



Borrower Credit Access and Credit Performance after Loan Modifications

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Motivation

- Housing crisis during the Great Recession
 - Large number of borrowers had difficulty in making mortgage payments
 - Lead to significant concern of foreclosure: high costs of foreclosures and negative externalities; exacerbated by institutional frictions
- There are a number of foreclosure and stabilization policies
 - HAMP, HARP, lower interest rate policies, private work-out, foreclosure prevention counseling, NSP
 - 3.6 millions of loan modifications during 2008-2014
- Need to learn more about the effectiveness of these programs

Motivation

- How loan modification programs affect consumers' financial well-being and their access to credit?
- Direct impact of loan mods: reporting of loan modifications by servicers, curing existing mortgage delinquency...
- Indirect impact of loan mods: prevention of new mortgage defaults
- Indirect impact of loan mods: spillover effect on other accounts
 - Potential payment relief from mods may lead to greater liquidity for borrowers, which helps them make debt payments on time.
 - Changed pecking order of mortgage payments and payments on credit cards and other debt could lead to more defaults on other accounts.

Related Literature

- Literature on who receive loan modifications (Cordell et al., 2009; Foote et al., 2010; Piskorski et al., 2010; Agarwal et al., 2011; Mayer et al., 2011; Been et al., 2013; and Adelino et al., 2013; Ding, 2014).
- Studies on post-modification mortgage performance (Haughwout, Okah, and Tracy, 2010; Quercia and Ding, 2009; Agarwal et al. 2010, 2012; Schmeiser and Gross, 2014; Scharlemann and Shore, 2015).
- Consumer finance literature on the choice between prioritizing mortgage payments or payments on other accounts (Jagtiani and Lang, 2011; Cohen-Cole and Morse, 2010; and Andersson et al., 2013).
- Literature on credit experience after bankruptcy and foreclosures (e.g., Brevoort and Cooper, 2010; Han and Li, 2011; Cohen-Cole, Duygan-Bump, and Montoriol-Garriga, 2013; Jagtiani and Li, 2014; and Dobbie and Song, 2014).

Related Literature: A Few Recent Studies

- Keys, et al. (2014) found that moderate payment reductions (through refinancing into mortgages with lower rates) lower mortgage default risk (20-40% reduction), increase new auto financing, and improve the overall household credit standing.
- Calem, Jagtiani, and Lang (2015) found modifications generally improve the curing probability of credit card delinquencies and reduce the balance on credit cards for borrowers already in foreclosure.
- Kim (2015) found modifications reduce mortgage default rate while the unsecured loan charge-off rate increases. He suspects that a household is more likely to default on its unsecured debt while preserving its home.

This Study: A Preview

- Use a unique national dataset that match mortgage data with borrower credit records
- Estimate the impact of loan mods on borrowers' access to credit/credit performance

Findings

- Loan modifications improve borrowers' overall household credit standing: a 24 point increase in 6 months and a 20 point improvement in 24 months.
- Loan modifications lead to a slight increase in certain debt (HELOC, auto); but performance on these accounts has generally been unaffected.

Data

- A 5% random sample of loan modifications during 2005-2012 in the Equifax Credit Risk Insight Servicing McDash (CRISM); tracked their performance till the end of 2014; over 65,000 loan modifications (borrowers) to start from.
- Modifications identified using a “contract-change” algorithm developed by Adelino, Gerardi, and Willen (2013) and Foote, et al. (2010)
 - ✓ Loan mods are identified based on changes in the mortgage contract, including changes in the interest rate, principal balance, and loan term.
 - ✓ “Contract-change” algorithm provides more consistent estimate of loan mods over time and across different institutions.
 - ✓ Servicer reported data and contract-change algorithms had converged over time by 2008.

Identification Strategy

- Primarily descriptive; followed the primary borrowers' short-term credit experience post- modification (6-month, 12-month, 24-month)
- No perfect control group is available; tried to construct a counterfactual by identifying individuals with similar initial characteristics as individuals who receive loan mods based on observables.
- Used a difference-in-differences framework and a set of linear regression models to further isolate the loan mod effects.

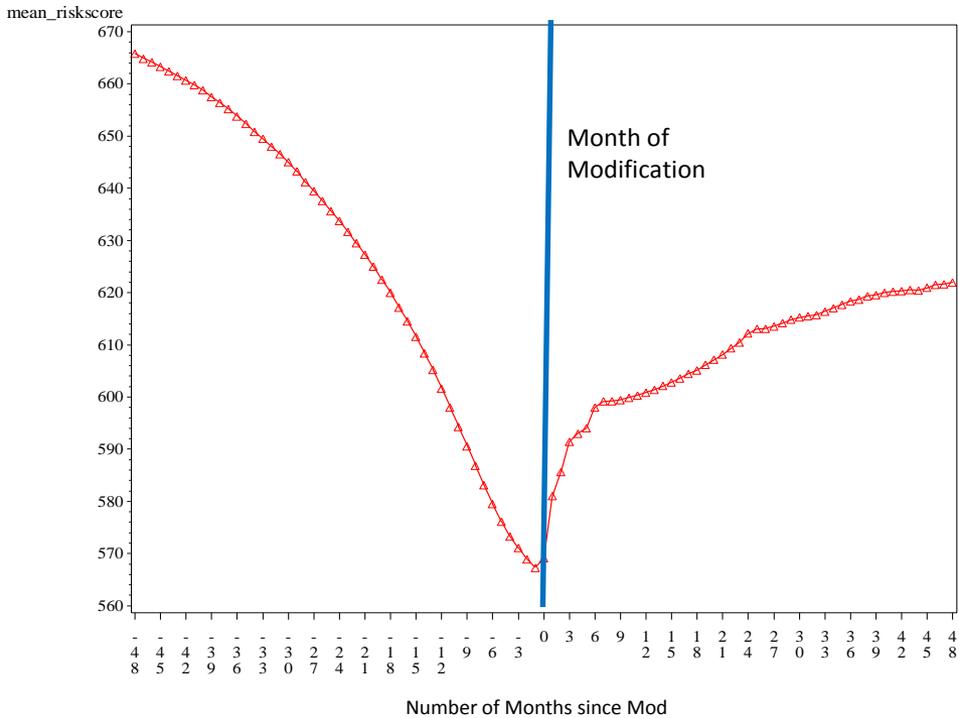
Construction of The Counterfactual: A Matched Sample

Modified loans and delinquent (60+day) but not modified loans were matched by:

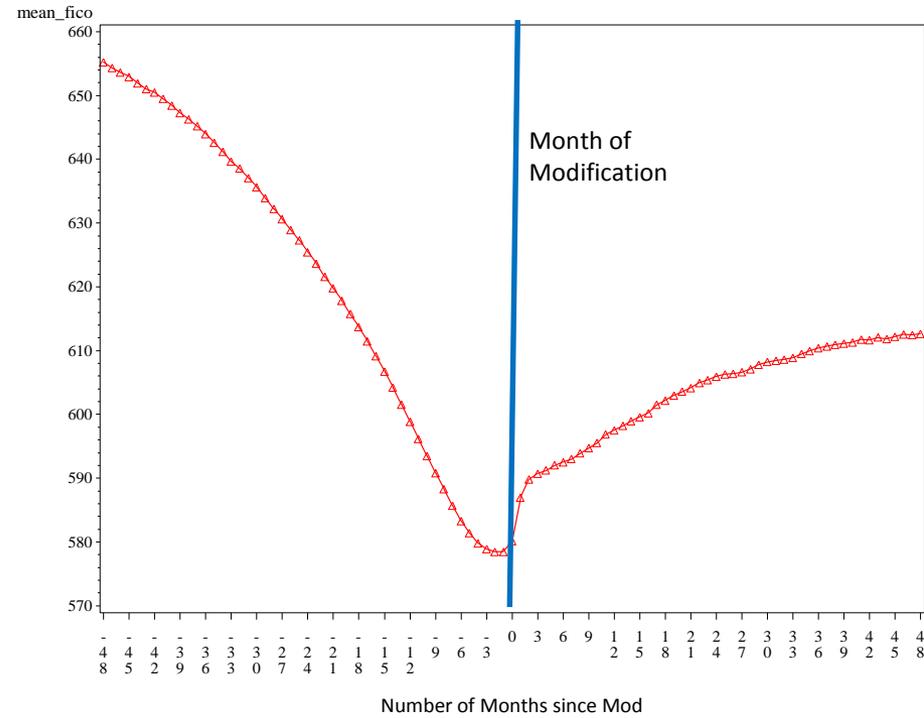
- Risk score (categorical)
 - Unpaid balance (categorical)
 - Timing of initial delinquency (within 6 months)
 - Debt-to-income score (categorical)
 - Whether having credit cards
 - Mortgage delinquency status (categorical)
 - Geography (zip code or county)
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- Age (primary borrower, categorical))
 - Origination cohort (categorical)
 - Household income (estimated, categorical)

Credit Score Change Pre- and Post-Modification

Equifax Risk Score



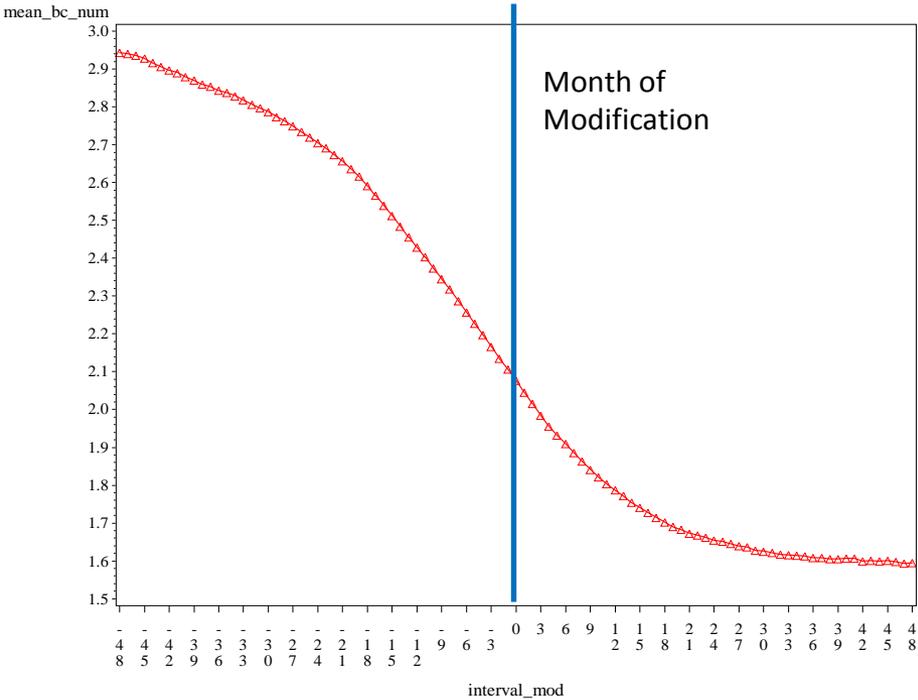
FICO Score



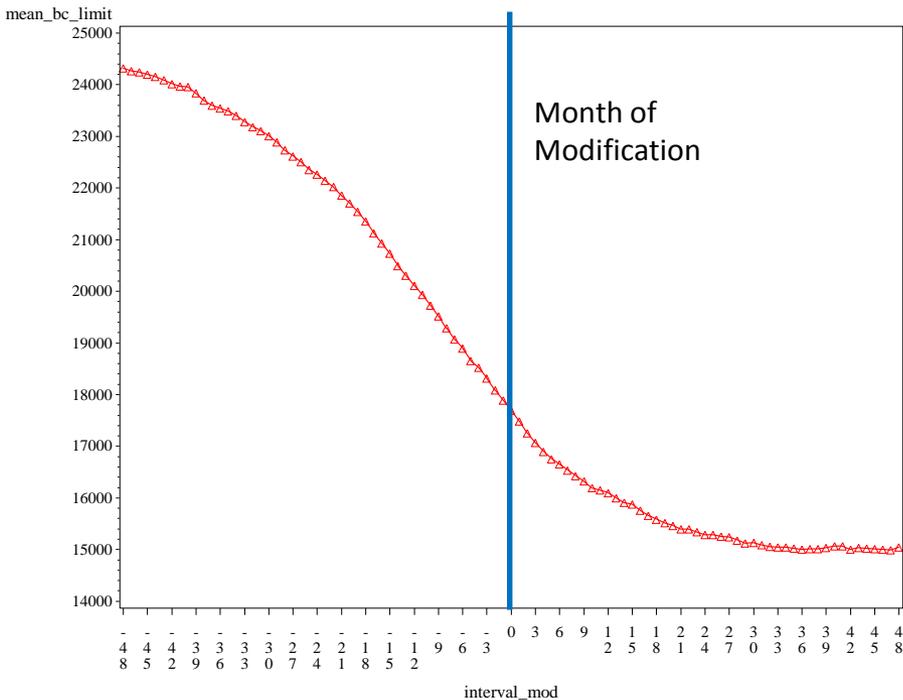
Source: Author's calculation based on a 5% random sample of first-lien mortgages originated during 2005-2009 in the Equifax Credit Risk Insight Servicing McDash (CRISM); modifications were identified based on an algorithm similar to Adelino et al. (2013)

Number of Credit Cards/Total Amount of Credit Limit Pre- and Post-Modification

Number of Credit Cards



Credit Limit of All Credit Cards



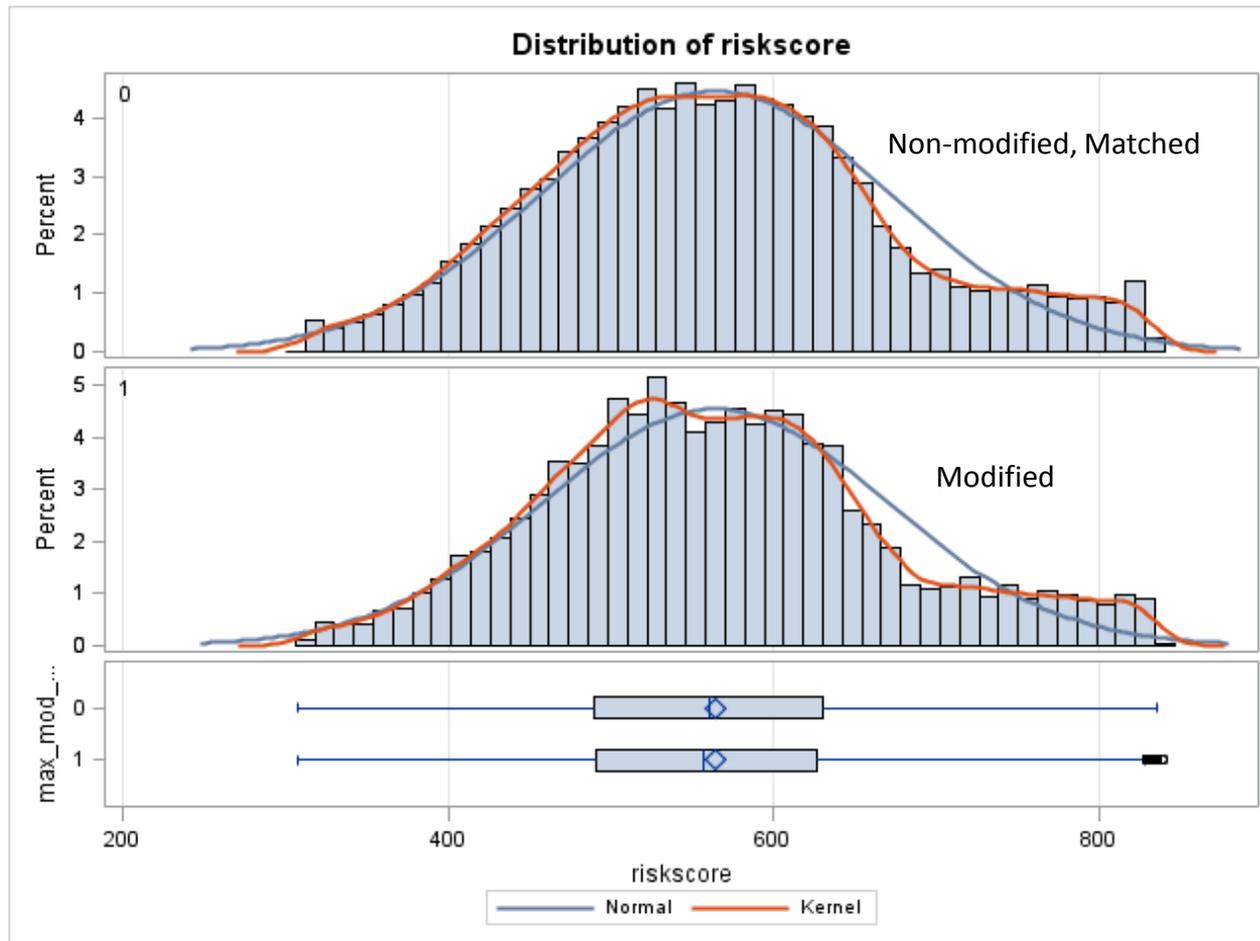
Source: Author's calculation based on a 5% random sample of first-lien mortgages originated during 2005-2009 in CRISM; modifications were identified based on an algorithm similar to Adelino et al. (2013).

Construction of The Counterfactual

Variable	All Loan Mods	Matched Sample		
		Matched Mods	Delinquent but Not Modified	Difference
risk score (mean)	562	563	562	0.472
risk score (median)	553	559	557	
FICO score	575	575	576	-1.494
borrower_age	46	46	45	0.600
borrower_age (median)	45	44	45	
debt-to-income score	634	638	634	4.803***
borrower income (estimated)	41	43	43	-0.554***
household income (estimated)	58	58	58	0.109
principal balance amount	235,769	255,189	259,640	-4,451***
credit card dummy	0.742	0.884	0.883	0.000
number of credit cards	2.008	2.527	2.510	0.016
credit card limit	15,971	16,538	17,495	-957***
credit card balance	9,799	10,330	11,228	-898***
credit card utilization rate	73.137	72.706	72.254	0.452
late on credit cards	0.274	0.341	0.370	-0.029***
auto loan dummy	0.485	0.514	0.535	-0.021***
auto loan balance	15,632	17,344	16,353	992***
late on auto loans	0.220	0.191	0.224	-0.032***
HELOC dummy	0.118	0.142	0.156	-0.014***
HELOC limit	77,161	75,050	89,260	-14,210***
HELOC balance	64,549	63,432	77,171	-13,739***
late on HELOC	0.315	0.307	0.420	-0.113***
retail card dummy	0.543	0.620	0.599	0.021***
retail card limit	3,234	3,565	3,431	133***
retail card balance	1,280	1,368	1,368	-0.280
late on retail cards	0.238	0.222	0.240	-0.018***
consumer finance dummy	0.363	0.410	0.391	0.019***
consumer finance account limit	7,443	7,352	7,601	-249
consumer finance account balance	4,518	4,141	4,504	-363
late on consumer finance accounts	0.282	0.254	0.289	-0.036***
student loan dummy	0.171	0.176	0.177	-0.001
student loan balance	29,510	29,313	30,360	-1,046
late on student loan	0.170	0.138	0.158	-0.020***
Number of observations	65,504	15,029	21,371	

Source: Author's calculation based on a 5% random sample of first-lien mortgages originated during 2005-2009 in CRISM; modifications were identified based on an algorithm similar to Adelino et al. (2013).

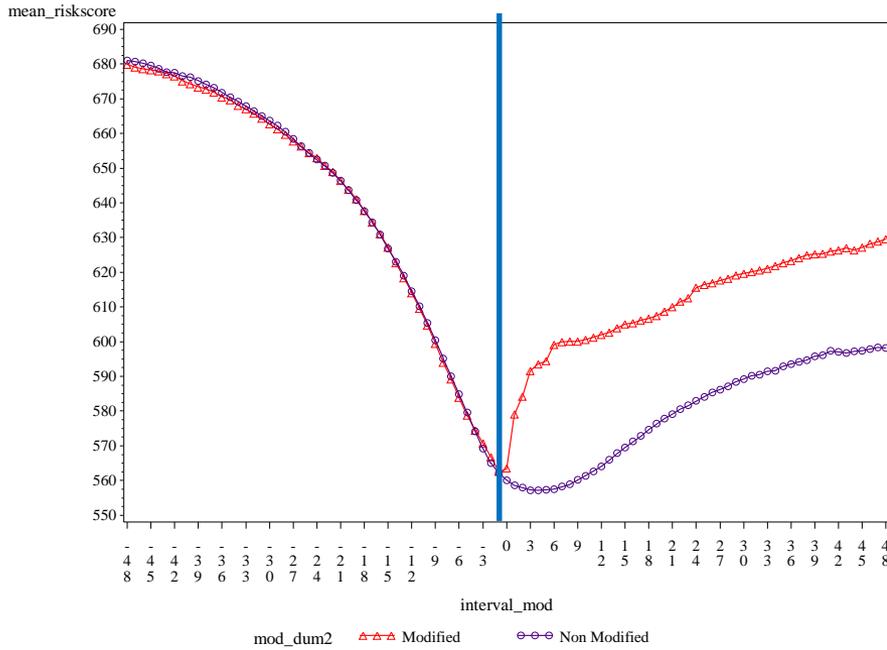
Equifax Risk Score Distribution (The Matched Sample)



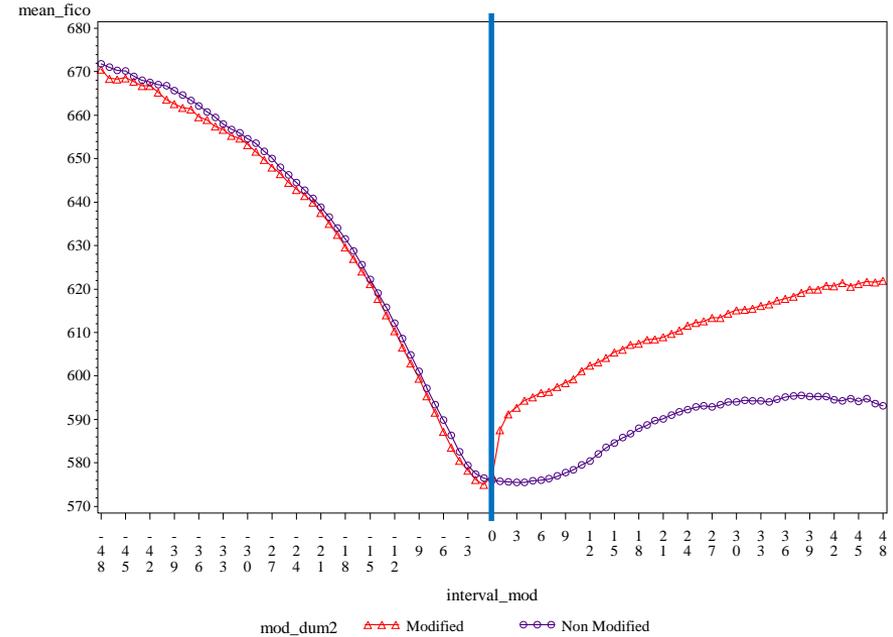
Note: Based on a 5% random sample of loans originated during 2005-2009 in CRISM data; observed for the month immediately before modification (or being matched)

Average Credit Score Pre- and Post-Modification (Modified and Matched)

Equifax Risk Score

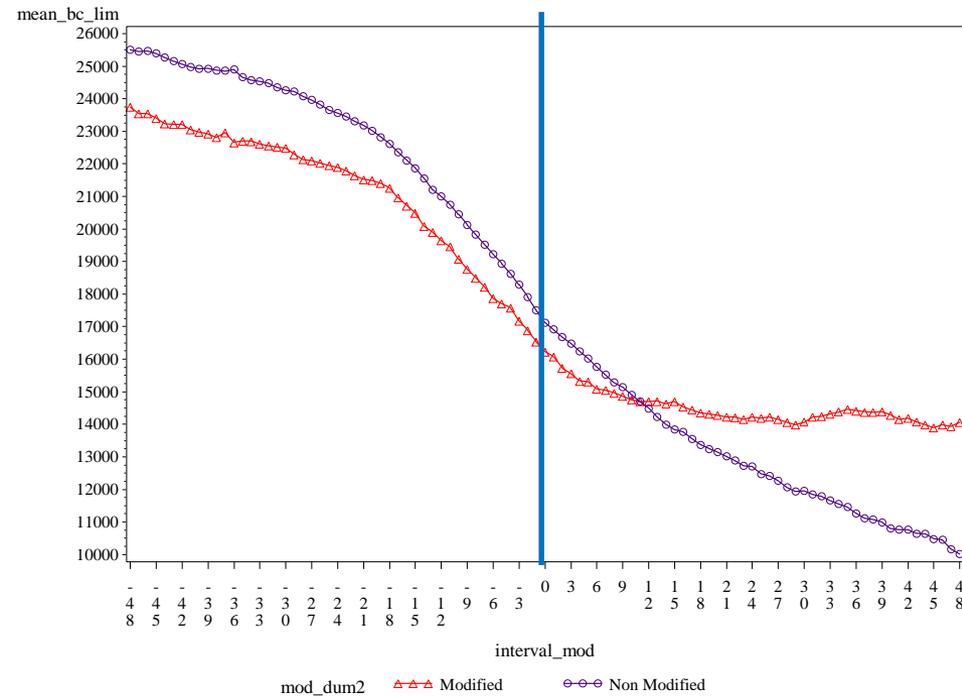
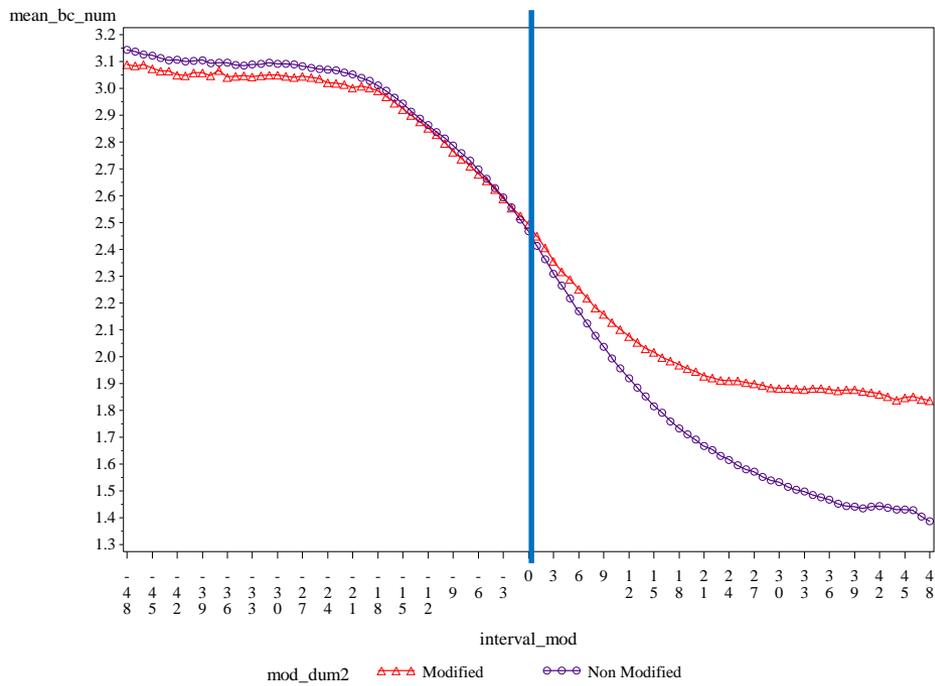


FICO Score



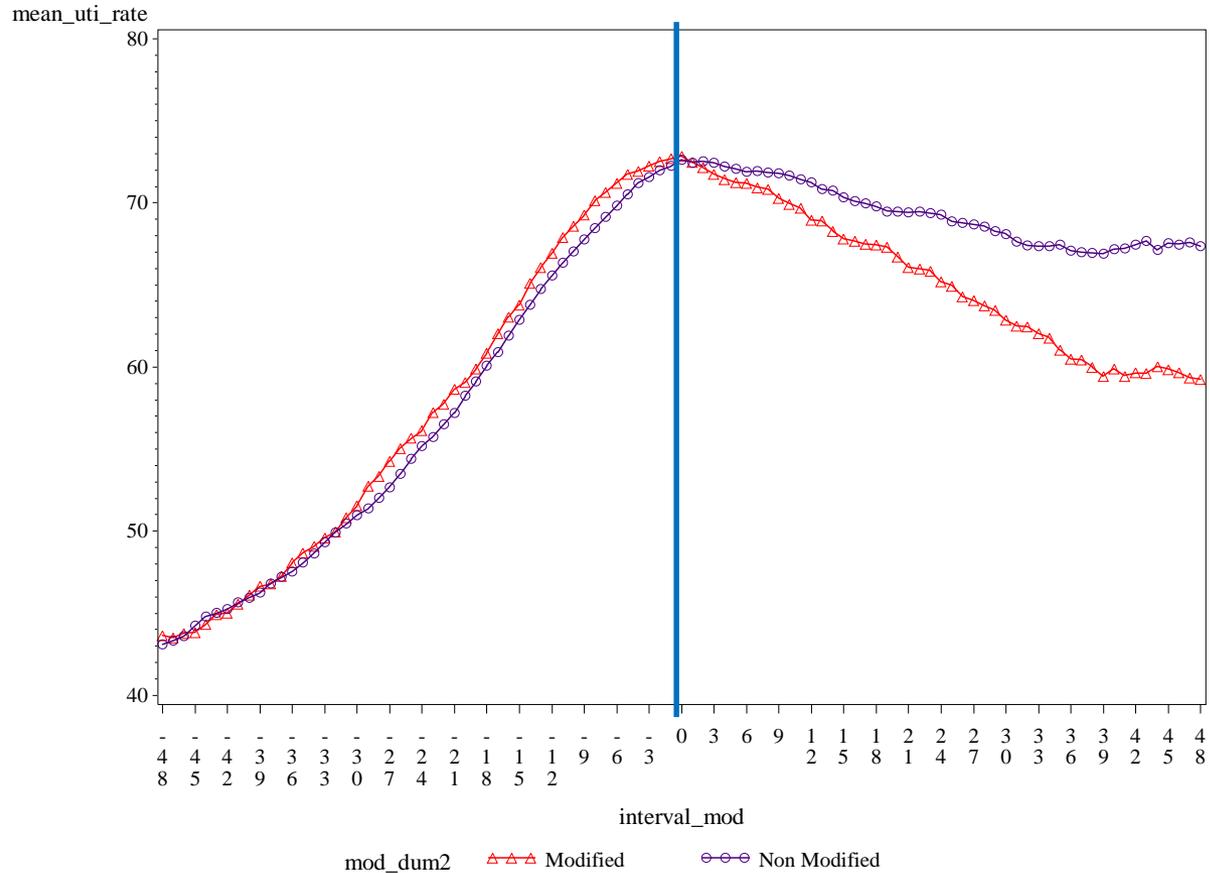
Note: interval_mod represents the number of months between the observation month and the modification month; based on a 5% random sample of loans originated during 2005-2009 in CRISM data

Number of Credit Cards and Total Amount of Credit Limit Pre- and Post-Modification (Modified and Matched)



Note: interval_mod represents the number of months between the observation month and the modification month; based on a 5% random sample of loans originated during 2005-2009 in CRISM data

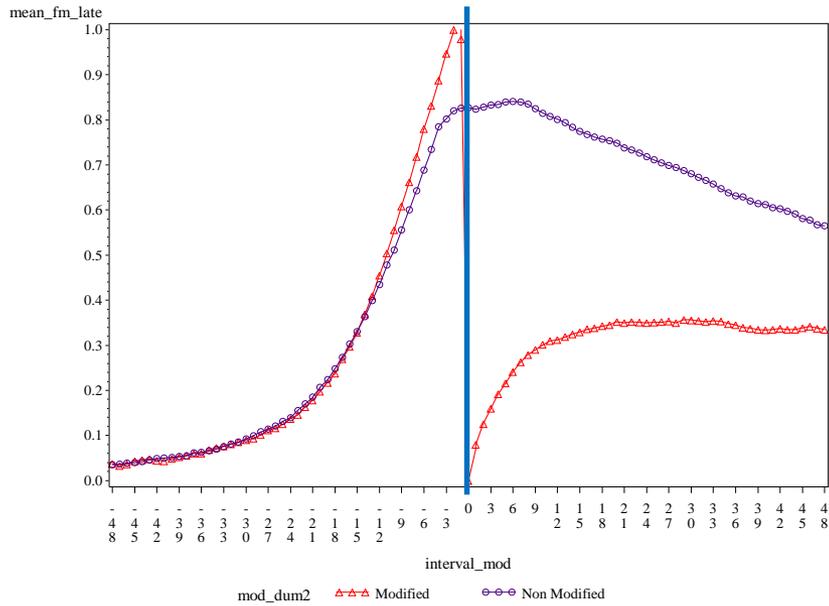
Credit Card Utilization Ratio Pre- and Post-Modification (Modified and Matched)



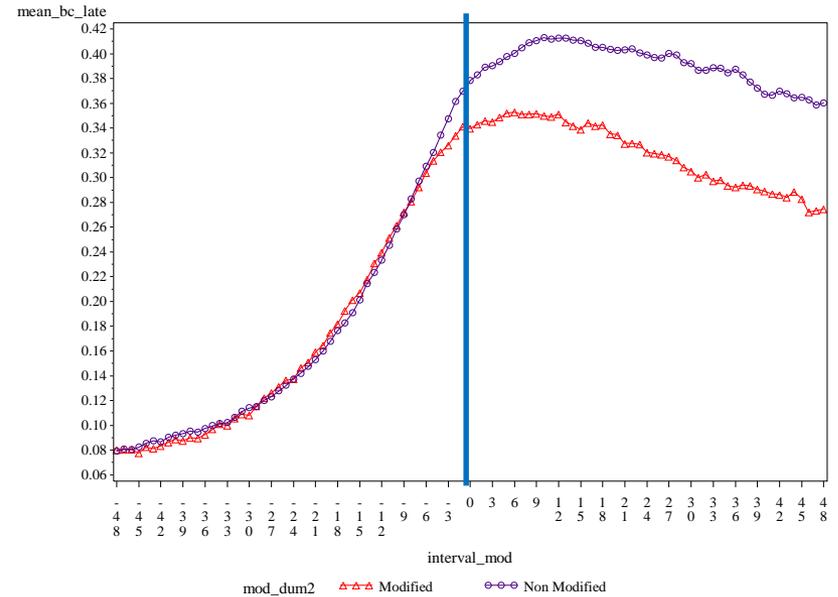
Note: interval_mod represents the number of months between the observation month and the modification month; based on a 5% random sample of loans originated during 2005-2009 in CRISM data

Mortgage and Credit Card Performance Pre- and Post-Modification (Modified and Matched)

Mortgage Delinquency Rate (30+day)



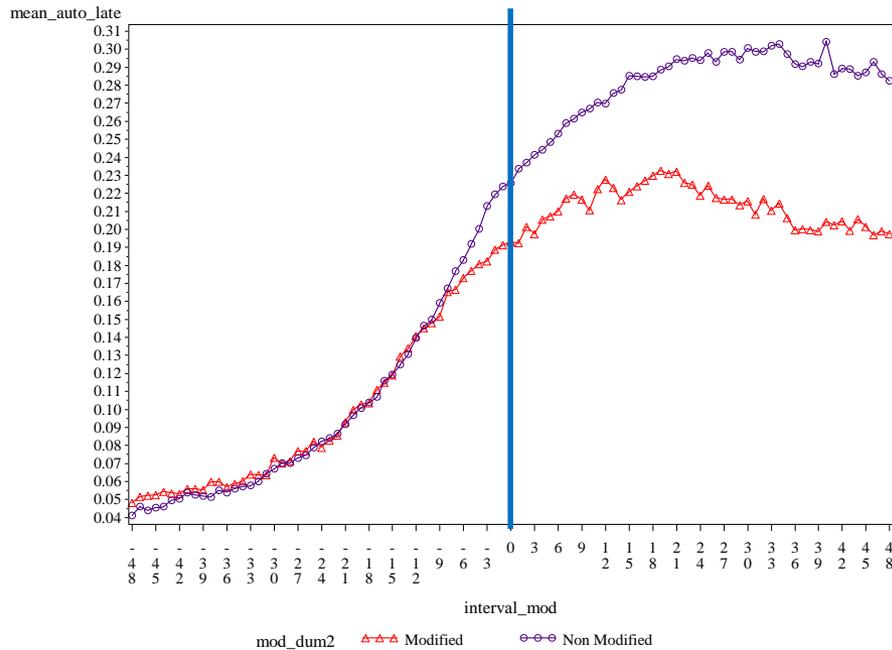
Credit Card Delinquency Rate (30+day)



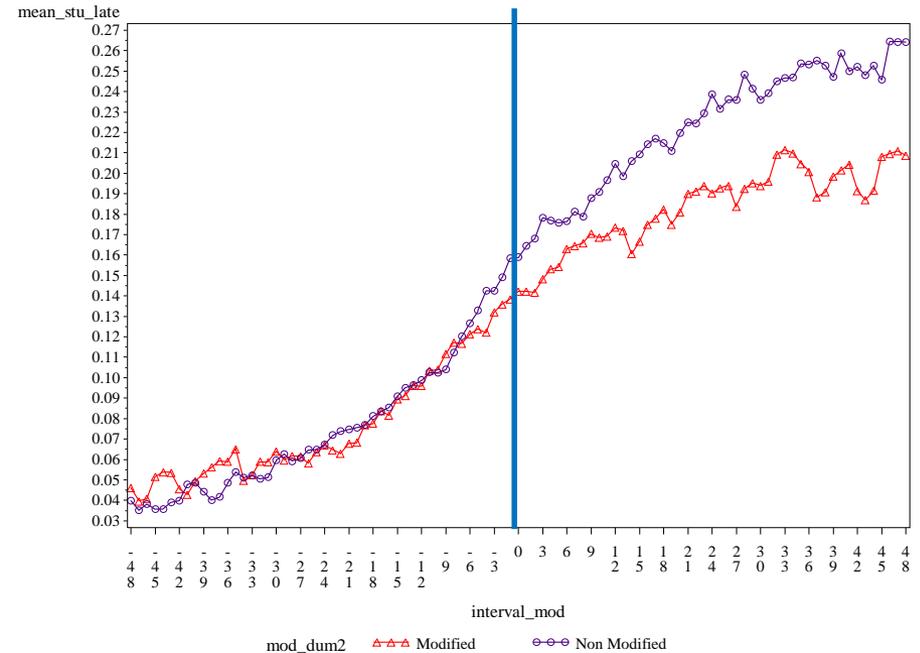
Note: interval_mod represents the number of months between the observation month and modification month; based on a 5% random sample of loans originated after 2005 in CRISM data

Auto Loan and Student Loan Performance Pre- and Post-Modification (Modified and Matched)

Auto Loan Delinquency Rate (30+day)



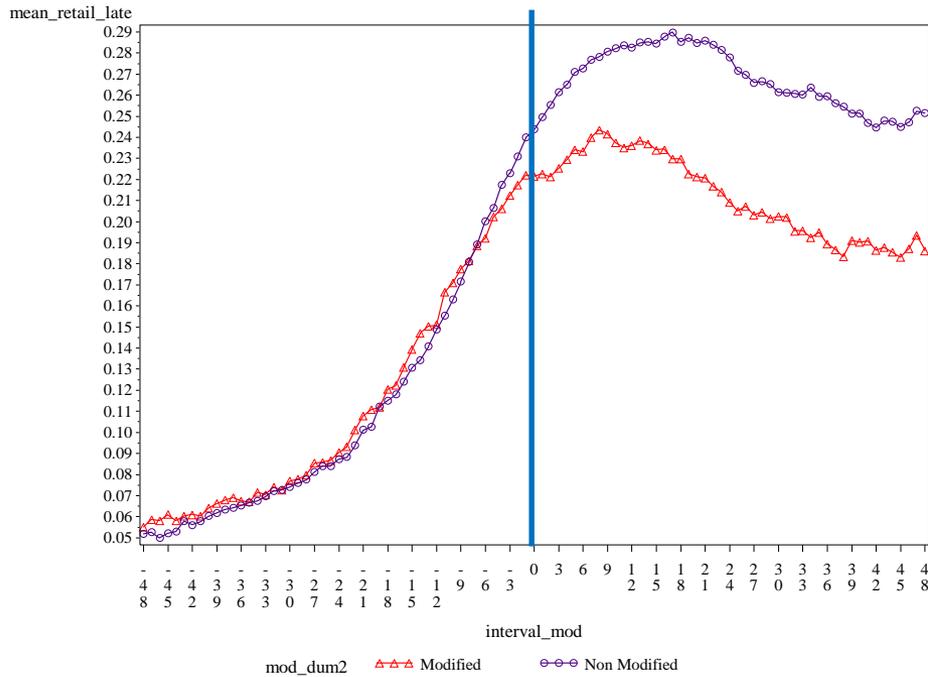
Student Loan Delinquency Rate (30+day)



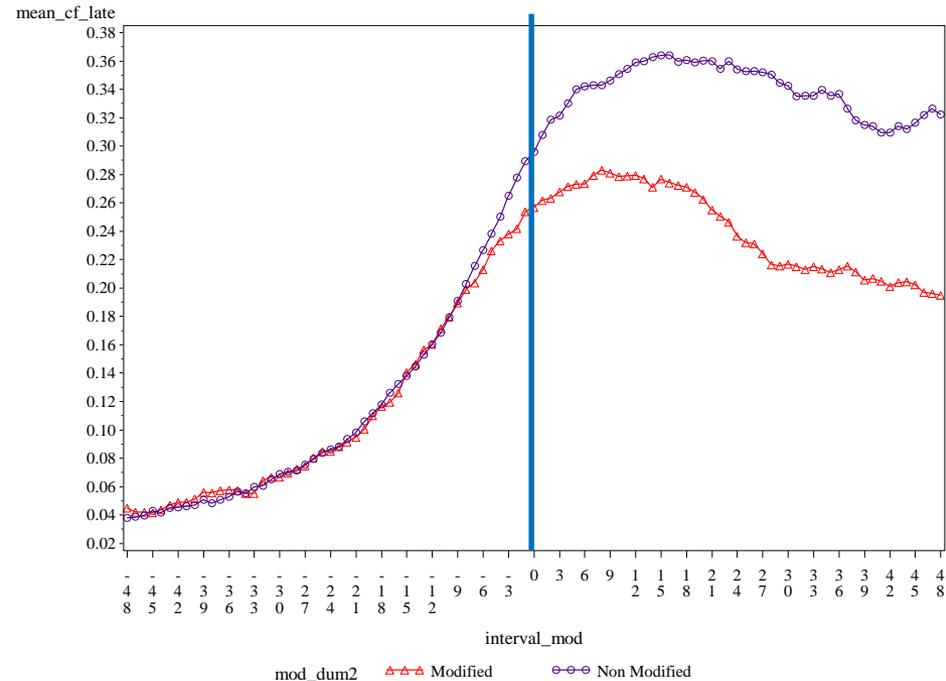
Note: interval_mod represents the number of months between the observation month and the modification month; based on a 5% random sample of loans originated during 2005-2009 in CRISM data

Retail and Consumer Finance Accounts Performance Pre- and Post-Modification (Modified and Matched)

Retail Account Del Rate (30+day)



Consumer Finance Account Del Rate (30+day)



Note: interval_mod represents the number of months between the observation month and the modification month; based on a 5% random sample of loans originated during 2005-2009 in CRISM data

Empirical Results: Loan Mod Effects on Access to Credit

Change in Credit Access Measures Post-modification

	<i>Coef. (std. err.)</i>
<u>Risk score change</u>	
6-months	24.215(1.573) ^{***}
12-months	19.553(1.465) ^{***}
24-months	20.340(1.142) ^{***}
<u>Credit Card Limit</u>	
6-months	41.7(120.8)
12-months	744.6(179.5) ^{***}
24-months	1,118.1(177.2) ^{***}
<u># of Credit Cards</u>	
6-months	0.034(0.011) ^{***}
12-months	0.087(0.013) ^{***}
24-months	0.198(0.019)
<u>Credit limit (12-mons)</u>	
credit card limit	744.6(179.5) ^{***}
HELOC limit	3,412.2(1,040.9) ^{***}
retail account limit	204.0(48.5) ^{***}
consumer finance account limit	71.5(155.1)

Note: Summary of coefficients from different regressions; ^{***}, ^{**}, ^{*} represent significant at 0.01, 0.05, or 0.1 level; author' calculation based on data from the Equifax Credit Risk Insight Servicing McDash (CRISM).

Empirical Results: Loan Mod Effects on Access to Credit

Heterogeneity in the Loan Mod Effects

<u>Risk score change (12 mons)</u>	
<i>principle reduction</i>	24.406(3.461) ^{***}
<i>rate reduction (no prin_red)</i>	21.079(1.562) ^{***}
<i>term extension only</i>	13.430(4.439) ^{***}
<i>other mods</i>	8.287(3.003) ^{***}
<u>Risk score change (12 mons)</u>	
<i>Inc/No Chg</i>	8.846(2.107) ^{***}
<i>1-10% Red</i>	14.286(2.808) ^{***}
<i>10-20% Red</i>	16.324(3.179) ^{***}
<i>20-30% Red</i>	22.651(2.698) ^{***}
<i>30-40% Red</i>	20.765(1.966) ^{***}
<i>40-50% Red</i>	23.845(2.286) ^{***}
<i>>50% Red</i>	26.873(1.863) ^{***}

Note: Summary of coefficients from different regressions; ^{***}, ^{**}, ^{*} represent significant at 0.01, 0.05, or 0.1 level; author' calculation based on data from the Equifax Credit Risk Insight Servicing McDash (CRISM).

Empirical Results: Loan Mod and Credit Use

Change in Credit Use Measures Post-Modification

Credit Use Measures (12 months)	Loan Mod Effect (<i>std. err.</i>)
Revolving account balance	1,318.9(283.7)***
Credit card balance	217.4(175.5)
HELOC balance	2,557.3(937.0)***
Retail account balance	72.9(33.5)**
Auto loan balance	322.1(87.2)***
Student loan balance	-479.4(349.8)
Consumer finance account balance	24.1(145.0)
Credit card utilization rate	-0.977(0.392)***

Note: Summary of coefficients from different regressions; ***, **, * represent significant at 0.01, 0.05, or 0.1 level; author' calculation based on data from the Equifax Credit Risk Insight Servicing McDash (CRISM).

Empirical Results: Loan Mod and Credit Performance

Credit Performance Post-modification

Credit Default (30+day late in 12 months)	Loan Mod Effect
Credit cards	-0.011(0.006)*
HELOC	0.020(0.018)
Auto loans	0.008(0.006)
Student loans	-0.006(0.013)
Retail loans	-0.001(0.006)
Consumer Finance	0.013(0.007)*

Note: Summary of coefficients from different regressions; ***, **, * represent significant at 0.01, 0.05, or 0.1 level; author' calculation based on data from the Equifax Credit Risk Insight Servicing McDash (CRISM).

Summary

Loan modifications

- Help troubled borrowers rehabilitate their credit scores, thereby increasing access to credit or decreasing the costs of access.
- Lead to a slight increase in certain debt (HELOC and auto loans); but the performance on these accounts has generally been unaffected.
- Generate positive spillover effects on borrowers' access to credit without deteriorating their credit performance.

Thank You

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