions and banks, which allows these lenders to underwrite or fund more mortgages. In 2016 Fannie Mae provided approximately \$637 billion in liquidity to the mortgage market, which provided reliable, large-scale access to affordable mortgages to low-income Americans (U.S. Securities and Exchange Commission, 2016). Not everyone is eligible for the Fannie Mae MBS; homebuyers must meet minimum credit requirements, such as a FICO score of at least 620. The Single-Family Loan Performance Data consists of static mortgage loan data at the loan's origination and delivery to Fannie Mae

and dynamic monthly performance data of each mortgage loan since the time of acquisition.² The loan performance data provides risk ratios for each loan, such as original loan-to-value (LTV), combined loan-to-value (CLTV), debt-to-income (DTI), credit score, and interest rate. Additionally, each loan has a state variable that indicates the state/territory within which the property securing the mortgage loan is located and a purpose variable that says whether the purpose of the loan is for refinance or purchase. The data used in this paper is isolated for each state, meaning each treated state's data will only include the data of the treated state and the neighboring states. This method is applied because a new study shows that performing regressions on data with different time periods creates problems with the coefficient (Callaway & Sant'Anna, 2020). Each sample is also restricted to single-family home property type and principal residence for property occupancy status.

To account for local economic conditions, yearly state-level macroeconomic variables are included in the regression: house-price index, unemployment rate, average disposable personal income, and average disposable personal income growth. These variables are added to control for local effects in the estimation process and to evaluate the possibility of omitted factors. I obtained the annual house-price-index (HPI) data from the U.S. Federal Housing Finance Agency (FHFA), which reports quarterly data using the last quarter of each year. The unemployment rate is obtained from the U.S. Bureau of Labor Statistics (BLS), and average disposable personal income and average disposable personal income growth are obtained from the U.S. Bureau of Economic Analysis (BEA). Table 2B reports summary statistics for these local economic variables

Table 2B

Summary Statistics: Economic variables

The unemployment rate is the percentage of the labor force that is unemployed (%). The House Price Index (HPI) is the quarterly house price index that measures the movement of single-family house prices; data is only available quarterly, so the last quarter for each year was used to have the date on a yearly basis. Average disposable Personal Income is the amount of money that an individual or household has to spend or save after income taxes have been deducted. The disposable personal income per capita in the given year minus disposable personal income per capita in the previous year, all divided by disposable personal income per capita in the previous year (%). All the variables are yearly data.

² Fannie Mae, "Single-Family Loan Performance Data," April 29, 2022. <https://capitalmarkets.fanniemae.com/credit-risk-transfer/single-family-credit-risk-transfer/fannie-mae-single-family-loan-performance-data>

Panel B: Other variables	N	Mean	Std. Dev.	Min	Max
Idaho					
State Average Disposable Personal Income	5	23,713	1,495	21,962	21,962
State Disposable Personal Income Growth	5	4.42	1.46	2.65	6.31
State Unemployment Rate	5	5.16	0.42	4.67	5.63
State House Price Index	5	168.32	15.50	153.60	192.71
Adjacent States (MT, OR, WA, UT, WY)					
State Average Disposable Personal Income	25	26,030	3,624	20,609	33,558
State Disposable Personal Income Growth	25	4.89	1.59	1.92	7.21
State Unemployment Rate	25	5.32	1.33	3.33	8.01
State House Price Index	25	198.61	23.85	154.25	248.01
Colorado					
State Average Disposable Personal Income	5	31,567	1,361	30,062	33,590
State Disposable Personal Income Growth	5	3.06	1.20	2.16	4.66
State Unemployment Rate	5	5.25	0.88	3.82	6.10
State House Price Index	5	246.07	15.08	228.65	268.00
Adjacent States (AZ, KS, NE, NM, OK, UT, WY)					
State Average Disposable Personal Income	35	26,317	3,035	21,771	34,187
State Disposable Personal Income Growth	35	4.74	1.70	1.14	7.67
State Unemployment Rate	35	4.70	0.79	3.14	6.17
State House Price Index	35	190.99	33.11	149.27	301.64
North Dakota					
State Average Disposable Personal Income	5	48,861	3,065	43,583	51,504
State Disposable Personal Income Growth	5	4.75	7.81	-3.54	15.24
State Unemployment Rate	5	2.91	0.27	2.62	3.34
State House Price Index	5	268.30	27.09	231.72	297.62
Adjacent States (MT, SD)					
State Average Disposable Personal Income	10	38,764	3,260	34,170	43,274
State Disposable Personal Income Growth	10	2.82	3.06	-1.62	7.74
State Unemployment Rate	10	4.55	1.12	3.05	6.64
State House Price Index	10	275.01	42.34	222.39	337.53
Tennessee					
State Average Disposable Personal Income	5	36,302	1,421	34,682	38,463
State Disposable Personal Income Growth	5	2.95	2.11	-0.69	4.57
State Unemployment Rate	5	7.40	1.35	5.58	9.12
State House Price Index	5	193.46	13.59	178.31	212.48
Adjacent States (AL, AR, GA, KY, MS, MO, NC, VA)					
State Average Disposable Personal Income	40	34,689	3,875	29,352	45,442
State Disposable Personal Income Growth	40	2.71	2.36	-3.17	7.29
State Unemployment Rate	40	7.27	1.56	4.39	10.26
State House Price Index	40	186.16	15.36	147.01	224.96
Connecticut					
State Average Disposable Personal Income	5	56,321	1,702	53,939	58,465

State Disposable Personal Income Growth	5	1.27	2.79	-3.50	3.78
State Unemployment Rate	5	6.68	1.50	4.85	8.36
State House Price Index	5	160.47	2.01	158.40	163.41
Adjacent State (MA)					
State Average Disposable Personal Income	5	51,010	2,396	48,504	54,190
State Disposable Personal Income Growth	5	2.67	2.87	-2.03	5.63
State Unemployment Rate	5	5.58	1.17	4.01	6.71
State House Price Index	5	231.61	16.58	211.32	254.32

4. HYPOTHESES / EMPIRICAL STRATEGY

The findings of the paper by Fedaseyeu (2020) and the paper by Fonseca (2022) show that the restriction of third-party debt collection state laws affects the number of third-party debt collection agencies. Building on this, the hypothesis of this paper is as follows:

- *Is the tightening or loosening of third-party debt collectors law affecting the riskiness of single-family mortgages?*

This paper estimates the effect of changes in debt collection legislation on the riskiness of mortgages. It is thereby using a state-level difference-in-difference strategy to compare how the changes in risk measures of mortgage loans before and after treatment differs between treated and control groups. The treatment group is composed of single-family mortgage loans in the state that changed their state debt collection legislation. The control group consists of single-family mortgage loans in the neighboring states that did not have a change in their state debt collection legislation. The control group provides a counterfactual of what would have happened to the mortgage loans' riskiness if the debt collection legislation had not changed. The precondition for this behavior is that there are no further variables impacting the behavior of either the treatment group or the control group.

The model has the following form:

$$y_{it} = \beta_1 Treated_i * After_t + \beta_2 X_{it} StateFE_i + TimeFE_t + \varepsilon_{it} \quad (1)$$

Where y_{it} is the value of the dependent variable in state i at time t , that will be used is different measures of risk (LTV, CLTV, DTI, Credit score, Interest rate). $Treated_i$ is a variable equal to

1 for state i , which had a law change, and $After_t$ is equal to 1 at time t after the law came into effect. X_{it} is a set of controls common to all states, such as the unemployment rate, house price index, average disposable personal income, and disposable personal income growth. The two-way fixed effect, $StateFE_i$, and $TimeFE_t$ are included as explanatory variables to control for the state-fixed effect and time-fixed effect. State-fixed effect controls for the unobserved state-level characteristics and time-fixed effect control for unobserved time-varying factors. The coefficient of interest β_1 measures the average change of risk on mortgages in the state that made changes to debt collection laws relative to the states neighboring state, following the law change. Assuming the standard error for each state is correlated, it is clustered at the state level. When clustering for State, the number of clusters ranges from 2 to 8, while ideally, one would want this number to be closer to 30. Due to this, each regression also clusters for the origination date of the loan, taking State times Origination date.

The following specifications are also estimated to provide additional evidence in favor of the parallel trends assumption that was previously mentioned. To study this, this paper also estimated the year-by-year effects, a dynamic version of Equation 1, which will provide insight into the stability and significance of regression coefficients over time and help understand the relationship between the variables. Due to some of the events having large data sets, it is impossible to run the regression on monthly data, so the data is collapsed into quarterly data. This means that the quarterly data provides an aggregated view of the mortgages over three months. Hence, the output will be a prediction for the mean value of the dependent variables based on the mean values of the independent variables, in contrast to Equation 1. In Equation 1, the output will be predicted for the value of the dependent variable based on the values of the independent variables for that specific observation. Using single-sample observations can lead to more accurate predictions. Still, it also increases the risk of overfitting and less robustness. At the same time, aggregated quarterly sample observation may reduce the risk of overfitting but may also lead to a loss of information, leading to less precise and less accurate predictions.

5. RESULTS

5.1 DEBT COLLECTION LAWS EFFECT ON MORTGAGE LOANS

5.1.1 TIGHTENING OF DEBT COLLECTION LAWS EFFECT ON MORTGAGE LOANS

In this section, I show that states that tighten their debt collection laws see a change in the riskiness of mortgage loans relative to the neighboring states with no law change. Table 3 reports estimates of Equation 1 for LTV, CLTV, DTI, Credit Score, and Interest Rate. Estimates in Table 3 control for the state-level unemployment rate, house-price index, average disposable personal income, and average DPI growth. Further, I look at Idaho (ID), North Dakota (ND), Colorado (CO), and Tennessee (TN) in a combined dataset and estimate the year-by-year effect to assess how the impact of the changes in the law on the five dependent variables varies over time.

Column 1 to 3 of Panel A of Table 3 reports the effect of debt collection restrictions on the risk ratios of mortgage loans for the state of Idaho and its neighboring states. I find that for mortgage loans, there is an increase in the risk ratios LTV, CLTV, and DTI of 0.91, 1.14, and 1.30 pp, respectively, all at a 1% confidence level. Columns 4 & 5 of Panel A of Table 3 focus on the borrowers' credit quality and pricing of the mortgage, and I find a slight decline of 0.03 pp for the interest rate but no evidence of change in the credit score.

Appendix Figure 1A, 1B, 1C, 1D, and 1E reports estimates and a 95% confidence interval of the year-by-year effects for the dependent variables LTV, CLTV DTI, credit score, and interest rate, respectively. I show that for Idaho (ID), there is no evidence of pre-existing trends in the outcome of these risk ratios LTV, CLTV, and DTI for the treated and control groups. Further, in the post period, I show that there is evidence of some effect on these risk ratios, but the effect is first observed after the fourth quarter. In the case of credit score and interest rate, I also find no evidence of the parallel assumption that I discussed in Section 4.

	(1)	(2)	(3)	(4)	(5)
Dependent Variable:	LTV	CLTV	DTI	Credit Score	Interest Rate
Treated*After	0.914*** (0.308)	1.143*** (0.305)	1.295*** (0.264)	-0.0659 (1.129)	-0.0329** (0.0139)
Unemployment Rate	-4.691 (21.15)	-2.720 (21.10)	13.06 (17.74)	173.7*** (65.17)	1.864* (0.952)

House Price Index	-0.0180 (0.0129)	-0.0135 (0.0133)	-0.0254** (0.0107)	-0.0917** (0.0370)	-0.000193 (0.000548)
Average DPI	2.17e-06 (0.000175)	1.40e-05 (0.000181)	0.000926*** (0.000154)	-0.000669 (0.000533)	1.88e-06 (7.82e-06)
Income Growth	10.19 (6.476)	15.05** (6.671)	-23.21*** (6.265)	58.51*** (20.99)	-0.219 (0.320)
Observations	39,547,009	39,547,009	39,547,009	39,547,009	39,547,009
Adjusted R-squared	0.026	0.025	0.013	0.027	0.703
State FE	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES

Notes: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Column 1 to 3 of Panel B of Table 3 reports the effect of debt collection restrictions on the risk ratios of mortgage loans for the state of North Dakota and its neighboring states. I find no evidence of change in the risk ratios LTV and CLTV, but I find a decrease in the DTI ratio of 0.74 pp at a 1% confidence level. Columns 4 & 5 of Panel B of Table 3 focus on the borrowers' credit quality and pricing of the mortgage risk. I find no significant evidence of change in the interest rate or the credit score. Due to Minnesota also experiencing a change in state law, the state had to be excluded from the sample. By removing Minnesota, the sample decreased by approximately 10 million observations, which is expected to affect the output.

Appendix Figure 1A, 1B, 1C, 1D, and 1E reports estimates and a 95% confidence interval of the year-by-year effects for the dependent variables LTV, CLTV DTI, credit score, and interest rate, respectively. I show that for North Dakota (ND), there was no evidence of pre-existing trends in the outcome of Figure 1A. Still, for Figure 1B, I find evidence of pre-existing trends for the treated and control groups and see evidence of this until the first quarter before the law change. There is some significant impact on the dependent variables for the treatment group. However, this impact is regressing back to the mean after the sixth quarter. For Figure 1C (DTI), I show evidence of pre-existing trends until one year prior to the law change but show a shift in the trend from negative to positive after the law change. For Figures 1D & 1E, in the case of credit score and interest rate, there is again no evidence of the parallel trend assumption, implying that there are other variables impacting the results that could not be controlled for. Overall, the results do indicate an effect of the events on the dependent variables, particularly

true for DTI. However, those results need to be considered with caution, as the pre-event time periods indicate that certain other impacts are at play, which has not been accounted for.

Table 3 Panel B: North Dakota					
	(1)	(2)	(3)	(4)	(5)
Dependent Variable:	LTV	CLTV	DTI	Credit Score	Interest Rate
Treated*After	0.656 (0.573)	0.553 (0.627)	-0.744*** (0.244)	0.252 (1.450)	-0.0282 (0.0221)
Unemployment Rate	-272.8*** (46.20)	-279.2*** (48.38)	-31.76 (26.48)	117.9 (135.1)	-0.210 (1.648)
House Price Index	-0.0133 (0.0310)	-0.0218 (0.0319)	-0.0104 (0.0155)	-0.0541 (0.0884)	0.00243** (0.00107)
Average DPI	-9.01e-05 (0.000127)	-3.37e-05 (0.000131)	0.000146** (6.73e-05)	-0.000169 (0.000344)	-6.15e-06 (4.48e-06)
Income Growth	2.866 (3.625)	1.342 (3.881)	-5.196*** (1.717)	13.59 (8.912)	0.165 (0.125)
Observations	5,023,664	5,023,664	5,023,664	5,023,664	5,023,664
Adjusted R-squared	0.028	0.028	0.013	0.026	0.399
State FE	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES

Notes: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Lastly, columns 1 to 3 of Panel C of Table 3 report the effect of debt collection restrictions on the risk ratios of mortgage loans for Connecticut and its neighboring states. I find no evidence of change in the risk ratios LTV, CLTV, and DTI. Columns 4 & 5 of Panel C of Table 3 focus on the borrowers' credit quality and pricing of the mortgage, and I find no significant evidence of change in the interest rate or the credit score. Due to two of the three neighboring states of Connecticut also experiencing a change in state laws, the two states had to be excluded from the sample. With this decreasing the sample size by approximately 15 million observations and only leaving one state as a control variable, there is a probability of impact on the output. Due to this, the reliability of the results is ambiguous, and hence I chose not to focus further on a sample of Connecticut.

Table 3 Panel C: Connecticut					
	(1)	(2)	(3)	(4)	(5)
Dependent Variable:	LTV	CLTV	DTI	Credit Score	Interest Rate
Treated*After	0.0571 (0.252)	0.00104 (0.229)	0.206 (0.160)	0.610 (1.257)	-0.0126 (0.00991)
Unemployment Rate	8.054 (64.86)	2.840 (64.42)	144.3*** (24.40)	-452.8*** (108.9)	2.976 (1.796)
House Price Index	-0.255*** (0.0355)	-0.282*** (0.0336)	-0.0385*** (0.0133)	0.210** (0.0865)	-0.00355*** (0.000985)
Average DPI	0.00232*** (0.000417)	0.00257*** (0.000387)	0.000265* (0.000157)	-0.00169** (0.000664)	6.08e-05*** (1.13e-05)
Income Growth	-69.78*** (11.61)	-79.31*** (11.51)	-0.330 (5.390)	36.51 (34.92)	-0.422 (0.375)
Observations	14,925,912	14,925,912	14,925,912	14,925,912	14,925,912
Adjusted R-squared	0.044	0.039	0.027	0.037	0.327
State FE	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES

Notes: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

As stated in Section 2, tighter debt collector laws decrease the number of third-party debt collectors. With fewer debt collectors and stricter laws, it would be expected that recovering delinquent debt could become more challenging. Further, it could be anticipated that this produces more risk-averse behavior by banks. This risk aversion could show itself by either requiring lower risk ratios such as LTV, CLTV, and DTI and or higher credit scores as well as an increase in overall interest rates per risk profile.

I anticipate that the time periods of the samples will influence the findings when analyzing the data, with Panel A of Table 3 being in the early 2000s and Panel B of Table 3 being after the GFC. I interpret the evidence from Panel A of Table 3 to be reliable within the period of the sample. According to Lewis (2010), during the time before the GFC, the risk aversion of U.S. banks was relatively minimal, with banks being highly levered plus having an elevated level of

exposure in the subprime mortgage market, which was considered to be low-risk at the time. Banks were also engaging in complex financial products, such as MBS. Keeping these factors in mind, the findings of increased risk ratios and the small decline in the mortgage price could be expected with the state of the economy and the accepted view on subprime mortgages at that time. When interpreting the evidence in Panel B of Table 3, I do so with caution due to a large part of the sample being removed, but the decrease in debt-to-income would be in line with the anticipated effect of stricter debt collector laws as the time of this sample is after the GFC.

5.1.2 LOOSENING OF DEBT COLLECTION LAWS EFFECT ON MORTGAGE LOANS

In this section, I explain that states which loosen their debt collection laws see a change in the risk measures of mortgage loans relative to the neighboring states with no law change. Table 4 reports estimates of Equation 1 for LTV, CLTV, DTI, Credit Score, and Interest Rate. Estimates in Table 4 control for the state-level unemployment rate, house-price index, average disposable personal income, and average DPI growth. Further, I look at Idaho (ID), North Dakota (ND), Colorado (CO), and Tennessee (TN) in a combined dataset and estimate the year-by-year effect to assess how the impact of the changes in the law on the five dependent variables varies over time.

	(1)	(2)	(3)	(4)	(5)
Dependent Variable:	LTV	CLTV	DTI	Credit Score	Interest Rate
Treated*After	0.746*** (0.163)	0.956*** (0.174)	-0.572*** (0.168)	-0.00797 (0.557)	-0.00153 (0.00826)
Unemployment Rate	-15.22 (17.98)	-30.01* (17.87)	61.13*** (13.49)	16.48 (52.25)	-0.870 (0.578)
House Price Index	0.0383*** (0.00498)	-0.0389*** (0.00494)	-0.00606* (0.00314)	0.00454 (0.0194)	-0.000249* (0.000133)
Average DPI	0.000303* (0.000158)	2.63e-05 (0.000170)	0.000708*** (0.000126)	-0.00124*** (0.000450)	-7.89e-06 (6.48e-06)
Income Growth	-25.76***	-23.13***	-17.93***	23.54*	0.0708

	(4.796)	(4.944)	(3.973)	(13.85)	(0.241)
Observations	47,785,424	47,785,424	47,785,424	47,785,424	47,785,424
Adjusted R-squared	0.048	0.047	0.020	0.022	0.613
State FE	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES

Notes: Robust standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

Column 1 to 3 of Panel A of Table 4 reports the effect of loosening debt collection restrictions on the risk ratios of mortgage loans for the state of Colorado and its neighboring states. I find that for mortgage loans, there is an increase in the risk ratios LTV and CLTV of 0.75 and 0.96 pp but a decrease in the risk ratio DTI of 0.57 pp, at a 1% confidence level. This shows that in the case of a law change, there is a difference between the treated and control group for these risk ratios. Columns 4 & 5 of Panel A of Table 4 focus on the borrowers' credit quality and pricing of the mortgage, and I find no significant evidence of change in the credit score or interest rate.

Appendix Figure 1A, 1B, 1C, 1D, and 1E reports estimates and a 95% confidence interval of the year-by-year effects for the dependent variables LTV, CLTV DTI, credit score, and interest rate, respectively. For Colorado (CO), I find no evidence of pre-existing trend for either of the risk measures. However, looking at Figure 1A (LTV), Figure 1C (DTI), and Figure 1D (Credit score), the two quarters before the legal change, there is some evidence in favor of the parallel assumption. Furthermore, no effect of the law change is observed before the second quarter for Credit scores and the third quarter for LTV and DTI. In the case of Figure 1B (CLTV) and Figure 1E (Interest rate), there is no evidence of pre-existing trends.

	(1)	(2)	(3)	(4)	(5)
Dependent Variable:	LTV	CLTV	DTI	Credit Score	Interest Rate
Treated*After	-0.639*** (0.217)	-0.578*** (0.215)	-0.112 (0.0937)	0.455 (0.374)	0.0137 (0.00852)
Unemployment Rate	55.88*** (11.32)	63.04*** (10.97)	4.283 (4.806)	24.35 (20.24)	0.697 (0.555)

House Price Index	-0.0229** (0.00978)	-0.0190* (0.00998)	-0.0184*** (0.00550)	0.0258 (0.0217)	-0.00145*** (0.000533)
Average DPI	-0.000774*** (0.000166)	-0.000761*** (0.000159)	-0.000194** (7.97e-05)	0.000707** (0.000357)	2.49e-05*** (8.65e-06)
Income Growth	16.22*** (3.872)	14.08*** (3.758)	5.314*** (1.755)	-20.23** (8.073)	0.360 (0.225)
Observations	41,846,995	41,846,995	41,846,995	41,846,995	41,846,995
Adjusted R-squared	0.051	0.046	0.014	0.036	0.369
State FE	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES

Notes: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Column 1 to 3 of Panel B of Table 4 reports the effect of loosening debt collection restrictions on the risk ratios of mortgage loans for the state of Tennessee and its neighboring states. I find that for mortgage loans, there is a decrease in the risk ratios LTV and CLTV of 0.64 and 0.58 pp, both at a 1% confidence level, but there is no significant evidence of change in DTI. Columns 4 & 5 of Panel B of Table 4 focus on the borrowers' credit quality and pricing of the mortgage, and I find no significant evidence of change in the credit score or interest rate.

Appendix Figure 1A, 1B, 1C, 1D, and 1E reports estimates and a 95% confidence interval of the year-by-year effects for the dependent variables LTV, CLTV DTI, credit score, and interest rate, respectively. For Tennessee (TN), I show that none of these five risk measures shows evidence of pre-existing trends in the treated and control groups. The pattern of the coefficients could imply that there are other extraneous factors involved.

In the case of looser debt collector laws, one would expect the opposite effect of a tightening, quite possibly no reduction, and or an increase in the number of debt collectors, making it easier for lenders to recover delinquent debt and making the banks less risk averse. When interpreting the evidence from Panel A and Panel B of Table 4, it is probable that the time frame is an important factor. The sample from Panel A took place before the GFC, in contrast to Panel B, which took place several years after the GFC. From the evidence from Panel A and B of Table 3, I see the same pattern emerging, suggesting an increase in risk measures before the GFC and, conversely, a decrease after the GFC. Despite seeing a similar pattern, the evidence needs to be

interpreted with caution since Panel A of table 4 shows inconsistencies with one of the three risk ratios decreasing as an effect of debt collector laws loosening.

Overall, whether the state tightens or loosens its debt collection laws, there is evidence that this has a significant effect on the risk ratios of single-family mortgages. However, the results show that the change varies and gives no clear indication of the direction one would expect the law change to have. Idaho and North Dakota both tightened their laws, but Idaho experienced an increase in all three risk ratios, whereas North Dakota only saw a decrease in the DTI ratio. Colorado and Tennessee both had a loosening of their state laws, but the event led in Colorado to an increase in the risk ratios LTV and CLTV but a decrease in DTI, while Tennessee experienced a decrease in LTV and CLTV. There are several possible explanations for the differing results, as mentioned earlier, due to the different sample periods: 2000 to 2004 for Idaho, 2001 to 2005 for Colorado, and 2011 to 2014 for North Dakota and Tennessee. Furthermore, the state of the US economy was very different, as two of the samples were before and two samples were after the GFC. The second explanation could be that different third-party debt collection laws impact mortgage loans differently. Idaho increased the penalty for debt collectors and defined what went into the prohibition of conduct. North Dakota required separate licenses for all agencies' offices and authorized criminal background checks of all parties involved in the collection agency. While Colorado limited the use of private remedies, Tennessee removed the requirement for separate licensing. Thirdly, these differences could arise due to other unmeasured variables, such as which political party holds the majority of seats in the state's legislature, education level, marital status, and even ethnicity. Moreover, none of the four states see an effect on the credit score. Further, Idaho sees a slight decline in the interest rate, unlike North Dakota, Colorado, and Tennessee.

5.2 THE IMPACT OF LOAN PURPOSE ON MORTGAGE LOANS

In this section, I delve further into the findings that tightening or loosening third-party debt collector law leads to a change in the riskiness of mortgage loans. Attempting to provide a more precise pattern for the impact a tightening versus loosening of debt collection laws have on the riskiness of the mortgage, I separate the data by loan purpose group, the first one being loans used to refinance an existing lien with cash-out or with no cash-out and the second on for loans used to purchase a property. Table 5 reports estimates of Equation 1 for LTV, CLTV, DTI,

credit score, and interest rate. Estimates in Table 5 control for the state-level unemployment rate, house-price index, average disposable personal income, and average DPI growth.

The qualifications a borrower needs to meet to refinance a loan are similar to those of a new mortgage loan, and the primary benefit of refinancing for a homeowner is the chance to change loan terms, i.e., lower interest, which could happen in the case that the borrower continues to make payments on time or makes a larger down payment. Potential downsides can be higher loan amounts which can lead to increased monthly payments as a result of cashing out a portion of your equity (Experian, 2022).

Appendix Table 5A also shows that in the state of Idaho (ID), mortgage risk ratios are affected by the law change and still experience an increase independent of the purpose of the loan. Although, in columns 1 to 6, LTV, CLTV, and DTI increase more in the case of purchase than refinance (1.26, 1.38, and 1.42 pp versus 0.73, 0.95, and 1.22 pp, respectively) LTV at a 5% confidence level and CLTV and DTI at a 1% confidence level. Columns 7 & 8 show that a borrower's credit quality is not affected in the case of refinance, but in the case of purchase, I find a decrease of 5.03 credit points in the credit score at a 1% confidence level. Lastly, columns 9 & 10 show that the effect on mortgage price is significant for both purposes, but in the case of refinance, has a decrease of 0.05 pp at a 1% percent confidence level and a positive effect of 0.03 pp at a 10% confidence level in the case of purchase.

Appendix Table 5B shows that in North Dakota (ND), the legal change has more visible effects when separating the sample based on purpose. Columns 1 to 4 show no effect in the case of refinance for LTV and CLTV, but both ratios increase in the case of purchase with 2.01 and 1.54 pp at a 1% and 10% confidence level, respectively. Column 5 shows that DTI decreases with 1.07 pp in the case of refinance at a 1% confidence level but with no effect on the purchase. Columns 7 & 8 show that there is still no effect on the borrower's credit quality, but columns 9 & 10 show a decrease of 0.08 pp at a 1% confidence level in the mortgage price when the loan purpose is for purchase but no effect in case of refinance.

The two sample states mentioned above both experienced a tightening of debt collection laws, and although both samples experienced similar effects, there are also some significant differences. Table 5A (ID) shows a more apparent pattern of the law change compared to the results of Table 3 Panel A. Here we observe that the majority of risk measures have a more

prominent effect when the purpose of the mortgage is purchase versus refinancing. Table 5B (ND) shows more meaningful results than the results in Table 3 Panel B, such as an increase in LTV and CLTV when the mortgage is used for purchase, which matches the result found in Table 5A. For the effects seen in DTI, credit score, and interest rate, no similar patterns are observed between these two samples.

Appendix Table 5C shows that in Colorado (CO), the effect of the law change on risk measures varies much more depending on the loan purpose. In columns 1 & 2, LTV increases by 0.85 pp in the case of refinance, but decreases by 1.05 pp in the case of purchase, both at a 1% confidence level. In columns 3 & 4, one can see that CLTV follows the same pattern, an increase of 1.06 pp at a 1% confidence level for refinancing and a decrease of 0.63 pp at a 10% confidence level for purchase. Columns 5 and 6 both show a decrease in DTI. Still, the decline is higher and more significant for purchase vs. refinancing, 1.91 and 0.42 pp at a 1% confidence level and 5% confidence level, respectively. Columns 8 and 10 show the effect on borrowers' credit quality and mortgage price in the case of purchase, where there is an increase of 4.37 credit points and a decrease of 0.03 pp in mortgage price, both at a 1% confidence level. Lastly, Columns 7 & 9 show no effect on the borrowers' credit quality or mortgage price in the case of refinancing.

Appendix Table 5D shows that in Tennessee (TN), the effect of law change is more spread when looking at the sample based on purpose. Columns 1 & 2 show a similar decrease for LTV independently of purpose, 0.39 and 3.41 pp at a 10% confidence level for refinance and purchase, respectively. Column 4 shows a decrease of 0.41 pp at a 5% confidence level for CLTV, while Column 3 shows no effect in the case of refinancing. Columns 5 & 6 show no effect on DTI in the case of refinancing or purchase. Columns 7 & 9 show the effect on borrowers' credit quality and mortgage price in the case of refinance, where there is a decrease of 1.27 credit points at a 1% confidence level and an increase of 0.02 pp on mortgage price at a 5% confidence level. Lastly, Columns 8 & 10 show no effect in the case of borrowers' credit quality or mortgage price in the case of purchase.

Both samples, CO & TN, experienced a loosening of debt collection laws but experienced moderately different effects of that law change. Table 5C (CO) finds an increase in LTV and CLTV in the case of refinance but a decrease in the case of purchase; the latter deviates from the findings in Table 4 Panel A, where these measures increased. For Table 5D (TN), I find that

LTV and CLTV decrease for both loan purposes, which for purchase matches with the finding in Table 5C. Although the effects found for credit score and interest deviate between the two samples, both samples show an effect for these variables, with was not visible in Table 4 Panel A or Table 4 Panel B.

The results are still inconsistent, and no clear statement can be made for how tightening vs. loosening third-party debt collector laws affects the risk measures of mortgage loans. Nonetheless, separating the loans by purpose provides more significant results across the dependent variables than the results produced in Section 5.1. The evidence shows that the borrower's credit quality changes in three states when separating the loan based on the loan purpose. A change in the credit score would suggest that a change in third-party debt collection law might alter the composition of borrowers since banks might be willing to extend credit to riskier applications when debt collection is more efficient. The results from Tennessee show a decrease in the credit score as a response to the loosening of debt collector laws, which supports the theory above. However, if this were universally true, one would expect an increase in the case of Idaho and a decrease in the case of Colorado. Nonetheless, the results are the opposite, indicating little evidence to support the notion that a change in the borrower's credit quality responds to changes in debt collector laws.

6. CONCLUSION

This paper makes use of a large panel data set of US single-family mortgage loans from Fannie Mae and seeks to examine the effect of change in debt collection legislation across five states and found that in four of the five states, these legislative changes led to either a negative or positive shock for specific risk ratios. While this study cannot distinguish between the effect of a tightening vs. a loosening of debt collection law change on the riskiness of US mortgage loans, it provides causal empirical evidence that informs on this matter by focusing on the effect of these legislative changes on risk measures.

The most significant effect is in the risk ratio loan-to-value and combined loan-to-value, but also some effect is seen in the debt-to-income ratio. When comparing the results from the four states, regardless of which way the legislative change advanced, the output reveals mostly an increase in risk measures before the GFC and a decrease thereafter. This shows evidence in favor of changed behavior towards a risk aversion to this type of security after the GFC. The

primary assumption of the hypothesis is that in the absence of law change, the outcome for mortgage loans riskiness in treated and control groups would move in line with current trends, and although I am able to find suggestive evidence of legal changes in debt collection policies influencing the risk measures, there is little to no evidence of parallel trends prior to the event. An explanation for the lack of parallel trends observed could be explained by the adjacent states not serving as a sufficient control group, and that other variables are causing this effect that I could not detect.

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APPENDIX

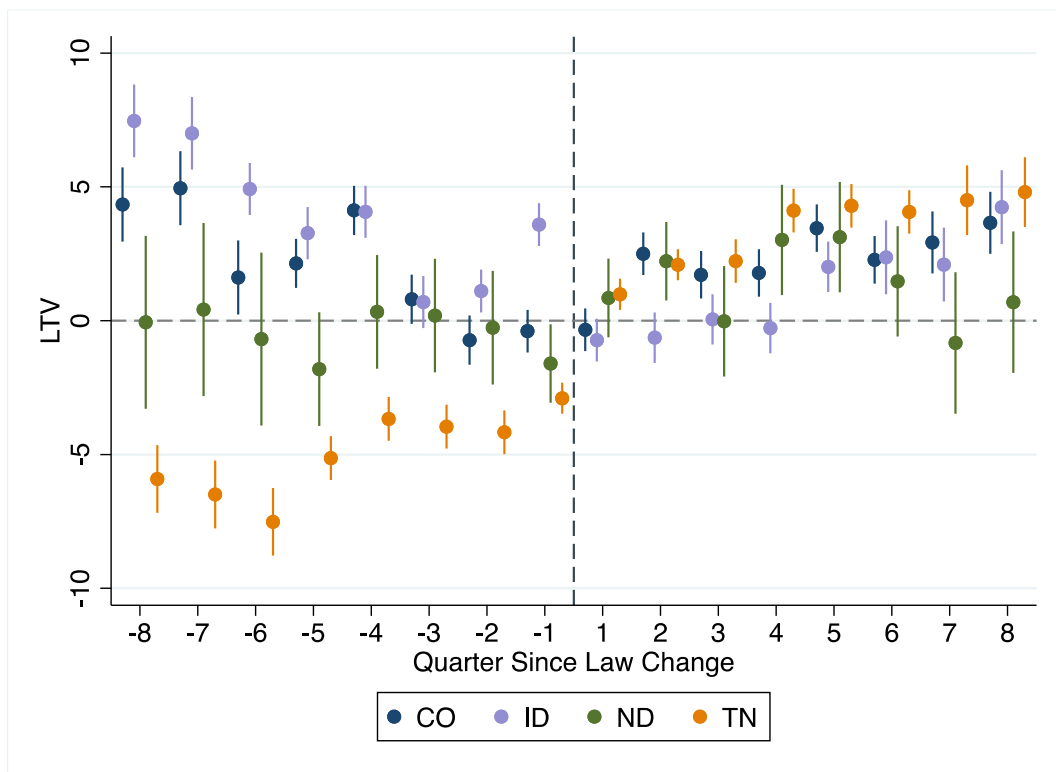


Figure 1A: Timing of Effect on Loan-to-value

This figure shows the timing of the effect of debt collection restrictions on the loan-to-value of single-family mortgage loans. This figure plots coefficient estimates and 95% confidence intervals of the year-by-year effects and shows how each state is affected over time. Observation is at an aggregated quarterly level, and included are fixed effects to control for unobserved time-varying differences across states. Controls include aggregated quarterly unemployment rate, house-price index, average disposable personal income, and average DPI growth. The vertical line indicates the quarter when the law came into effect. The vertical line indicates the quarter when the law came into effect. As mentioned in section 5.2, the results from the State of Connecticut were unreliable, and for that reason, Connecticut is excluded from the figures.

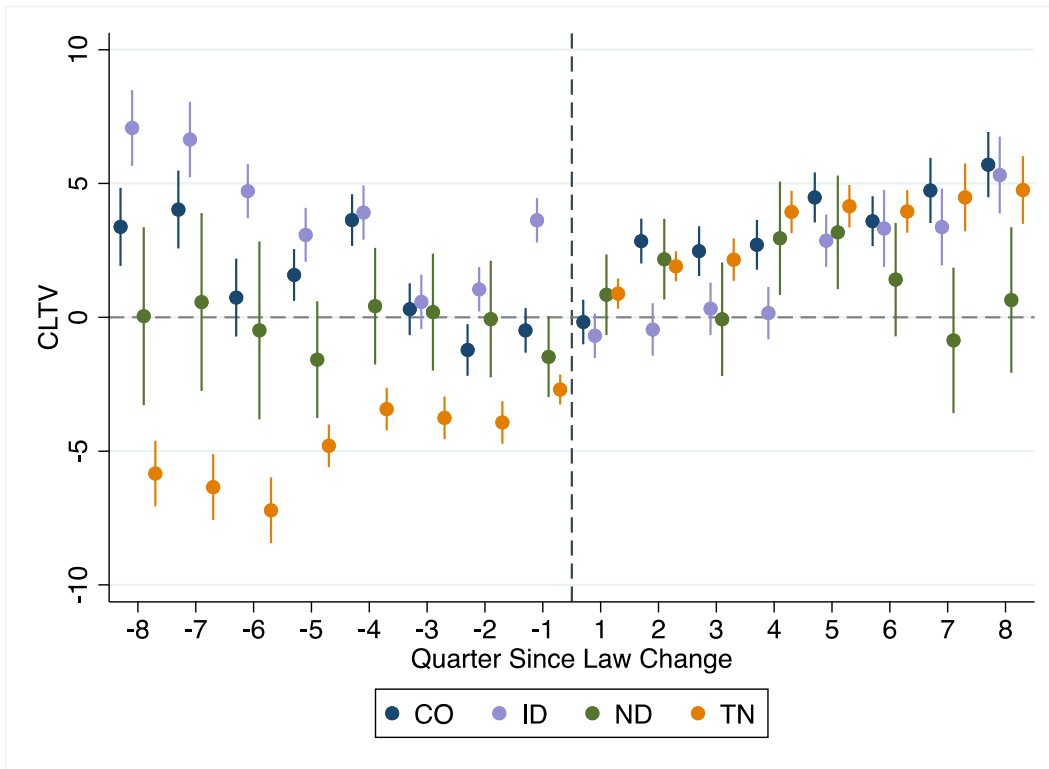


Figure 1B: Timing of Effect on Combined Loan-to-value

This figure shows the timing of the effect of debt collection restrictions on the combined loan-to-value of single-family mortgage loans. This figure plots coefficient estimates and 95% confidence intervals of the year-by-year effects and shows how each state is affected over time. Observation is at an aggregated quarterly level, and included are fixed effects to control for unobserved time-varying differences across states. Controls include aggregated quarterly unemployment rate, house-price index, average disposable personal income, and average DPI growth. The vertical line indicates the quarter when the law came into effect. The vertical line indicates the quarter when the law came into effect. As mentioned in section 5.2, the results from the State of Connecticut were unreliable, and for that reason, Connecticut is excluded from the figures.

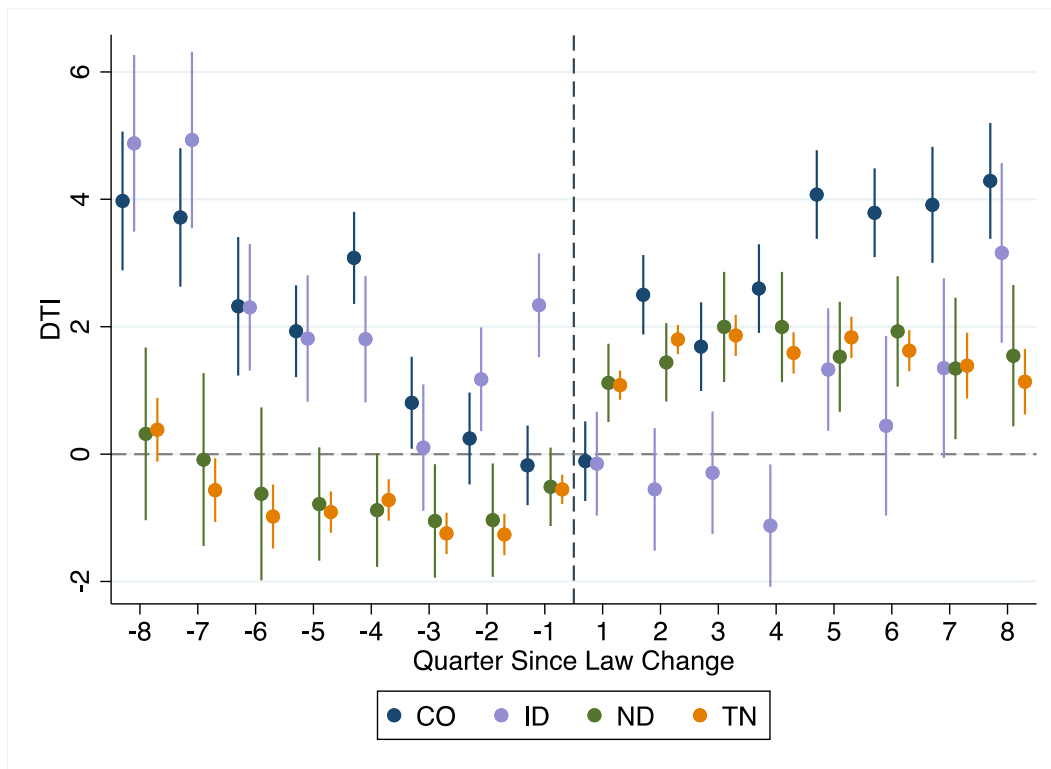


Figure 1C: Timing of Effect on Debt-to-value

This figure shows the timing of the effect of debt collection restrictions on the debt-to-income of single-family mortgage loans. This figure plots coefficient estimates and 95% confidence intervals of the year-by-year effects and shows how each state is affected over time. Observation is at an aggregated quarterly level, and included are fixed effects to control for unobserved time-varying differences across states. Controls include aggregated quarterly unemployment rate, house-price index, average disposable personal income, and average DPI growth. The vertical line indicates the quarter when the law came into effect. The vertical line indicates the quarter when the law came into effect. As mentioned in section 5.2, the results from the State of Connecticut were unreliable, and for that reason, Connecticut is excluded from the figures.

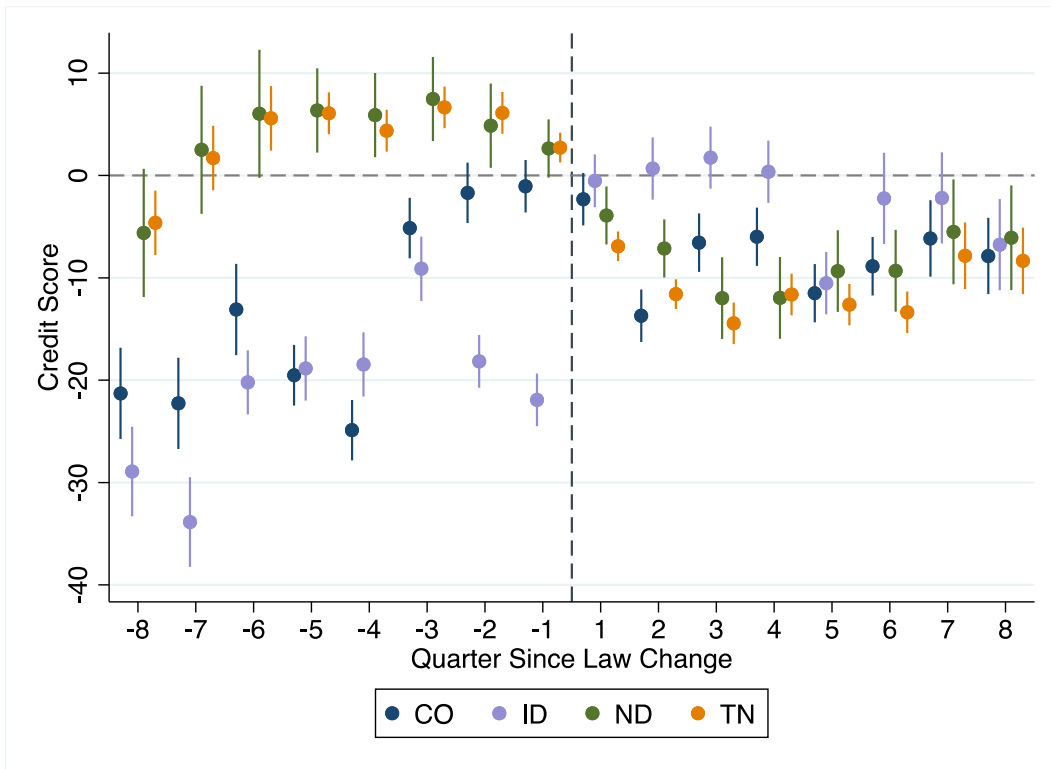


Figure 1D: Timing of Effect on Credit Scores

This figure shows the timing of the effect of debt collection restrictions on the credit score of single-family mortgage loans. This figure plots coefficient estimates and 95% confidence intervals of the year-by-year effects and shows how each state is affected over time. Observation is at an aggregated quarterly level, and included are fixed effects to control for unobserved time-varying differences across states. Controls include aggregated quarterly unemployment rate, house-price index, average disposable personal income, and average DPI growth. The vertical line indicates the quarter when the law came into effect. The vertical line indicates the quarter when the law came into effect. As mentioned in section 5.2, the results from the State of Connecticut were unreliable, and for that reason, Connecticut is excluded from the figures.

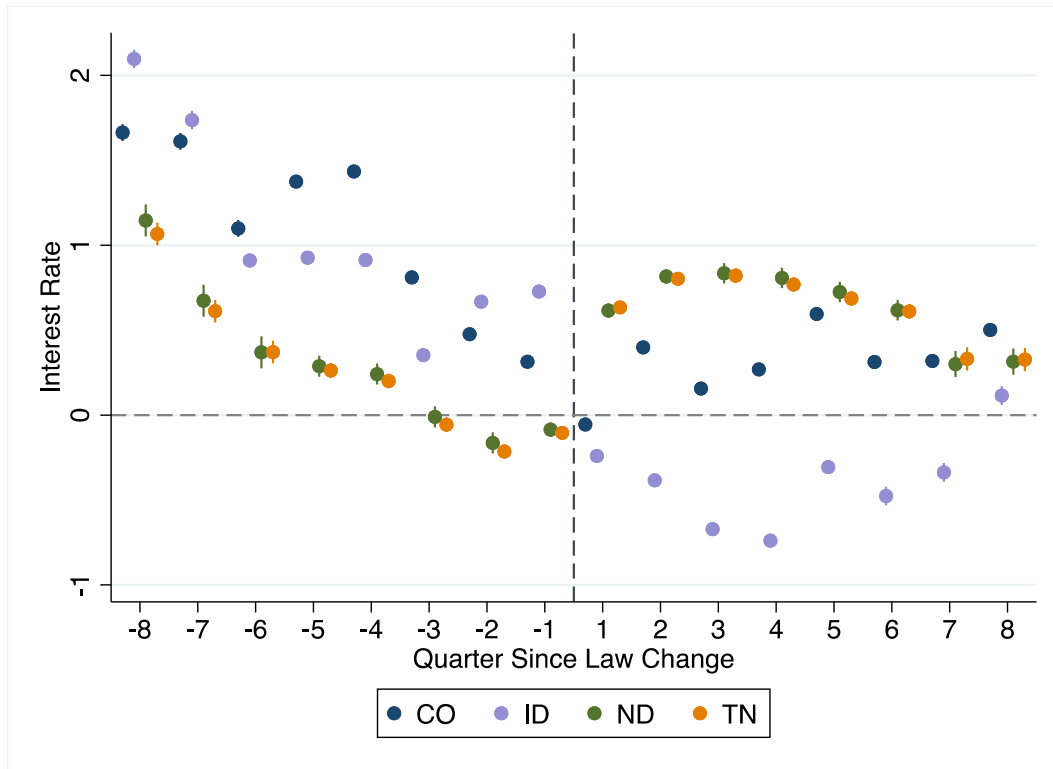


Figure 1E: Timing of Effect on Interest Rates

This figure shows the timing of the effect of debt collection restrictions on the interest rate of single-family mortgage loans. This figure plots coefficient estimates and 95% confidence intervals of the year-by-year effects and shows how each state is affected over time. Observation is at an aggregated quarterly level, and included are fixed effects to control for unobserved time-varying differences across states. Controls include aggregated quarterly unemployment rate, house-price index, average disposable personal income, and average DPI growth. The vertical line indicates the quarter when the law came into effect. The vertical line indicates the quarter when the law came into effect. As mentioned in section 5.2, the results from the State of Connecticut were unreliable, and for that reason, Connecticut is excluded from the figures.

Table 5A: Idaho

Dependent Variable:	LTV		CLTV		DTI		Credit score		Interest rate	
	Refinance (1)	Purchase (2)	Refinance (3)	Purchase (4)	Refinance (5)	Purchase (6)	Refinance (7)	Purchase (8)	Refinance (9)	Purchase (10)
Treated*After	0.728** (0.360)	1.258** (0.504)	0.952*** (0.354)	1.378*** (0.513)	1.218*** (0.270)	1.416*** (0.447)	2.015 (1.479)	-5.028*** (1.605)	-0.0493*** (0.0153)	0.0308** (0.0138)
Unemployment Rate	9.674 (23.16)	-36.88 (38.97)	7.306 (24.23)	-23.10 (39.46)	20.60 (20.38)	33.41 (25.92)	241.8*** (79.11)	64.47 (97.24)	1.470 (1.140)	2.486*** (0.868)
House Price Index	-0.00477 (0.0141)	0.0276 (0.0182)	0.00260 (0.0143)	0.0221 (0.0192)	-0.0318*** (0.0111)	0.00272 (0.0115)	-0.0339 (0.0486)	-0.205*** (0.0507)	0.000150 (0.000657)	-0.000396 (0.000488)
Average DPI	0.000157 (0.000184)	0.000198 (0.000259)	0.000177 (0.000192)	0.000200 (0.000266)	0.00104*** (0.000164)	0.000814*** (0.000188)	-0.000514 (0.000649)	-0.000518 (0.000789)	9.22e-07 (9.06e-06)	1.10e-05 (7.34e-06)
Income Growth	1.059 (7.238)	-3.336 (9.855)	6.088 (7.803)	0.0172 (9.631)	-26.35*** (6.645)	-23.15*** (8.006)	31.60 (24.61)	57.35* (32.22)	-0.175 (0.356)	-0.186 (0.269)
Observations	32,316,656	7,230,353	32,316,656	7,230,353	32,316,656	7,230,353	32,316,656	7,230,353	32,316,656	7,230,353
Adj. R-squared	0.021	0.011	0.020	0.007	0.013	0.003	0.035	0.014	0.662	0.819
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 5A: Impact of loan purpose on mortgage loans in Idaho

Notes: All columns report estimates of the linear regression model specified in Equation 1 LTV, CLTV, DTI, Credit Score, and Interest Rate for the state of Idaho, and separate each dependent variable by loan purpose, and the loan purpose of either refinancing or purchase. Estimates control for the state-level unemployment rate, house-price index, average disposable personal income, and average DPI growth. Robust standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5B: North Dakota

Dependent Variable:	LTV		CLTV		DTI		Credit score		Interest rate	
	Refinance (1)	Purchase (2)	Refinance (3)	Purchase (4)	Refinance (5)	Purchase (6)	Refinance (7)	Purchase (8)	Refinance (9)	Purchase (10)
Treated*After	0.267 (0.633)	2.075*** (0.772)	0.267 (0.658)	1.543* (0.799)	-1.067*** (0.268)	-0.206 (0.614)	0.293 (1.635)	1.875 (2.281)	-0.0227 (0.0226)	-0.0862*** (0.0311)
Unemployment Rate	-164.6*** (46.93)	-156.0** (61.60)	-174.5*** (48.09)	-161.0*** (60.40)	-25.25 (33.85)	-1.499 (37.68)	154.9 (171.7)	-80.89 (208.9)	-1.212 (1.810)	1.815 (2.126)
House Price Index	0.0403 (0.0300)	-0.113*** (0.0365)	0.0298 (0.0305)	-0.118*** (0.0357)	0.000698 (0.0188)	-0.0319 (0.0221)	-0.153 (0.110)	0.151 (0.127)	0.00223* (0.00120)	0.00304** (0.00133)
Average DPI	-0.000472*** (0.000131)	0.000425** (0.000177)	-0.000409*** (0.000132)	0.000485*** (0.000180)	0.000109 (7.63e-05)	0.000177 (0.000125)	0.000195 (0.000447)	-0.000870 (0.000568)	-3.57e-06 (4.73e-06)	-3.06e-06 (6.58e-06)
Income Growth	8.485** (4.084)	-1.247 (5.919)	7.041* (4.197)	-3.938 (5.991)	-6.386*** (1.999)	-1.460 (4.574)	5.031 (9.470)	38.40** (16.47)	0.0845 (0.127)	-0.0626 (0.199)
Observations	3,474,263	1,549,401	3,474,263	1,549,401	3,474,263	1,549,401	3,474,263	1,549,401	3,474,263	1,549,401
Adj. R-squared	0.021	0.010	0.023	0.010	0.011	0.01	0.034	0.017	0.340	0.499
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 5B: Impact of loan purpose on mortgage loans in North Dakota

Notes: All columns report estimates of the linear regression model specified in Equation 1 LTV, CLTV, DTI, Credit Score, and Interest Rate for the state of North Dakota, and separate each dependent variable by loan purpose, and the loan purpose of either refinancing or purchase. Estimates control for the state-level unemployment rate, house-price index, average disposable personal income, and average DPI growth. Robust standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5C: Colorado

Dependent Variable:	LTV		CLTV		DTI		Credit score		Interest rate	
	Refinance (1)	Purchase (2)	Refinance (3)	Purchase (4)	Refinance (5)	Purchase (6)	Refinance (7)	Purchase (8)	Refinance (9)	Purchase (10)
Treated*After	0.851*** (0.157)	-1.046*** (0.340)	1.064*** (0.175)	-0.626* (0.338)	-0.416** (0.163)	-1.908*** (0.293)	-0.360 (0.570)	4.370*** (1.120)	0.00328 (0.00916)	-0.0271*** (0.00973)
Unemployment Rate	-19.30 (18.34)	91.06*** (26.89)	-32.47* (18.06)	71.40*** (26.81)	59.34*** (13.23)	95.55*** (20.35)	79.61 (53.56)	-179.2** (85.26)	-0.644 (0.599)	-0.192 (0.800)
House Price Index	-0.0342*** (0.00580)	-0.0322*** (0.00572)	-0.0342*** (0.00568)	-0.0321*** (0.00528)	-0.00179 (0.00329)	-0.0140*** (0.00473)	0.0110 (0.0190)	-0.0170 (0.0183)	-0.000240 (0.000158)	-0.000166 (0.000130)
Average DPI	0.000370** (0.000162)	0.000420** (0.000180)	9.07e-05 (0.000173)	0.000149 (0.000189)	0.000685*** (0.000134)	0.000677*** (0.000168)	-0.00121** (0.000507)	-0.00138** (0.000657)	-9.76e-06 (7.44e-06)	5.52e-06 (7.00e-06)
Income Growth	-21.99*** (5.111)	-14.39** (6.539)	-19.34*** (5.305)	-12.66* (6.440)	-14.61*** (4.506)	-13.56*** (4.857)	14.63 (16.35)	14.97 (21.46)	0.0319 (0.263)	0.124 (0.295)
Observations	38,419,139	9,366,285	38,419,139	9,366,285	38,419,139	9,366,285	38,419,139	9,366,285	38,419,139	9,366,285
Adj. R-squared	0.039	0.027	0.037	0.018	0.019	0.019	0.030	0.016	0.600	0.675
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 5C: Impact of loan purpose on mortgage loans in Colorado

Notes: All columns report estimates of the linear regression model specified in Equation 1 LTV, CLTV, DTI, Credit Score, and Interest Rate for the state of Colorado, and separate each dependent variable by loan purpose, and the loan purpose of either refinancing or purchase. Estimates control for the state-level unemployment rate, house-price index, average disposable personal income, and average DPI growth. Robust standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5D: Tennessee

Dependent Variable:	LTV		CLTV		DTI		Credit score		Interest rate	
	Refinance (1)	Purchase (2)	Refinance (3)	Purchase (4)	Refinance (5)	Purchase (6)	Refinance (7)	Purchase (8)	Refinance (9)	Purchase (10)
Treated*After	-0.385* (0.225)	-0.341* (0.178)	-0.317 (0.221)	-0.406** (0.187)	-0.0300 (0.129)	0.235 (0.146)	-1.271*** (0.445)	-0.178 (0.503)	0.0231** (0.00984)	-0.000350 (0.00611)
Unemployment Rate	48.43*** (11.34)	25.55** (10.22)	52.68*** (11.36)	37.01*** (10.43)	1.589 (5.264)	-9.984 (7.898)	53.98** (26.72)	8.216 (35.56)	0.737 (0.640)	-0.118 (0.456)
House Price Index	-0.0161 (0.0109)	-0.0234** (0.0115)	-0.0160 (0.0112)	-0.0169 (0.0118)	-0.0230*** (0.00669)	-0.0124 (0.00793)	0.0418 (0.0287)	0.0617 (0.0382)	-0.00112* (0.000627)	-0.00161*** (0.000455)
Average DPI	0.000536*** (0.000158)	2.44e-05 (0.000196)	-0.000530*** (0.000153)	-0.000109 (0.000204)	-0.000185** (9.06e-05)	0.000259** (0.000101)	0.000696* (0.000420)	-0.000887* (0.000531)	3.94e-05*** (9.71e-06)	8.80e-06 (7.18e-06)
Income Growth	10.95*** (3.748)	0.821 (4.504)	8.643** (3.679)	1.665 (4.564)	5.424** (2.124)	-2.249 (2.686)	-28.98*** (9.715)	19.35 (12.49)	0.104 (0.249)	0.196 (0.178)
Observations	29,860,315	11,986,680	29,860,315	11,986,680	29,860,315	11,986,680	29,860,315	11,986,680	29,860,315	11,986,680
Adj. R-squared	0.033	0.019	0.028	0.019	0.014	0.009	0.049	0.017	0.319	0.467
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 5D: Impact of loan purpose on mortgage loans in Tennessee

Note: All columns report estimates of the linear regression model specified in Equation 1 LTV, CLTV, DTI, Credit Score, and Interest Rate for the state of Tennessee, and separate each dependent variable by loan purpose, and the loan purpose of either refinancing or purchase. Estimates control for the state-level unemployment rate, house-price index, average disposable personal income, and average DPI growth. Robust standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.