Credit Market Consequences of Credit Flag Removals*

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Abstract

This paper estimates the impact of a bad credit report on financial outcomes by exploiting exogenous variation in the timing of credit flag removals. Credit flags are removed from credit reports after seven years, generating an immediate change in the information available to the credit market. We study the effects of credit flag removal using a sample of 246,000 individuals whose flags were removed between 2004 and 2013. We find that the removal of bankruptcy and charge-off flags result in increased credit scores. These increased scores are associated with increases in the number of credit card lines, credit card limits, and credit card balances. Results from a second identification strategy exploiting a sudden change in how credit flags are coded yields similar results. The findings support the view that credit reporting decisions have direct credit market consequences for consumers.

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1 Introduction

Access to credit plays a central role in most individuals' financial lives. Individuals borrow to smooth their consumption (e.g., with credit cards), invest in human capital (e.g., with student loans), and purchase durable goods (e.g., with auto and mortgage loans). Thus, understanding how changes in credit reports affect access to credit – and in turn borrowing – is a key economic question.

This paper examines the impact of an improved credit report on a number of important financial outcomes. Our research design uses the sharp removal of various credit "flags" from credit reports at statutorily determined time horizons. Under the Fair Credit Reporting Act (FCRA), credit bureaus are required to remove most credit flags either seven or ten years after the initial event. For example, credit bureaus are required to remove charge-off flags seven years after the initial charge-off. Chapter 13 bankruptcy flags are similarly removed at seven years, while Chapter 7 bankruptcy flags are removed at ten years. Because these credit flags are an input into credit-scoring models, these removals result in a discontinuous change in the information available to the credit market.

Our study uses a sample of 246,000 individuals whose flags were removed between 2004 and 2013. In particular, our panel dataset was based on a random sample of all individuals with TransUnion credit records in June 2014, and tracks these individuals from 2001 through 2015, pulling credit reports from June of each year. The TransUnion data include the complete credit record including public records (e.g., bankruptcies, civil judgments, and tax liens), credit inquiries, trade lines, and credit score. For a randomly selected 10% of the sample, we observe all trade-line level information (e.g., balances on each credit card, individual collection items). No personally identifiable information ("PII") were provided to us by TransUnion.

We find that the removal of bankruptcy and charge-off flags has a sharp, statistically and economically significant, and fairly persistent effect on credit scores. Our event study estimates indicate that bankruptcy flag removal raises credit scores by 14 points in the first year, with similar effects at horizons of two or three years after removal. We find that charge-off flag removal raises credit scores by 15 points in the first year, with longer-run effects that are somewhat more sensitive to the empirical specification.

This jump in credit scores due to flag removal translates into higher credit card credit limits and credit card balances in most of our regression specifications. Bankruptcy flag removal leads to a roughly 15% increase in new credit card openings, 30% increase in new credit card limits, and 20% increase in new credit card balances. Charge-off flag removal similarly leads to corresponding proportional effects of new credit card openings, limits, and balances. We estimate that charge-off flag removal leads to a roughly 20% increase in limits and balances on all credit cards (both new and existing). We find similar – if not slightly larger – effects when we restrict our charge-off flag analysis to the subsample of individuals with a preexisting bankruptcy flag,

We also examine the effect of bankruptcy and charge-off flag removal on auto loan balances and mortgage balances. We do not observe sharp, on-impact effects for these outcomes, either for all tradelines (new and existing) or when we focus on new tradelines, where one might be more likely to detect an effect. Our inability to detect an effect may stem from the fact that individuals open new auto loans and mortgages less frequently that credit cards, which would make detecting a similarly-sized proportional effect more challenging. We also caution against interpreting longer-run effects for

auto and mortgage outcomes, due to the strong preexisting time trends for these variables over our window of observation.

To provide additional evidence on the impact of credit flags on creditworthiness and credit access, we also use a second identification strategy that exploits a sudden change in how charge-off flags were recorded by the credit bureaus. In October 2008, credit bureaus suddenly changed derogatory credit flags to discharged in bankruptcy flags for individuals who (i) received a discharge through Chapter 7 bankruptcy and (ii) whose debts had not been sold to a third-party debt collector. We estimate the impact of these changes using a difference-in-differences design that compares the outcomes of Chapter 7 bankruptcy filers whose debts were not sold to a third-party (the "treatment" group), who have their flags changed in October 2008, to the outcomes of Chapter 7 bankruptcy filers whose debts were sold to a third-party (the "control" group), who are unaffected in October 2008.

We find that the flag switch led to an increase in credit scores of 10 to 18 points on average for the treated consumers relative to the control group. The increase in credit scores led to greater credit card limits and card balances in the subsequent years. Unfortunately, the relatively small sample sizes used to produce these estimates and the challenges of estimating credit market responses to this change in the midst of the Great Recession mean that these results are sensitive to the inclusion of time trends. Thus, we recommend caution in over-interpreting these difference-in-difference findings.

Nonetheless, the two approaches follow a consistent pattern: Removing indicators of previous negative credit market behavior leads to sharp and immediate increases in credit scores. These increases in creditworthiness are associated with increased credit card account opening and account usage. Impacts on other credit products or credit openings are possible, but difficult to detect using our empirical framework.

Our paper is related to a number of papers that examine the effects of flag removal on credit market outcomes. The recent literature builds on work by Musto (2004), who studies the impact of bankruptcy flag removal on credit scores and credit card borrowing using an event study design. Musto (2004) finds that flag removal has a sharp short-run effect on credit scores and credit card borrowing, but has adverse longer-run consequences. More recently, Gross, Notowidigdo and Wang (2016) use credit bureau data and an event study design to estimate the effect of bankruptcy flag removal on credit card limits and credit card balances and Dobbie et al. (2017) use the staggered removal of Chapter 7 versus Chapter 13 flags to study the effects of flag removal on credit bureau and labor market outcomes. Where comparable, our estimates from the current analysis are quite similar to those in the related literature.

The rest of our paper proceeds as follows. Section 2 presents background on credit reporting and describes our data. In Section 3, we present our research design. Section 4 presents our results for the credit market outcomes. Section 5 concludes.

2 Background and Data

2.1 Credit Reporting

The history of credit reporting in the United States can be traced back to the nineteenth century, when third parties sold lists of deadbeat borrowers to local merchants. The credit reporting industry grew throughout the twentieth century, but remained highly fragmented, with 2,250 local and regional firms

as of 1970. During the 1970s and 1980s, the rapid growth in credit card lending fueled an expansion and consolidation of the credit bureau industry. Today, there are three national credit reporting agencies – Equifax, TransUnion, and Experian – that provide most credit reports. See CFPB (2012) for more on the history of the credit reporting system.

Along with basic information on name, address, and Social Security number (SSN), consumer credit reports provide four main categories of information:

(i) The *tradeline* segment provides information on contract characteristics, utilization, and delinquency or default at the product level. For instance, for an individual credit card, the tradeline data include information on the credit limit, account balance, and whether the consumer is in delinquency or default. The tradeline data are provided to the credit bureaus by lenders.

(ii) The *public records* segment includes information on bankruptcies and tax liens. Non-financially relevant public information, such as marriage records, are not included in the credit report. These data are obtained from the Public Access to Court Electronic Records (PACER) system and government offices.

(iii) The *collections* segment provides information on debts under collection and is reported to the credit bureaus by third-party collection agencies.

(iv) The *inquiries* segment provides information on consumer-initiated credit requests, known as "hard" inquiries. "Soft" inquiries, which result, for example, from a bank-initiated pre-screening, are typically not revealed to others upon inquiry or incorporated into credit scores.

The Fair Credit Reporting Act (1970) limits the amount of time that information can be maintained on credit reports. The FCRA stipulates that information on late payments, delinquencies, and collection items be removed after seven years. Information on Chapter 13 bankruptcies is also traditionally removed after a period of only seven years, while Chapter 7 bankruptcies may be listed for ten years after the order for relief or date of adjudication.

Requestors of credit bureau information do not necessarily receive the full set of credit bureau data. Potential employers, for instance, usually receive modified credit reports that do not contain an individual's date of birth or credit score. Lenders, on the other hand, usually receive at least one consumer credit score, in addition to all of the standard credit report information. These credit scores are sometimes developed by third parties, such as the Fair Isaac Corporation (FICO), and sometimes developed by the credit bureaus themselves (e.g., the TransUnion CreditVision®Link^{SM} credit score). There are also dozens of different types of credit scores, each based on different outcome variables and used for different types of lending decisions. The most commonly used credit scores aim to predict the probability that a consumer will become 90+ days delinquent on a new loan within the next 24 months. See CFPB (2012) for more background on the U.S. credit reporting system.

2.2 Data Sources and Sample Construction

This study uses credit bureau data from TransUnion. The full dataset is based on a random sample of 3,000,000 individuals who had credit reports in June 2014.[1] We construct a panel dataset with infor-

[1] Our data is a representative sample of all individuals with a credit file but does not include the roughly 11 percent of the U.S. population without credit files. As a result, our credit data will be more representative for high-income individuals

mation on these individuals from June of each year from 2001 and 2015, inclusive. Our sample size naturally decreases in the years away from 2014 due to entry into in the credit reports (e.g., individuals opening their first account) and exit (e.g., due to death or emigration).

In each snapshot, the TransUnion data includes the complete credit record for each sampled consumer including public records (e.g., bankruptcies, civil judgments, and tax liens), credit inquiries, trade lines, and credit score. For a randomly selected 10% of the sample, we all observe tradeline level information (e.g., balances on each credit card, individual collection items) used to construct the standard credit records. In the data appendix, we detail how we code each variable used in the analysis.

We use four samples for our analysis. The bankruptcy sample is restricted to the set of individuals who had a bankruptcy flag removed during our sample period. The charge-off sample is similarly restricted to individuals who had a charge-off flag removed during our sample period. We further subdivide the charge-off sample into a subsample of those with a preexisting bankruptcy flag at the time of charge-off flag removal. Finally, the difference-in-differences sample is restricted to individuals who received a discharge through Chapter 7 bankruptcy, whether or not those debts had been sold to a third-party debt collector. In all four samples, we restrict to individuals for whom we observe outcomes at least three years before and three years after a flag removal or change in flag designation.

Table 1 provides summary statistics for each of these three samples. Panel A shows average outcomes in the year prior to flag removal (or change in flag type). Panel B shows average outcomes in the year of flag removal (or change in flag type). The credit score we report is the Vantage Score 3.0 measure of credit risk. The Vantage Score ranges from 300 to 850, with a higher score indicating greater creditworthiness.

In the year prior to flag removal (or before the change in flag type), credit scores average 579 in the charge-off sample, 596 in the bankruptcy sample, and 573 in the difference-in-difference samples, and the share of individuals whose credit score has increased year-on-year ranges from 52% to 58%. Non-credit score outcomes tend to be highest for the bankruptcy sample, and lowest in the charge-off sample, but there are some exceptions. Average credit card limits range from $2,255 to $3,921 and average credit card balances range from $1,026 to $1,721 across samples. Average auto balances range from $3,504 to $6,216 across samples; the values are low because the averages include zeros for individuals without an auto loan. Average mortgage loan balances range from $21,174 to $32,236 across samples, with the low values similarly arising because the averages include zeros.

In addition to examining effects on all borrowing, we also examine effects on new loans. We do this because new borrowing may be more sensitive than balances on existing loans, allowing us to better detect the impact of flag removal. In the year prior to flag removal (or before the change in flag type), individuals opened between 0.03 and 0.65 new credit card accounts and hold average credit card balances of $33 and $475 across the four samples. In the year prior to flag removal, new auto balances range from $129 to $2,321 across samples and new mortgage balances range from $503 to $5,078 across samples.

than for low-income individuals.

3 Research Design

We estimate the impact of a discrete improvement in one's credit report on financial outcomes using two complimentary empirical approaches. First, we use an event study design that exploits the sharp removal of credit flags at statutorily determined time horizons. Second, we use a difference-in-differences design that exploits a sudden change in how credit flags of Chapter 7 bankruptcy filers were recorded on credit reports.

3.1 Event Study Specification

Our main empirical approach is an event study design that compares the outcomes of individuals just before and just after a flag removal. Our strategy exploits the fact that The Fair Credit Reporting Act (1970) stipulates that information on late payments, delinquencies, and collection items be removed after seven years. Our goal is to study this flag removal at seven years and to use it to estimate the causal effect of the change in credit report information available to potential lenders.

We first take a non-parametric, graphical approach to the event study analysis. For each outcome y_{it} of individual i in year t, we denote the years since a credit flag removal as r_{it}. We estimate the following non-parametric event study regression:

$$y_{it} = \gamma_t + \gamma_c + \sum_{\tau \neq -1} \delta_\tau \cdot \mathbf{1}\{r_{it} = \tau\} + \epsilon_{it} \tag{1}$$

Here, γ_t represents year fixed effects and γ_c represents fixed effects for each flag-removal cohort based on the year in which their flag was removed. The coefficients δ_τ show the effect of flag removal over "event time" τ, defined as the year relative to the year of flag removal. We normalize the effect to be equal to zero in the year prior to flag removal ($\tau = -1$) so the effects can be compared to this baseline.

We then plot estimates of δ_τ over event-time. Such an event study approach describes the change in outcomes before and after flag removal with few parametric assumptions. Intuitively, the regression compares outcomes for consumers who just had their credit flag removed to outcomes for consumers who have yet to have their flags removed while differencing out the common effect of calendar time and level shifts across cohorts.

A drawback to this approach is that it does not control for trends that depend on the time elapsed since the initial credit event. The placement of a credit flag on the credit report often represents a dramatic event in the financial lives of consumers, potentially causing a sharp and immediate decrease in their credit scores. Over time, consumers may gradually accumulate new credit following the initial credit event. These dynamics can cause overall credit usage to exhibit trends prior to credit flag removal. Since flag removal is not randomly assigned and occurs at the same relative time for all consumers, the nonparametric event study cannot account for such trends. To account for pre-trends, we complement the approach above with a parametric event study regression that controls for a linear preexisting time trend.

3.2 Difference-in-Differences Specification

To provide additional evidence on the impact of flags on creditworthiness and credit access, we also use a second identification strategy that exploits a sudden change in how various derogatory

flags were recorded by the credit bureaus in an appendix. In October 2008, credit bureaus suddenly changed delinquency and charge-off flags to discharged in bankruptcy flags for individuals who (i) received a discharge through Chapter 7 bankruptcy and (ii) whose debts had not been sold to a third-party debt collector. We estimate the impact of these changes using a difference-in-differences design that compares the outcomes of Chapter 7 bankruptcy filers whose debts were not sold to a third-party (the "treatment" group), who have their flags changed in October 2008, to the outcomes of bankruptcy filers whose debts were sold to a third-party (the "control" group), who are unaffected in October 2008.

For a given outcome, y_{it}, our difference-in-differences regression specification takes the form:

$$y_{it} = \gamma_t + \gamma_c + \sum_{\tau \in T} \delta_\tau \cdot \mathbf{1}\{Treatment_i = 1\} \cdot \mathbf{1}\{t = \tau\} + \epsilon_{it} \tag{2}$$

Here, γ_t again represents year fixed effects while γ_c now represents fixed effects for each bankruptcy filing cohort. $\mathbf{1}\{Treatment_i\}$ is an indicator for being in the treatment group (i.e. a Chapter 7 bankruptcy filer whose debts were not sold to a third-party) and δ_τ are coefficients on the treatment group that vary non-parametrically by event-time. We omit the period prior to October 2008, $\tau = -1$, so that the other δ_τ's can be interpreted relative to this baseline period. We also drop the base effect for the year prior to flag removal, $\gamma_t = -1$, as it is not separately identified from the other fixed effects in the specification.

In this specification, the δ_τ coefficients for $\tau > 0$ can be interpreted as the differential change in y_{it} for the treatment group relative to the control group following October 2008. The identifying assumption is parallel trends: conditional on our controls, y_{it} would have followed a similar evolution for both groups of Chapter 7 bankruptcy filers in the absence of the settlement agreement with the credit bureau. This identifying assumption would be violated if the treatment and control groups have different trends over time. Below, we assess the validity of this assumption by examining outcomes for the treatment and control groups in the pre-settlement period.

4 Results

We first use our event study design to analyze the effects of various types of credit flag removal on credit scores, credit card limits and balances, auto loan balances, and mortgage balances. We then discuss the results from our difference-in-differences design, which examines the relative impact of the derogatory flag designation on the same set of outcomes.

4.1 Event Study Estimates

4.1.1 Bankruptcy Flag Removals

We start by examining the effect of bankruptcy flag removal on our outcome variables. Figure 1 plots average credit scores, the share of individuals that experience a year-on-year increase in credit scores, credit card limits, credit card balances, auto loan balances, and mortgage balances on all tradelines (new and existing) relative to the date of bankruptcy flag removal. Figure 2 plots average credit card limits and balances, auto loan balances, and mortgage balances on *new* tradelines relative to the date of bankruptcy flag removal. Table 2 shows regression estimates of the effect of bankruptcy flag removal. Columns 1-3 display effects at horizons of 1-3 years from our baseline event study specification and

columns 4-6 display effects at 1-3 years from a specification that controls for a linear time trend. Event study plots for all and for new tradelines are shown in Appendix Figures A1 and A2.

The top left panel of Figure 1 shows that bankruptcy flag removal leads to a sharp, persistent, and economically significant increase in credit scores. The top right panel shows that this average increase is accompanied by a sharp increase in the share of individuals that experience a year-on-year increase in credit scores. The non-parametric regression estimates indicate that scores increase by 14 points in the first year and 17 to 19 points at longer time horizons. As reported in the first row of Table 2, the estimated impact on credit scores is very similar whether time trends are included or not. Since credit scores are used in the vast majority of lending decisions, improvements in credit scores should directly translate into increased credit availability, lower interest rates, or both.

The sharp increase in credit scores, somewhat puzzlingly, does not translate into a robust increase in credit card limits and balances, auto loan balances, or mortgage balances in the analysis that aggregates all tradelines (new and existing). Figure 1 shows no evidence of a jump in any of the non-credit score outcomes. In general, non-credit score outcomes have larger values after bankruptcy flag removal. However, the values are also typically lower than would be predicted from a linear extrapolation of the pre-bankruptcy flag removal trend. Because of this, the parameter estimates for all tradelines outcomes are very sensitive to inclusion of the linear trend, as shown in Table 2.

In contrast, the effects for new tradelines exhibit some evidence of positive effects, at least for the credit card outcomes. Figure 2 shows a fairly sharp on-impact effect of bankruptcy flag removal on new credit card openings. The parameter estimates indicate that within one year of flag removal, the rate of credit card openings increases by 0.006 to 0.007, depending upon whether you include a linear trend, relative to a pre-flag removal opening rate of 0.044. In proportional terms, this corresponds to a 14% to 17% rise in the rate of credit card openings. Naturally, credit limits and balances on new cards also rise. At one year after flag removal, credit card limits on new cards increase by approximately \$25 on a pre-flag removal mean of \$76, or roughly 30%. At one year after flag removal, credit card balances on new cards rise by \$6 on a pre-bankruptcy flag removal mean of \$33, or roughly 20%. As shown in Table 2, the effects on new credit card limits and borrowing are fairly robust to controlling for a linear trend.

Unlike the effects on new credit cards, the effects of bankruptcy flag removal on new auto loan balances and new mortgage balances continue to be challenging to interpret. We find no clear evidence of an on-impact effect, and strong time trends make it hard to interpret the effects of bankruptcy flag removal at longer time horizons.

Where comparable, our estimates are quite similar to those in the related literature. For example, Gross, Notowidigdo and Wang (2016) use a similar event study design but higher frequency data to show that Chapter 7 bankruptcy flag removals increase credit scores by 15 points in the first year after flag removal. New credit card borrowing also increases by \$435 in the first year, while new auto lending increases by \$148 and new mortgage lending increases by \$709. The difference in our results is most likely due to the higher frequency of the data in Gross, Notowidigdo and Wang (2016).

4.1.2 Charge-Off Flag Removals

We next turn to the effect of charge-off flag removal. The analysis follows the same structure as for bankruptcy flag removal. Figure 3 plots average credit scores, the share of individuals that experience a year-on-year increase in credit scores, credit card limits, credit card balances, auto loan balances, and mortgage balances on all tradelines (new and existing) relative to the date of charge-off flag removal. Figure 4 plots average credit card limits and balances, auto loan balances, and mortgage balances on *new* tradelines relative to the date of charge-off flag removal. Table 3 shows regression estimates of the effect of charge-off flag removal, with columns 1-3 displaying effects from our baseline event study specification and columns 4-6 displaying effects from a specification that controls for a linear time trend. Event study plots for all and for new tradelines are shown in Appendix Figures A3 and A4.

Figure 3 shows that charge-off flag removal also leads to a sharp increase in credit scores, although the precise magnitude of the effect is somewhat sensitive to controls for preexisting trends, and a sharp jump in the share of individuals that experience a year-on-year increase in credit scores. The non-parametric event study, shown in columns 1-3 of Table 3, indicates that charge-off flag removal generates a sharp and persistent 10-point increase in credit scores. However, because credit scores were increasing prior to charge-off flag removal, the specification that controls for a linear trend reduces the magnitude of the one-year effect to 4 points, and actually yields negative effects at longer time horizons. This sensitivity indicates that caution should be applied when interpreting the effects of charge-off flag removal at time horizons of more than one year.

The increase in credit scores brought about by charge-off flag removal translates into increases in credit card limits and balances aggregated across all tradelines (new and existing). Within one year of charge-off flag removal, credit card limits increase between \$212 and \$263, depending on the inclusion of the linear control, on a pre-flag removal base of \$2,255, or approximately 10%. The effects at longer time horizons are similar but more sensitive to the inclusion of the linear time trend. Credit card balances increase between \$109 and \$128, depending on the inclusion of the linear control, on a pre-flag removal base of \$1,025, or roughly 10%.

Figure 3 and Table 3 shows that there are increases in auto and mortgage balances around the timing of the removal of the charge-off flag, but that these effects are quite sensitive to controlling for preexisting trends. In particular, there are no statistically or economically significant effects on auto balances in the specifications that control for preexisting trends. The effect on mortgage balances is highly sensitive to the inclusion a linear time trend, suggesting that these effects should not be over-interpreted.

The impact of charge-off flag removal on new tradelines, shown in Figure 4 and in the bottom half of Table 3, largely echo the analysis for all tradelines. There is an on-impact effect on new credit card openings, new credit card limits, and new credit card balances. In particular, within one year of flag removal, openings increase between 0.006 and 0.007, depending on the inclusion of the linear control, on a pre-flag removal mean of 0.035, or about 20%. Within one year after flag removal, new credit card limits rise by approximately \$12 on a pre-flag removal mean of \$49 or about 25%, and new credit card balances rise by approximately \$6 on a base of \$24, or about 25%. The effects at longer time horizons are sensitive to the inclusion of the linear trend. Similar to the effects on all tradelines, the effects on new auto and mortgage balances are sensitive to the inclusion of the linear time trend,

again suggesting that strong interpretation of the effects would be inappropriate.

4.1.3 Charge-Off Flag Removals, Subsample of Individuals with a Preexisiting Bankruptcy Flag

We also conduct an analysis where we restrict the sample to individuals with a preexisting bankruptcy flag. In principle, effects for this subsample may differ from the effect for the full charge-off sample for two reasons. First, since individuals with a preexisting bankruptcy flag may not be representative of the full charge-off sample, we may observe different effects due to heterogeneity in the impact of flag removal across individuals. Second, the impact of charge-off flag removal may interact with the existence of a bankruptcy flag due to the credit score formula or the underwriting models of banks.

The subsample analysis mirrors the analysis of charge-off flag removal for the full sample. Figure 5 plots average credit scores, the share of individuals that experience a year-on-year increase in credit scores, credit card limits and balances, auto loan balances, and mortgage balances on all tradelines (new and existing) relative to the date of charge-off flag removal. Figure 6 plots average credit card limits and balances, auto loan balances, and mortgage balances on *new* tradelines relative to the date of charge-off flag removal. Table 4 shows regression estimates of the effect of charge-off flag removal, with columns 1-3 displaying effects from our baseline event study specification and columns 4-6 displaying effects from a specification that controls for a linear time trend. Event study plots for all and for new tradelines are shown in Appendix Figures A5 and A6.

The effects of charge-off flag removal on credit scores are very similar for individuals with a preexisting bankruptcy flag relative to the full charge-off sample. Figure 5 shows that charge-off flag removal also leads to a sharp increase in credit scores and a jump in the share of individuals that experience a year-on-year increase in credit scores. The regression estimates, shown in Table 4, show that credit scores increase by a statistically significant 8 to 12 points at one year after flag removal. As before, because credit scores were increasing prior to charge-off flag removal, the effects at longer time horizons are sensitive to whether we control for a linear trend.

The impact of charge-off flag removal on credit card limits and balances aggregated across all tradelines (new and existing) is somewhat larger in the subsample with preexisting bankruptcy flags than in the full charge-off sample. At one year after charge-off flag removal, credit card limits increase between \$381 and \$493, depending on the inclusion of the linear control, on a pre-flag removal base of \$2,583, or approximately 18%, compared to 10% in the full sample. Credit card balances increase between \$217 and \$317, depending on the inclusion of the linear control, on a pre-flag removal base of \$1,229, or roughly 20%, compared to 10% in the full sample.

Figure 5 and Table 4 show evidence of increases in auto balances (new and existing) around the timing of charge-off flag removal in the sample of individuals with a preexisting bankruptcy flag. At one year after charge-off flag removal, auto balances increase by \$113 to \$147, depending on the inclusion of the linear control, on a pre-flag removal base of \$4,297, or approximately 3%. The impact on mortgage balances is more sensitive to the inclusion of the control for preexisting trends, but generally suggests an economically significant increase at two and three years after flag removal.

Figure 6 and the bottom half of Table 4 show a fairly large on-impact effect on new credit card openings, new credit card limits, and new credit card balances. Within one year of flag removal, credit card openings increase by between 0.009 and 0.010, depending on the inclusion of the linear

control, on a pre-flag removal mean of 0.045, which is similar in proportion to the effect in the full charge-off sample. Within one year after flag removal, new credit card limits rise by approximately $18 on a pre-flag removal mean of $55, and new credit card balances rise by approximately $34 on a base of $171. The effects at longer time horizons are larger and fairly robust to the inclusion of the linear trend. There is also suggestive evidence of an increase in auto balances at one year, but, in general, the new auto and mortgage balances are sensitive to the inclusion of the linear time trend, suggesting that strong interpretation of these effects would be inappropriate.

4.2 Difference-in-Differences Estimates

In this section, we describe the estimates from our difference-in-differences design, which examines the relative impact of the derogatory flag designations on the same set of credit outcomes. Recall that in October 2008, credit bureaus suddenly changed charge-off and delinquency flags to discharged in bankruptcy flags for individuals who (i) received a discharge through either Chapter 7 or Chapter 13 bankruptcy and (ii) whose debts had not been sold to a third-party debt collector.

To verify the effect of the October 2008 change in how derogatory flags were recorded, Figure A9 presents the time series of the share of bankruptcy filers with at least one "discharged in bankruptcy" account which had been designated "X days past due", "Charged off as bad debt", or similar derogatory classification in the year prior.[2] The dashed vertical line indicates October 2008, the date at which credit bureaus reportedly made such flag changes. The figure shows that while this type of change was quite rare in most time periods, there was a sharp spike in October 2008 when many bankruptcy filers received this change in designation.

Figure 7 shows that credit scores differentially rose in response to the change in flag designation. After controlling for cohort and time effects, we find that the flag switch led to a sizable increase in credit scores of 10 to 18 points on average for the treated consumers relative to the control group. These estimates are presented in Table 5, and plotted in Figure A7. The analysis also shows a rise in the share of individuals that experience a year-on-year increase in credit scores.

The increase in credit scores led to greater credit card limits and card balances, although the response occurs with some lag. Estimates of the effect size (reported in Table 5) suggest that by the second year following the change in flag designation, credit card limits were over $2,500 higher for treated consumers, and credit card balances were over $850 greater. Unfortunately, we find that these estimates are quite sensitive to the inclusion of time trends due to the relatively small sample sizes used to produce these estimates and the challenges of estimating credit market responses to this change in the midst of the Great Recession. Thus, we hesitate to draw strong inferences from the difference-in-difference findings alone.

Nonetheless, when taken together with our event study estimates described above, a consistent pattern emerges. Removing negative credit report information leads to sharp and immediate increases in credit scores, which in turn lead to increased credit card account opening and account usage. Impacts on other credit products or credit openings are possible, but difficult to detect using either research design.

[2] For a complete list of "derogatory" codes, see B.1.

5 Conclusion

This paper estimates the impact of a bad credit report on financial outcomes by exploiting exogenous variation in the timing of credit flag removals. We find that removing indicators of previous negative credit market behavior leads to sharp and immediate increases in credit scores, new credit card accounts, and new credit card borrowing. Our findings therefore support the view that credit reporting decisions have important and direct credit market consequences for consumers.

References

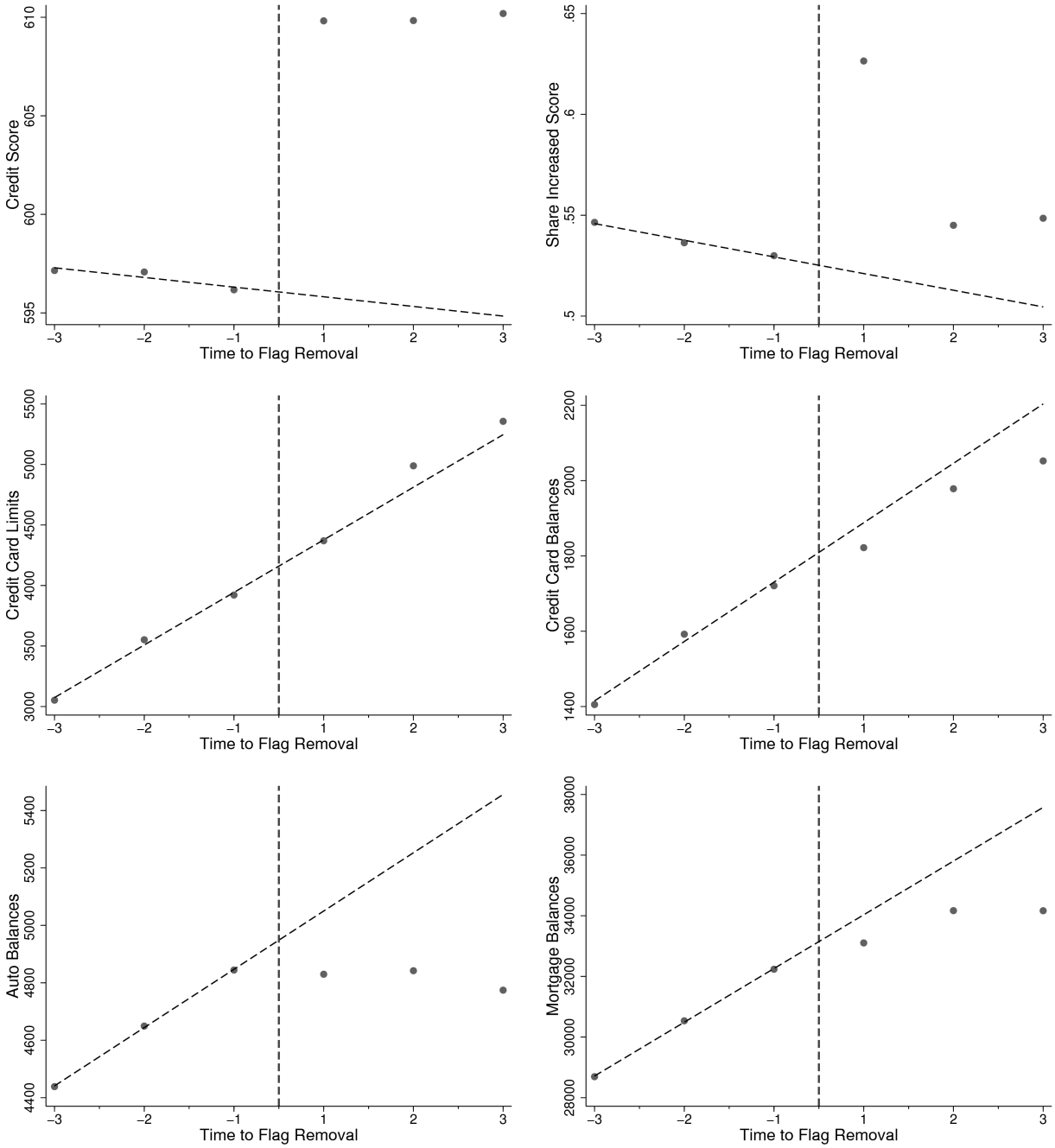
CFPB. 2012. "Key Dimensions and Processes in the U.S. Credit Reporting System: A review of how the nation's largest credit bureaus manage consumer data." Consumer Financial Protection Bureau.

Dobbie, Will, Paul Goldsmith-Pinkham, Neale Mahoney, and Jae Song. 2017. "Bad Credit, No Problem? Credit and Labor Market Consequences of Bad Credit Reports." *Working Paper*.

Gross, Tal, Matthew J. Notowidigdo, and Jialan Wang. 2016. "The Marginal Propensity to Consumer Over the Business Cycle." *NBER Working Paper*.

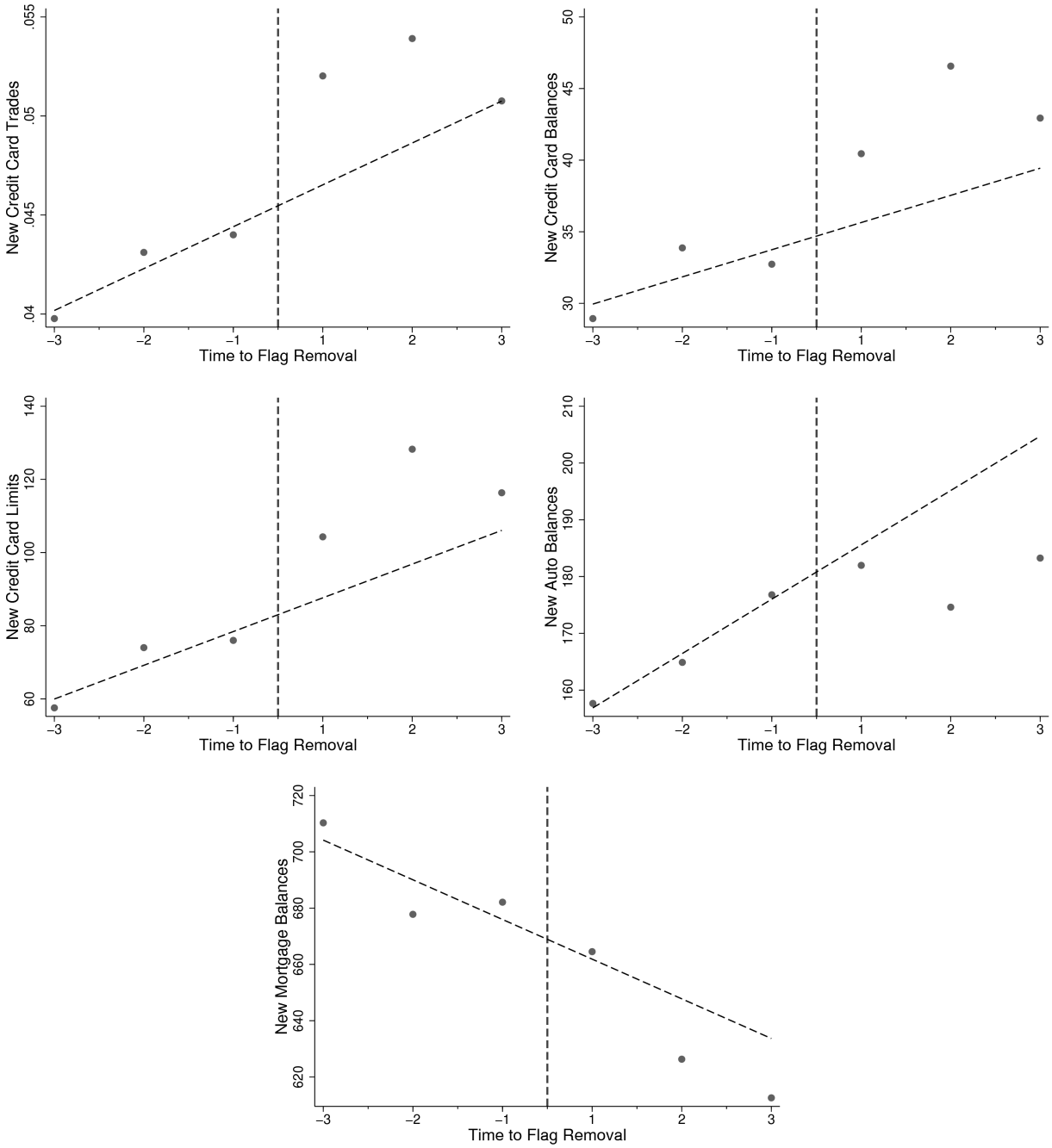
Musto, David K. 2004. "What Happens When Information Leaves a Market? Evidence from Post-Bankrutpcy Consumers." *The Journal of Business*, 77(4): 725–748.

Figure 1: Bankruptcy Flag Removal, All Tradelines



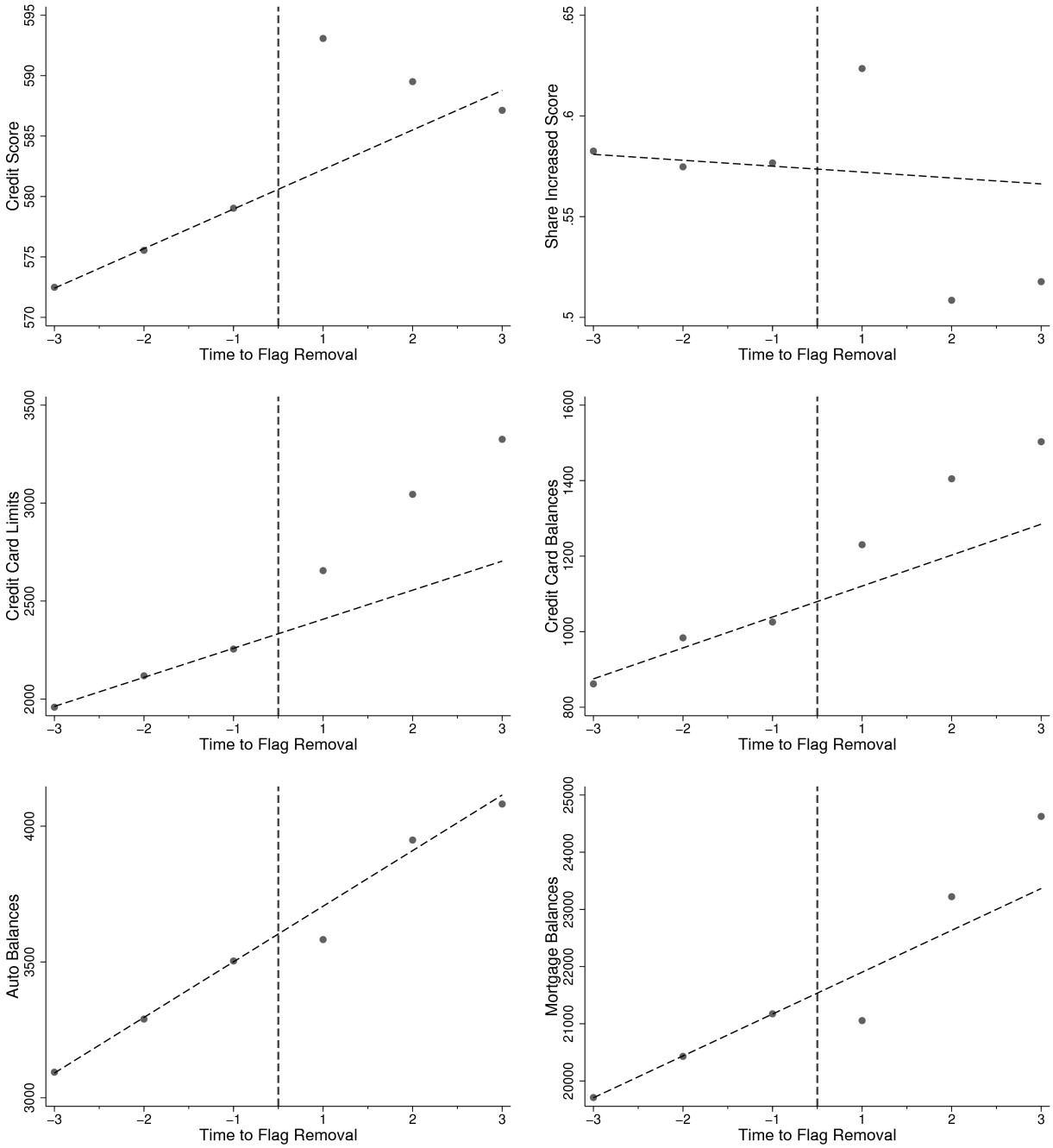
Note: This figure is a scatter plot of average year-adjusted outcomes by years relative to bankruptcy flag removal, denoted by the horizontal axis. See Table 1 notes for additional details on the outcome measures and sample.

Figure 2: Bankruptcy Flag Removal, New Tradelines



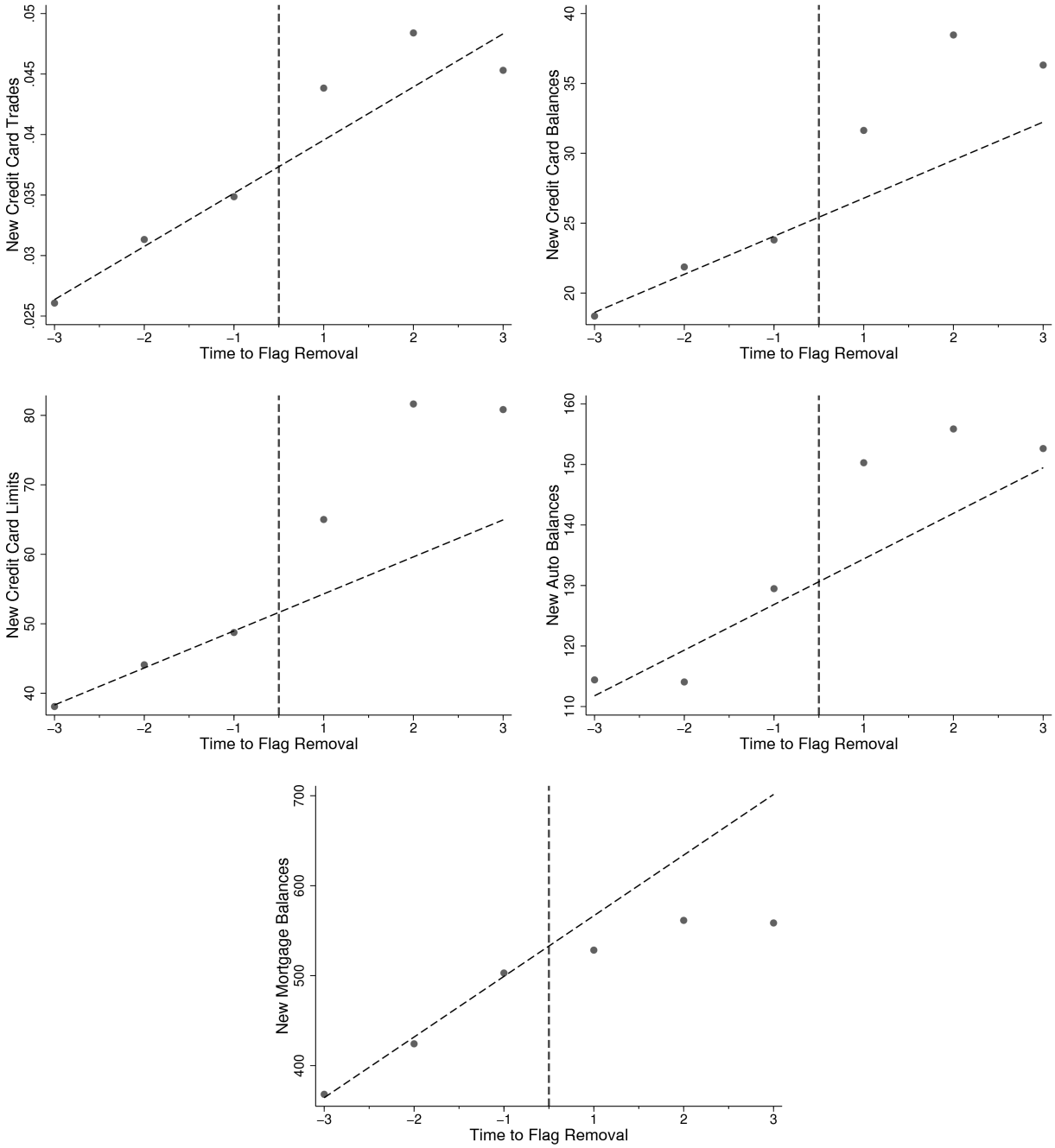
Note: This figure is a scatter plot of average year-adjusted outcomes by years relative to bankruptcy flag removal, denoted by the horizontal axis. See Table 1 notes for additional details on the outcome measures and sample.

Figure 3: Charge-Off Flag Removal, All Tradelines



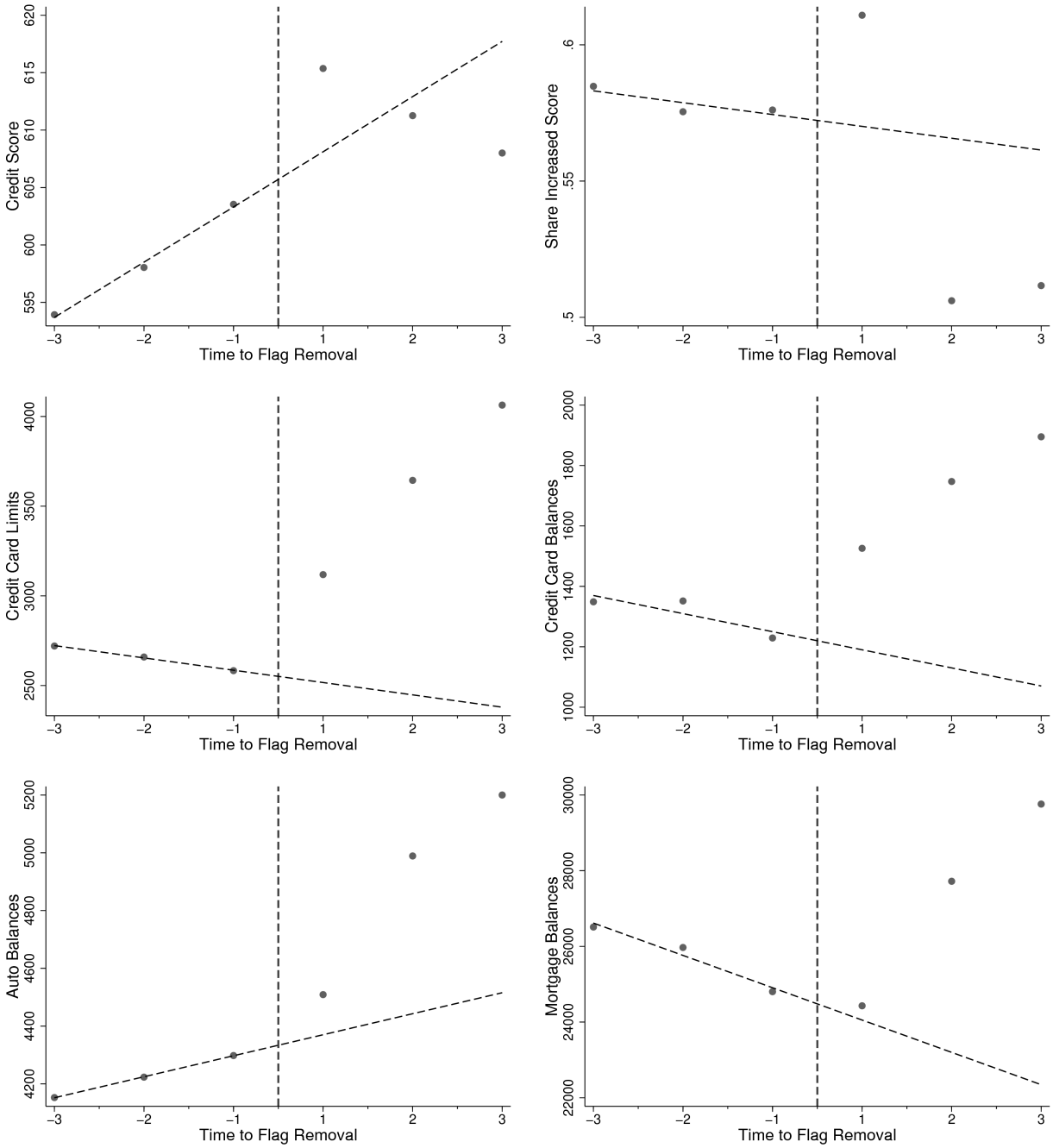
Note: This figure is a scatter plot of average year-adjusted outcomes by years relative to charge-off flag removal, denoted by the horizontal axis. See Table 1 notes for additional details on the outcome measures and sample.

Figure 4: Charge-Off Flag Removal, New Tradelines



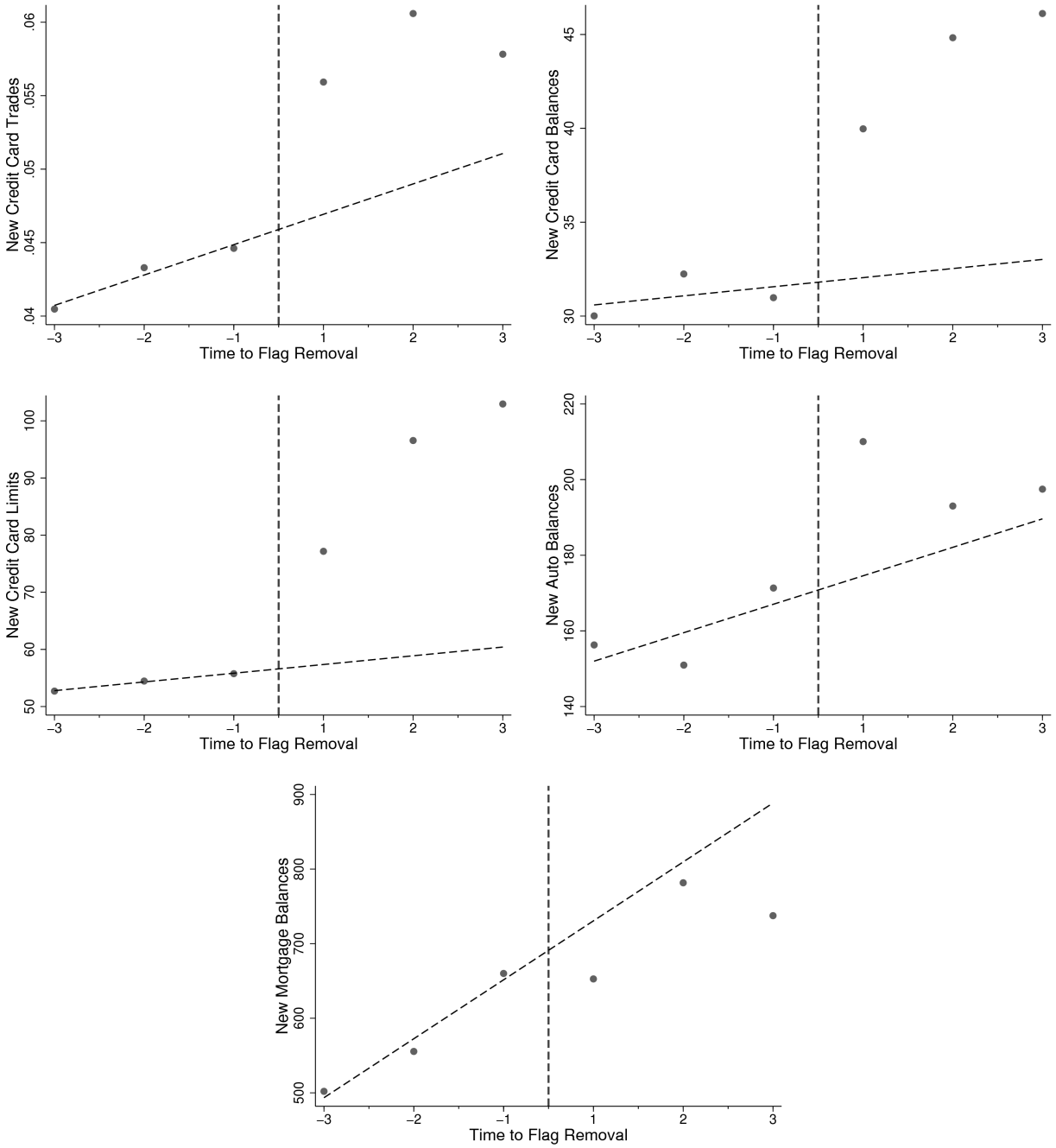
Note: This figure is a scatter plot of average year-adjusted outcomes by years relative to charge-off flag removal, denoted by the horizontal axis. See Table 1 notes for additional details on the outcome measures and sample.

Figure 5: Charge-Off Flag Removal (Bankruptcy Filers Only), All Tradelines



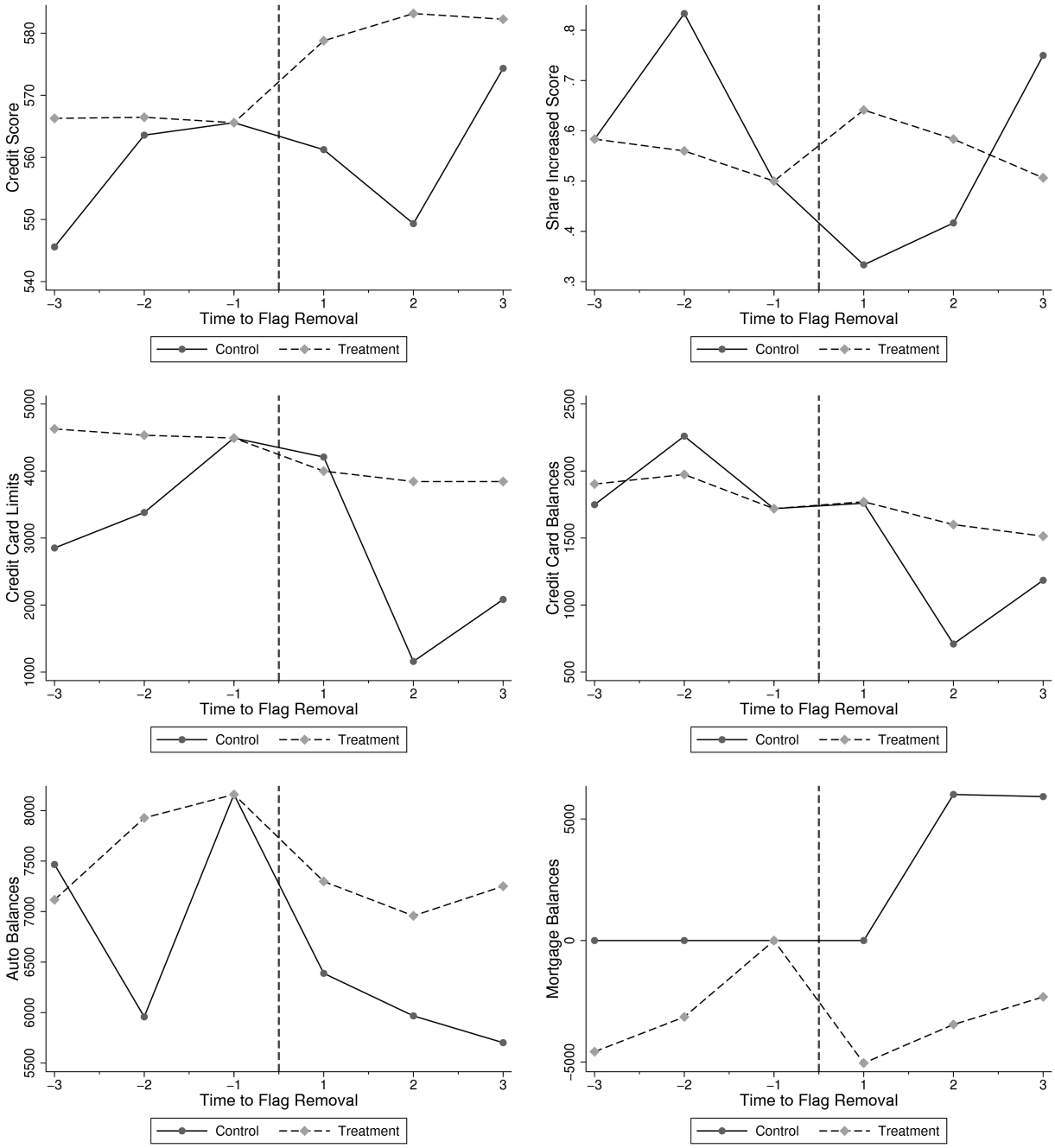
Note: This figure is a scatter plot of average year-adjusted outcomes by years relative to charge-off flag removal, denoted by the horizontal axis, *among individuals with a preexisting bankruptcy flag*. See Table 1 notes for additional details on the outcome measures and sample.

Figure 6: Charge-Off Flag Removal (Bankruptcy Filers Only), New Tradelines



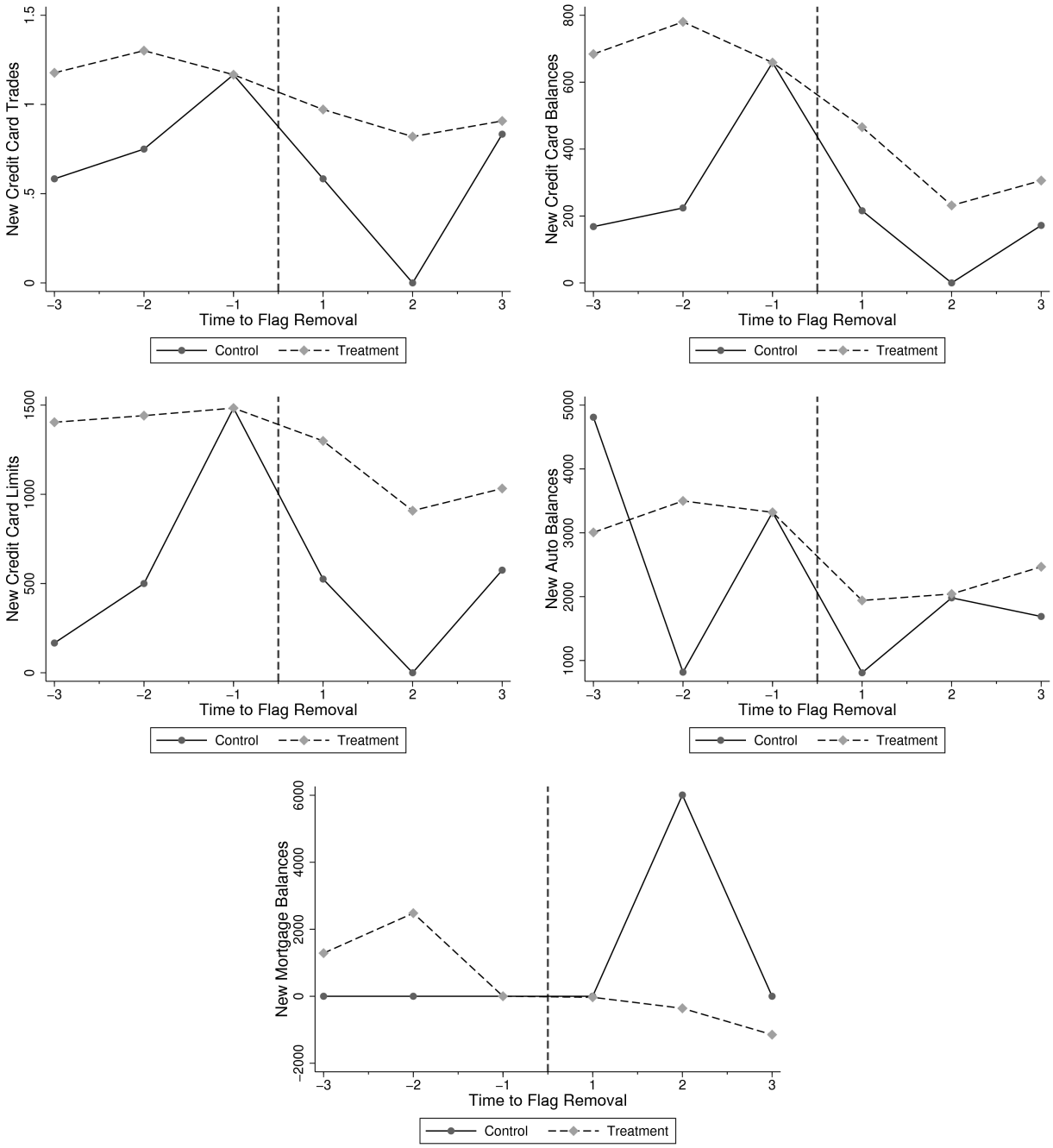
Note: This figure is a scatter plot of average year-adjusted outcomes by years relative to charge-off flag removal, denoted by the horizontal axis, *among individuals with a preexisting bankruptcy flag*. See Table 1 notes for additional details on the outcome measures and sample.

Figure 7: Difference-in-Differences Trends, All Tradelines



Note: This figure is a scatter plot of average "treatment" and "control" outcomes by year for the difference-in-differences sample. See Table 1 notes for additional details on the outcome measures and sample.

Figure 8: Difference-in-Differences Trends, New Tradelines



Note: This figure is a scatter plot of average "treatment" and "control" outcomes by year for the difference-in-differences sample. See Table 1 notes for additional details on the outcome measures and sample.

Table 1: Summary Statistics

Panel A: Year Prior to Flag Removal/Change

	(1) Bankruptcy		(2) Charge-Off		(3) Charge-Off (Bankrupt)		(4) Diff-in-Diff	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Credit Score	596.17	81.31	579.03	74.57	603.54	69.87	573.41	72.58
Share Increased Score	0.53	0.50	0.58	0.49	0.58	0.49	0.52	0.50
Credit Card Limits	3,921.27	7,631.55	2,255.01	5,911.78	2,583.00	5,335.00	2,687.34	5,234.67
Credit Card Balances	1,720.67	3,553.85	1,025.51	2,740.16	1,229.03	2,696.54	1,300.70	2,747.48
Auto Balances	4,844.37	8,208.51	3,503.63	7,190.61	4,298.05	7,815.50	6,216.46	8,943.54
Mortgage Balances	32,235.95	64,668.21	21,173.79	52,780.76	24,803.22	54,481.24	25,127.13	58,193.43
New Credit Card Trades	0.04	0.32	0.03	0.29	0.04	0.32	0.65	1.11
New Credit Card Balances	32.73	398.61	23.80	316.89	30.98	344.23	475.22	1,288.07
New Credit Card Limits	76.00	801.45	48.74	588.01	55.75	571.62	801.58	2,039.09
New Auto Balances	176.80	1,874.97	129.48	1,576.04	171.34	1,811.44	2,320.57	6,323.49
New Mortgage Balances	682.10	10,624.97	502.98	9,178.70	660.03	10,209.52	5,078.55	29,293.77
N	90683		203887		67966		2348	

Panel B: Year of Flag Removal/Change

	(1) Bankruptcy		(2) Charge-Off		(3) Charge-Off (Bankrupt)		(4) Diff-in-Diff	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Credit Score	610.58	95.58	593.69	79.71	615.83	71.99	583.93	75.10
Share Increased Score	0.62	0.48	0.62	0.49	0.61	0.49	0.63	0.48
Credit Card Limits	4,219.13	8,315.29	2,517.73	6,297.99	2,963.65	5,863.89	2,170.30	4,829.22
Credit Card Balances	1,742.54	3,699.53	1,153.24	2,928.20	1,446.13	2,966.97	1,254.44	2,784.07
Auto Balances	4,764.18	8,221.15	3,522.10	7,385.51	4,444.72	8,091.32	5,331.68	8,133.12
Mortgage Balances	32,631.06	65,747.49	20,859.57	53,634.54	24,420.37	55,845.64	21,446.43	55,744.05
New Credit Card Trades	0.05	0.36	0.04	0.33	0.05	0.36	0.41	0.86
New Credit Card Balances	38.37	446.48	29.66	364.47	37.65	379.10	284.31	916.65
New Credit Card Limits	101.11	973.92	62.19	693.83	73.63	723.90	552.00	1,773.49
New Auto Balances	180.60	1,913.09	147.85	1,703.08	205.35	2,011.83	1,261.43	4,429.98
New Mortgage Balances	621.40	10,297.61	486.06	9,135.88	610.24	10,013.22	4,233.01	26,550.68
N	90683		203887		67966		2348	

Note: This table reports summary statistics for each outcome in the year prior to and year following a flag removal and/or flag change. The Charge-Off and Bankruptcy samples each include individuals who had a credit flag removal of that type within our sample period. The Charge-Off (Bankrupt) sample is the subsample of Charge-Off limited to individuals with a preexisting bankruptcy flag at the time of charge-off flag removal. The Diff-in-Diff sample includes individuals with account-specific derogatory flags who had previously received a discharge through either Chapter 7 or Chapter 13 bankruptcy, whether or not those debts had not been sold to a third-party debt collector. See Appendix B.2 for additional details on Diff-in-Diff sample selection and treatment designation. The pooled sample of across all of the above samples consists of 245,772 individuals.

Table 2: Event Study Estimates: Bankruptcy Flag Removal

	Mean at	Non-Parametric Estimates			Estimates with Trend		
	$t = -1$	1 Year	2 Years	3 Years	1 Year	2 Years	3 Years
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Credit Score	596.2	14.41	15.51	17.40	14.40	15.56	17.50
	(0.270)	(0.416)	(0.416)	(0.416)	(0.537)	(0.710)	(0.898
Share Increased Score	0.530	0.0939	0.0115	0.0150	0.102	0.0264	0.0371
	(0.00166)	(0.00233)	(0.00233)	(0.00233)	(0.00303)	(0.00402)	(0.00510)
Credit Card Limits	3,921.2	297.7	791.8	1,077.4	-6.215	208.8	215.2
	(25.34)	(38.62)	(38.62)	(38.62)	(50.06)	(66.22)	(83.76
Credit Card Balances	1,720.6	21.79	112.3	139.0	-56.45	-33.97	-75.35
	(11.80)	(17.07)	(17.07)	(17.07)	(22.09)	(29.22)	(36.97
Auto Balances	4,844.3	-80.47	-114.9	-163.3	-193.8	-338.4	-496.9
	(27.26)	(38.43)	(38.43)	(38.43)	(49.62)	(65.64)	(83.03
Mortgage Balances	32,231.1	395.2	896.2	200.4	-1,192.2	-2,206.9	-4,418.4
	(214.7)	(302.2)	(302.2)	(302.2)	(390.5)	(516.6)	(653.5
New Credit Card Trades	0.0441	0.00599	0.00635	0.00223	0.00741	0.00946	0.00702
	(0.00106)	(0.00162)	(0.00162)	(0.00162)	(0.00209)	(0.00276)	(0.00349)
New Credit Card Balances	32.77	5.612	10.07	4.914	5.866	11.48	7.468
	(1.325)	(2.086)	(2.086)	(2.086)	(2.693)	(3.563)	(4.507
New Credit Card Limits	76.07	25.06	46.91	32.75	18.39	35.75	17.10
	(2.663)	(4.425)	(4.425)	(4.425)	(5.714)	(7.559)	(9.562
New Auto Balances	176.8	3.952	-3.323	7.799	0.430	-11.50	-5.027
	(6.226)	(8.811)	(8.811)	(8.811)	(11.37)	(15.05)	(19.03
New Mortgage Balances	682.1	-60.71	-151.2	-206.0	-9.200	-52.13	-59.35
	(35.28)	(48.64)	(48.64)	(48.64)	(62.82)	(83.10)	(105.1

Note: This table reports event study estimates of the effect of charge-off flag removal for the Bankruptcy sample. Column 1 reports the dependent variable mean and standard deviation for the Bankruptcy sample in the year prior to flag removal. Columns 2-4 report estimated effects to each outcome 1, 2, and 3 years following the flag removal, respectively, in a non-parametric specification with corresponding lag dummies (excluding $t = -1$). Columns 5-7 report the estimates in a specification which omits lagged year dummies and includes a linear time trend. See the text for additional details on the specification and the Table 1 notes for additional details on the outcome measures and sample.

Table 3: Event Study Estimates: Charge-Off Flag Removal

	Mean at	Non-Parametric Estimates			Estimates with Trend		
	$t = -1$	1 Year	2 Years	3 Years	1 Year	2 Years	3 Years
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Credit Score	579.0	14.66	11.91	10.68	11.23	4.902	0.0942
	(0.165)	(0.245)	(0.245)	(0.245)	(0.317)	(0.419)	(0.531)
Share Increased Score	0.577	0.0446	-0.0718	-0.0633	0.0482	-0.0664	-0.0560
	(0.00109)	(0.00155)	(0.00155)	(0.00155)	(0.00202)	(0.00268)	(0.00340)
Credit Card Limits	2,254.6	262.7	532.8	712.6	211.5	440.7	579.7
	(13.09)	(20.13)	(20.13)	(20.13)	(26.11)	(34.54)	(43.69)
Credit Card Balances	1,025.4	127.7	235.7	281.9	108.9	212.9	255.1
	(6.068)	(9.389)	(9.389)	(9.389)	(12.19)	(16.12)	(20.39)
Auto Balances	3,503.3	18.65	330.4	455.7	-117.4	57.21	45.42
	(15.92)	(22.89)	(22.89)	(22.89)	(29.58)	(39.13)	(49.50)
Mortgage Balances	21,172.6	-315.4	1,489.8	2,327.3	-989.6	180.6	383.0
	(116.9)	(168.2)	(168.2)	(168.2)	(217.5)	(287.7)	(363.9)
New Credit Card Trades	0.0349	0.00694	0.0100	0.00535	0.00616	0.00866	0.00339
	(0.000645)	(0.000984)	(0.000984)	(0.000984)	(0.00127)	(0.00168)	(0.00213)
New Credit Card Balances	23.80	5.864	11.10	7.099	5.678	10.92	6.924
	(0.702)	(1.145)	(1.145)	(1.145)	(1.478)	(1.956)	(2.474)
New Credit Card Limits	48.75	13.45	28.11	24.17	11.63	24.57	18.91
	(1.302)	(2.157)	(2.157)	(2.157)	(2.785)	(3.684)	(4.660)
New Auto Balances	129.5	18.38	23.25	20.56	17.90	19.55	13.64
	(3.490)	(5.125)	(5.125)	(5.125)	(6.617)	(8.753)	(11.07)
New Mortgage Balances	503.0	-16.34	-35.56	-86.44	-62.15	-127.4	-224.4
	(20.33)	(27.54)	(27.54)	(27.54)	(35.56)	(47.04)	(59.50)

Note: This table reports event study estimates of the effect of charge-off flag removal for the Charge-Off sample. Column 1 reports the dependent variable mean and standard deviation for the Charge-Off sample in the year prior to flag removal. Columns 2-4 report estimated effects to each outcome 1, 2, and 3 years following the flag removal, respectively, in a non-parametric specification with corresponding lag dummies (excluding $t = -1$). Columns 5-7 report the estimates in a specification which omits lagged year dummies and includes a linear time trend. See the text for additional details on the specification and the Table 1 notes for additional details on the outcome measures and sample.

Table 4: Event Study Estimates: Charge-Off Flag Removal (Bankruptcy Filers Only)

	Mean at	Non-Parametric Estimates			Estimates with Trend		
	$t = -1$	1 Year	2 Years	3 Years	1 Year	2 Years	3 Years
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Credit Score	603.5	12.30	8.832	6.449	7.681	-0.697	-7.992
	(0.268)	(0.399)	(0.399)	(0.399)	(0.517)	(0.684)	(0.865)
Share Increased Score	0.576	0.0334	-0.0727	-0.0683	0.0393	-0.0629	-0.0547
	(0.00190)	(0.00268)	(0.00268)	(0.00268)	(0.00350)	(0.00466)	(0.00592)
Credit Card Limits	2,582.9	380.5	781.1	1,080.1	493.9	1,019.3	1,443.0
	(20.46)	(33.98)	(33.98)	(33.98)	(44.16)	(58.41)	(73.89)
Credit Card Balances	1,229.0	217.0	365.0	455.7	317.1	588.3	802.2
	(10.34)	(17.40)	(17.40)	(17.40)	(22.60)	(29.90)	(37.82)
Auto Balances	4,297.4	147.1	557.6	735.1	113.4	493.6	640.8
	(29.97)	(43.64)	(43.64)	(43.64)	(56.36)	(74.55)	(94.30)
Mortgage Balances	24,800.9	-386.6	2,687.1	4,212.9	233.7	4,083.4	6,385.2
	(209.0)	(309.0)	(309.0)	(309.0)	(400.0)	(529.2)	)669.4)
New Credit Card Trades	0.0446	0.00886	0.0118	0.00708	0.0101	0.0146	0.0115
	(0.00123)	(0.00190)	(0.00190)	(0.00190)	(0.00245)	(0.00324)	(0.00410)
New Credit Card Balances	30.98	6.692	9.865	9.011	7.942	12.95	13.93
	(1.320)	(2.126)	(2.126)	(2.126)	(2.746)	(3.632)	(4.594)
New Credit Card Limits	55.75	17.93	35.07	37.57	18.63	36.62	39.98
	(2.193)	(3.932)	(3.932)	(3.932)	(5.076)	(6.716)	(8.495)
New Auto Balances	171.3	34.02	15.29	18.84	34.26	11.65	11.32
	(6.948)	(10.10)	(10.10)	(10.10)	(13.04)	(17.25)	(21.82)
New Mortgage Balances	660.0	-49.79	22.70	-72.33	-110.8	-103.3	-263.2
	(39.16)	(53.82)	(53.82)	(53.82)	(69.50)	(91.94)	(116.3)

Note: This table reports event study estimates of the effect of charge-off flag removal for the Charge-Off (Bankrupt) sample. Column 1 reports the dependent variable mean and standard deviation for the Charge-Off sample in the year prior to flag removal. Columns 2-4 report estimated effects to each outcome 1, 2, and 3 years following the flag removal, respectively, in a non-parametric specification with corresponding lag dummies (excluding $t = -1$). Columns 5-7 report the estimates in a specification which omits lagged year dummies and includes a linear time trend. See the text for additional details on the specification and the Table 1 notes for additional details on the outcome measures and sample.

Table 5: Difference-in-Differences Estimates: Change in Credit Flag Designation

	Mean at	Non-Parametric Estimates			Estimates with Trend		
	$t = -1$	1 Year	2 Years	3 Years	1 Year	2 Years	3 Years
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Credit Score	587.5	17.53	33.83	7.912	10.42	13.66	11.62
	(3.462)	(26.78)	(26.14)	(23.78)	(5.933)	(7.892)	(9.979)
Share Increased Score	0.505	0.308	0.167	-0.244	0.153	0.125	0.0779
	(0.0250)	(0.199)	(0.204)	(0.192)	(0.0446)	(0.0606)	(0.0775)
Credit Card Limits	3,002.6	-210.3	2,684.6	1,760.0	-188.5	-161.3	20.87
	(287.7)	(2,814.8)	(2,086.9)	(2,191.4)	(436.3)	(593.4)	(767.3)
Credit Card Balances	1,398.0	11.15	890.7	329.3	203.6	182.1	244.9
	(146.8)	(1,150.0)	(906.7)	(1,030.4)	(325.4)	(449.5)	(583.9)
Auto Balances	5,814.3	909.8	990.4	1,549.1	-696.2	-1,166.8	-1,003.4
	(419.0)	(3,018.8)	(3,037.1)	(2,988.8)	(707.6)	(948.8)	(1,223.2)
Mortgage Balances	24,554.3	-5,041.2	-9,461.8	-8,237.3	-6,162.3	-6,420.8	-7,130.6
	(2,537.9)	(4,135.7)	(6,960.7)	(6,883.9)	(3,788.5)	(4,497.4)	(5,293.1)
New Credit Card Trades	0.744	0.388	0.820	0.0742	-0.195	-0.323	-0.210
	(0.0631)	(0.535)	(0.429)	(0.603)	(0.101)	(0.136)	(0.179
New Credit Card Balances	574.2	249.8	231.5	134.1	-199.0	-411.4	-315.4
	(68.68)	(318.0)	(247.8)	(271.8)	(88.71)	(105.4)	(136.0
New Credit Card Limits	966.7	774.2	908.2	457.4	-173.9	-580.1	-471.1
	(111.1)	(679.6)	(605.3)	(690.3)	(153.1)	(169.1)	(219.0
New Auto Balances	2,475.1	1,132.5	60.84	778.0	-1,102.7	-885.4	-344.2
	(313.9)	(1,816.9)	(2,198.7)	(2,363.5)	(555.4)	(784.7)	(1,033.4)
New Mortgage Balances	3,691.9	-30.28	-6,368.1	-1,147.7	-1,100.3	-1,337.0	-2,032.2
	(1,098.1)	(1,843.8)	(6,030.7)	(1,702.5)	(1,782.0)	(2,085.8)	(2,436.3)

Note: This table reports difference-in-differences estimates of the effect of changing a derogatory flag to a "discharged in bankruptcy" flag. Column 1 reports the dependent variable mean and standard deviation for the Diff-in-Diff sample in the year prior to flag change. Columns 2-4 report estimated treatment effects to each outcome 1, 2, and 3 years following the flag change, respectively, in a non-parametric specification with corresponding lag dummies (excluding $t = -1$). Columns 5-7 report the estimates in a specification which omits lagged year dummies and includes a linear time trend. See the text for additional details on the specification and Appendix B.2 for additional details on sample selection and treatment designation.

Credit Market Consequences of Credit Flag Removals

Online Appendix

Will Dobbie Benjamin J. Keys Neale Mahoney

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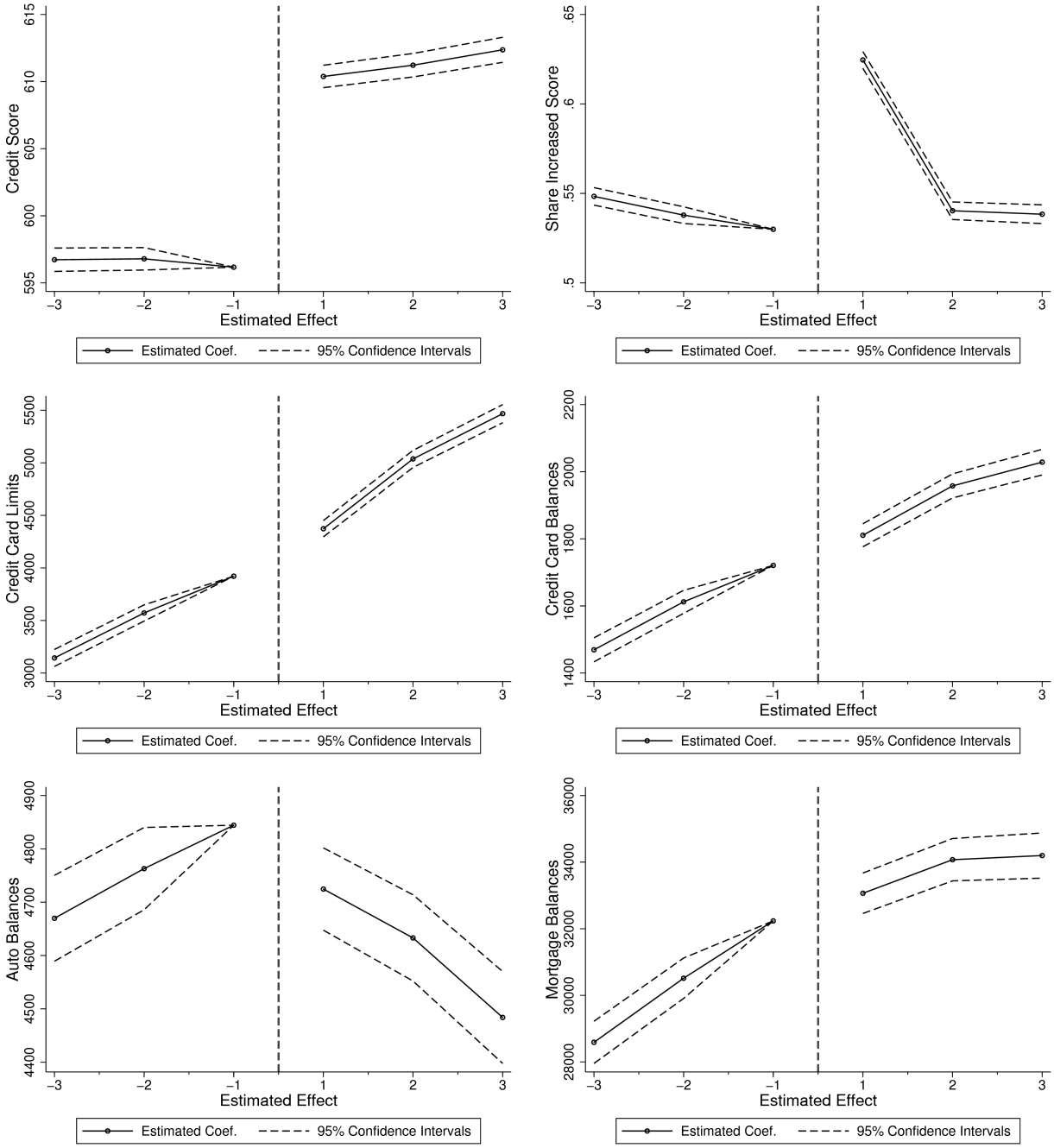
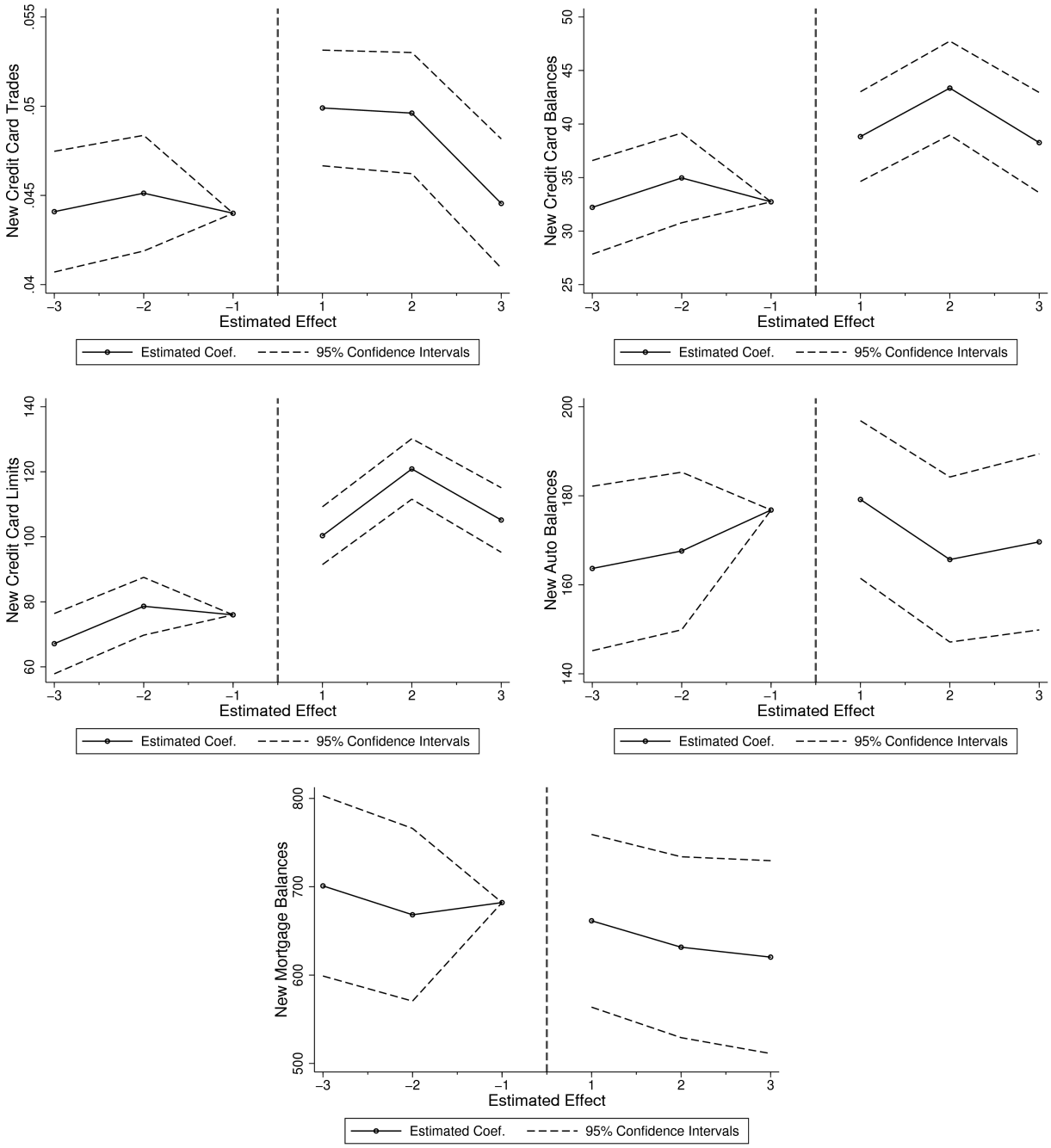
A Additional Tables and Figures

Figure A1: Event Study: Bankruptcy Flag Removal, All Tradelines



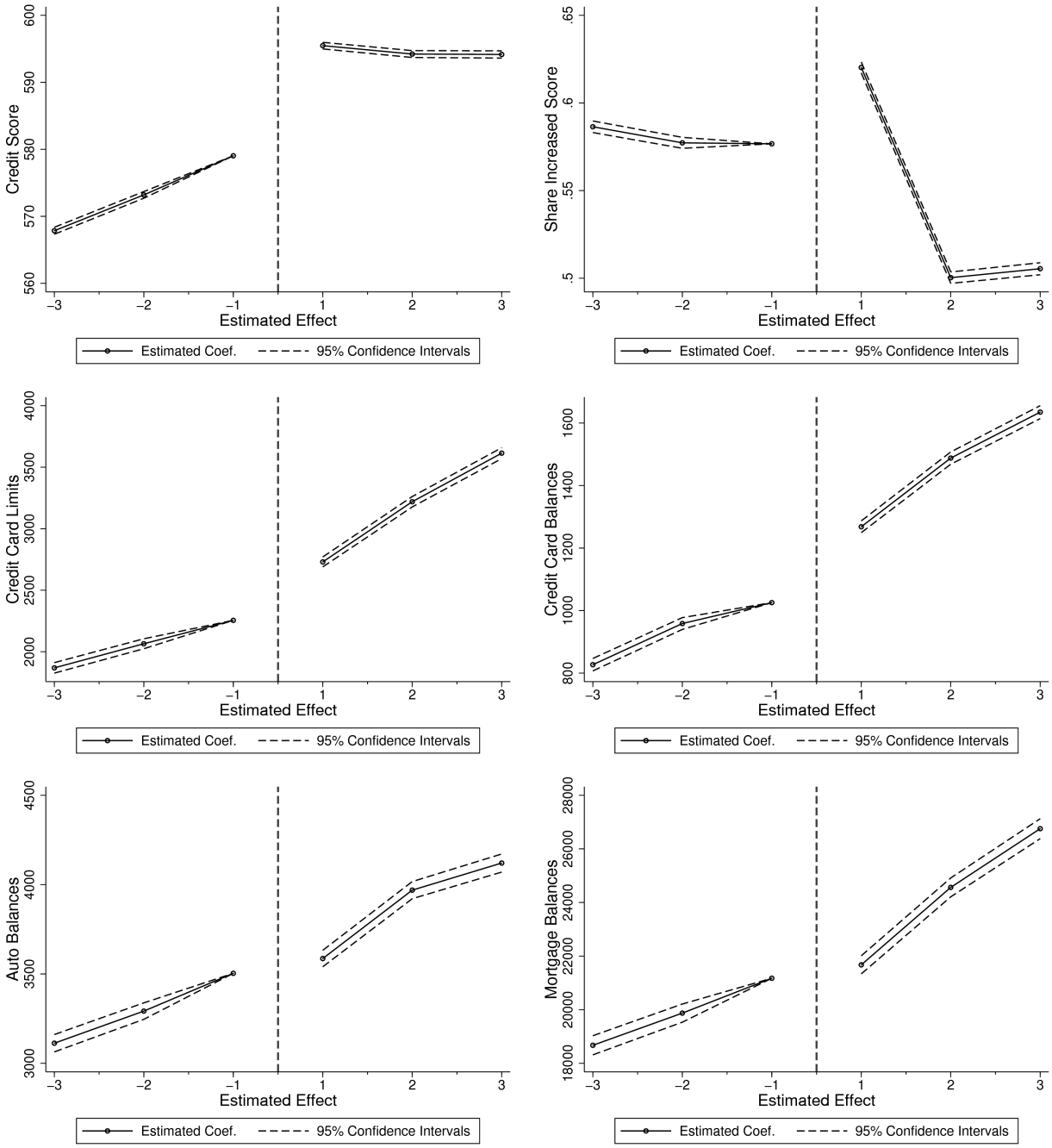
Note: This figure plots event study estimates of the effect of bankruptcy flag removal. The horizontal axis denotes time, in years, relative to the year of bankruptcy flag removal, which is indicated by the dashed vertical line. The estimated effect is normalized to zero in the year before the bankruptcy flag removal. See the text for additional details on the specification and the Table 1 notes for additional details on the outcome measures and sample.

Figure A2: Event Study: Bankruptcy Flag Removal, New Tradelines



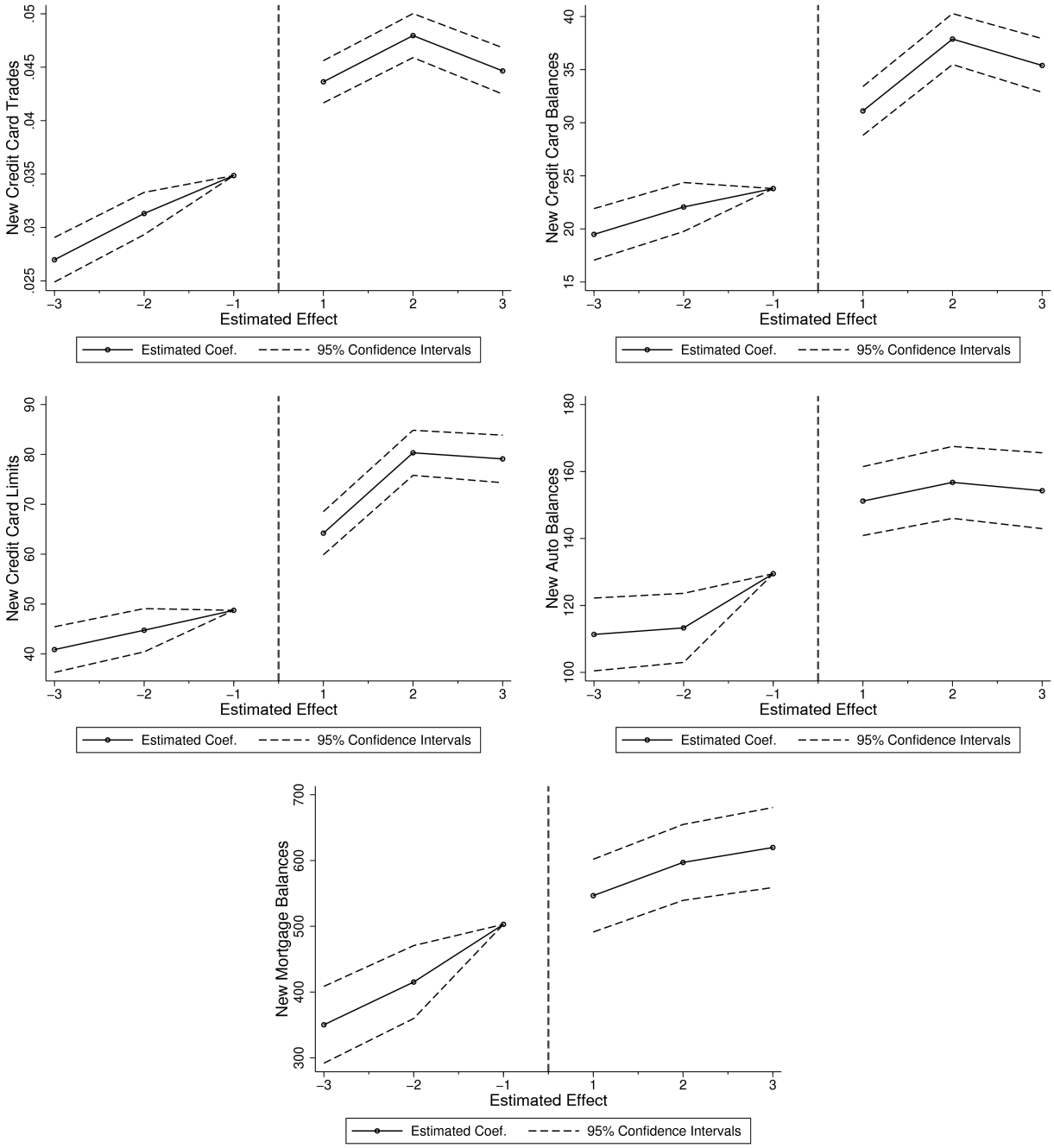
Note: This figure plots event study estimates of the effect of bankruptcy flag removal. The horizontal axis denotes time, in years, relative to the year of bankruptcy flag removal, which is indicated by the dashed vertical line. The estimated effect is normalized to zero in the year before the bankruptcy flag removal. See the text for additional details on the specification and the Table 1 notes for additional details on the outcome measures and sample.

Figure A3: Event Study: Charge-Off Flag Removal, All Tradelines



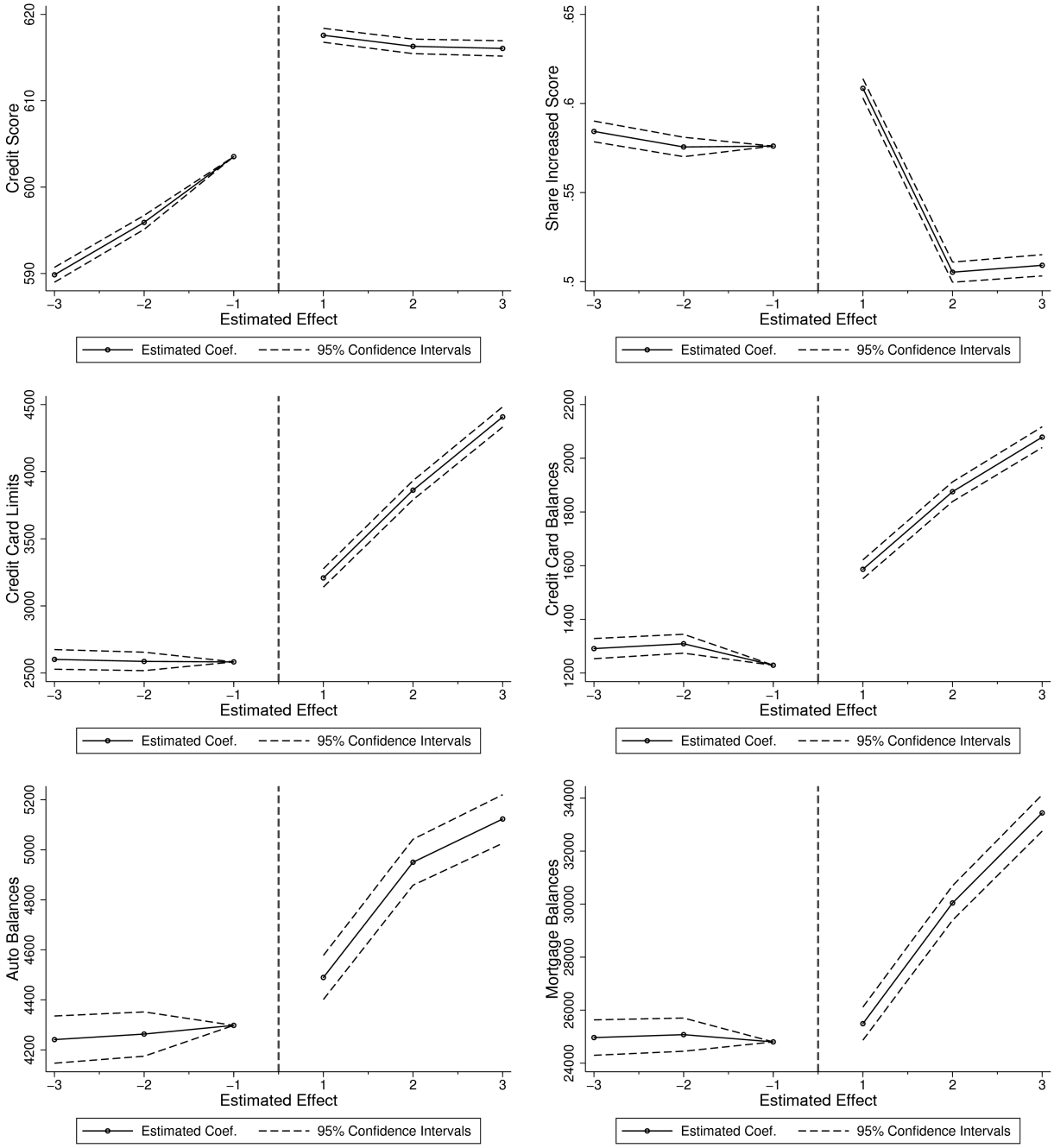
Note: This figure plots event study estimates of the effect of charge-off flag removal. The horizontal axis denotes time, in years, relative to the year of charge-off flag removal, which is indicated by the dashed vertical line. The estimated effect is normalized to zero in the year before the charge-off flag removal. See the text for additional details on the specification and the Table 1 notes for additional details on the outcome measures and sample.

Figure A4: Event Study: Charge-Off Flag Removal, New Tradelines



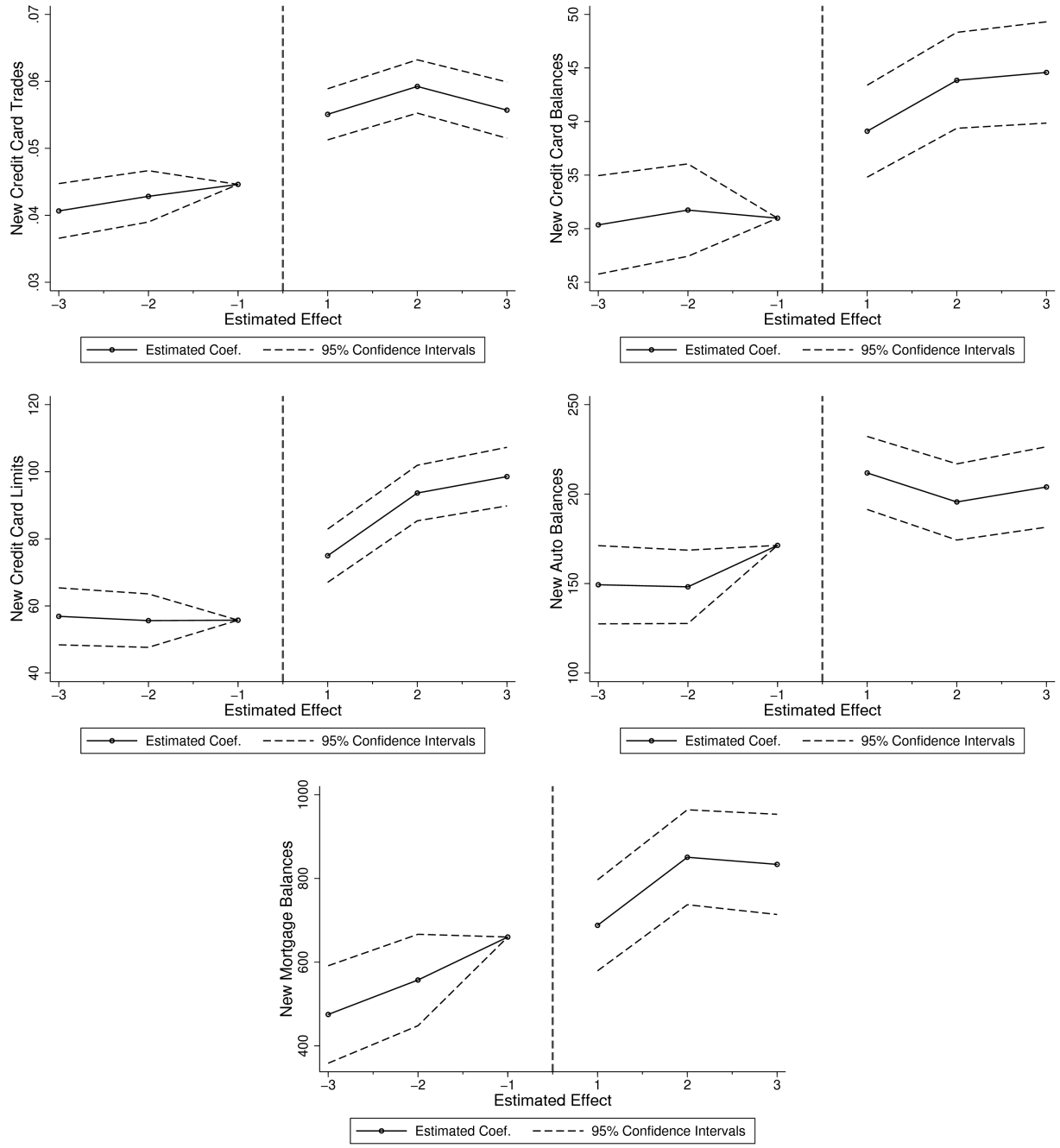
Note: This figure plots event study estimates of the effect of charge-off flag removal. The horizontal axis denotes time, in years, relative to the year of charge-off flag removal, which is indicated by the dashed vertical line. The estimated effect is normalized to zero in the year before the charge-off flag removal. See the text for additional details on the specification and the Table 1 notes for additional details on the outcome measures and sample.

Figure A5: Event Study: Charge-Off Flag Removal (Bankruptcy Filers Only), All Tradelines



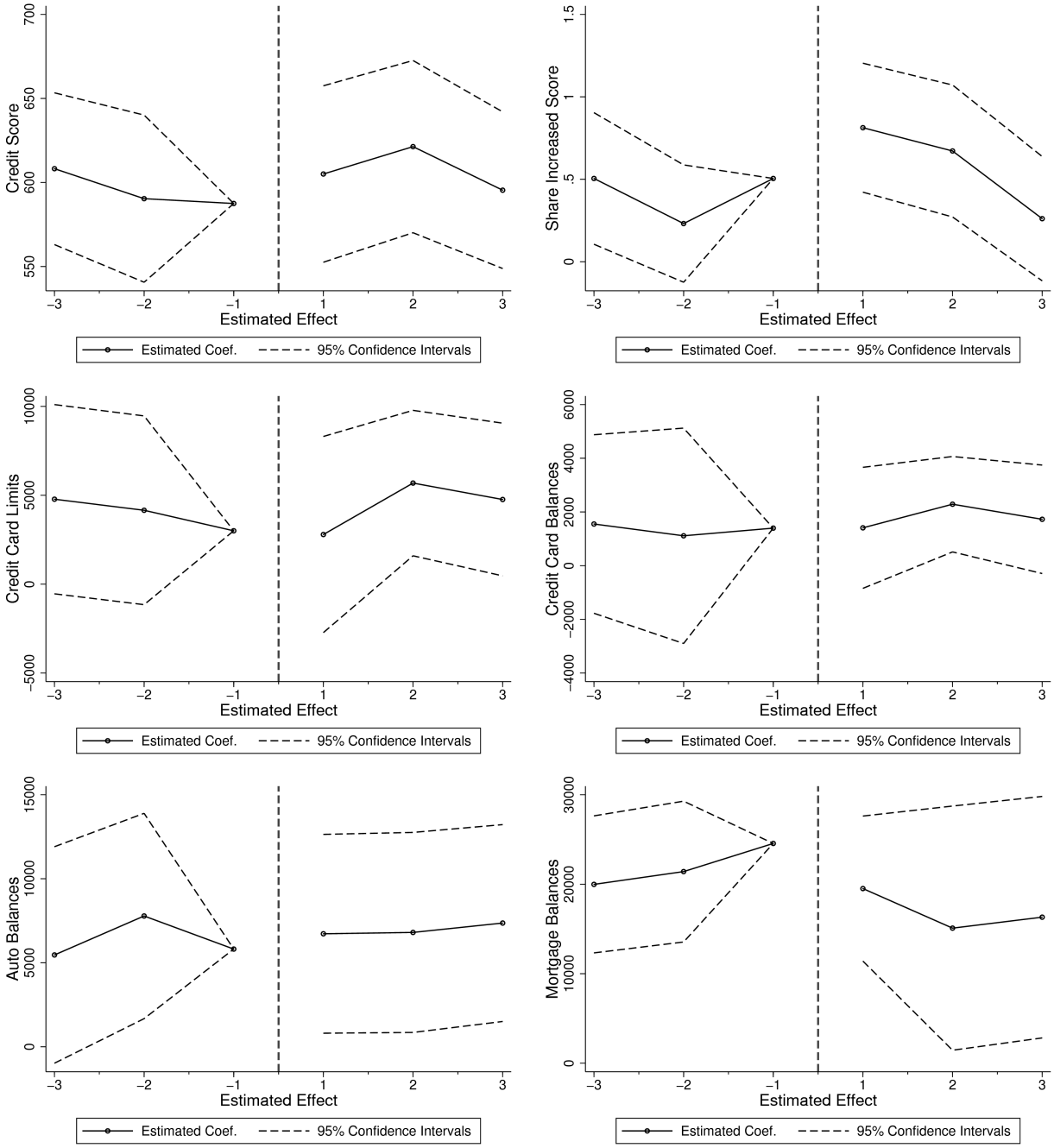
Note: This figure plots event study estimates of the effect of charge-off flag removal *among individuals with a preexisting bankruptcy flag*. The horizontal axis denotes time, in years, relative to the year of charge-off flag removal, which is indicated by the dashed vertical line. The estimated effect is normalized to zero in the year before the charge-off flag removal. See the text for additional details on the specification and the Table 1 notes for additional details on the outcome measures and sample.

Figure A6: Event Study: Charge-Off Flag Removal (Bankruptcy Filers Only), New Tradelines



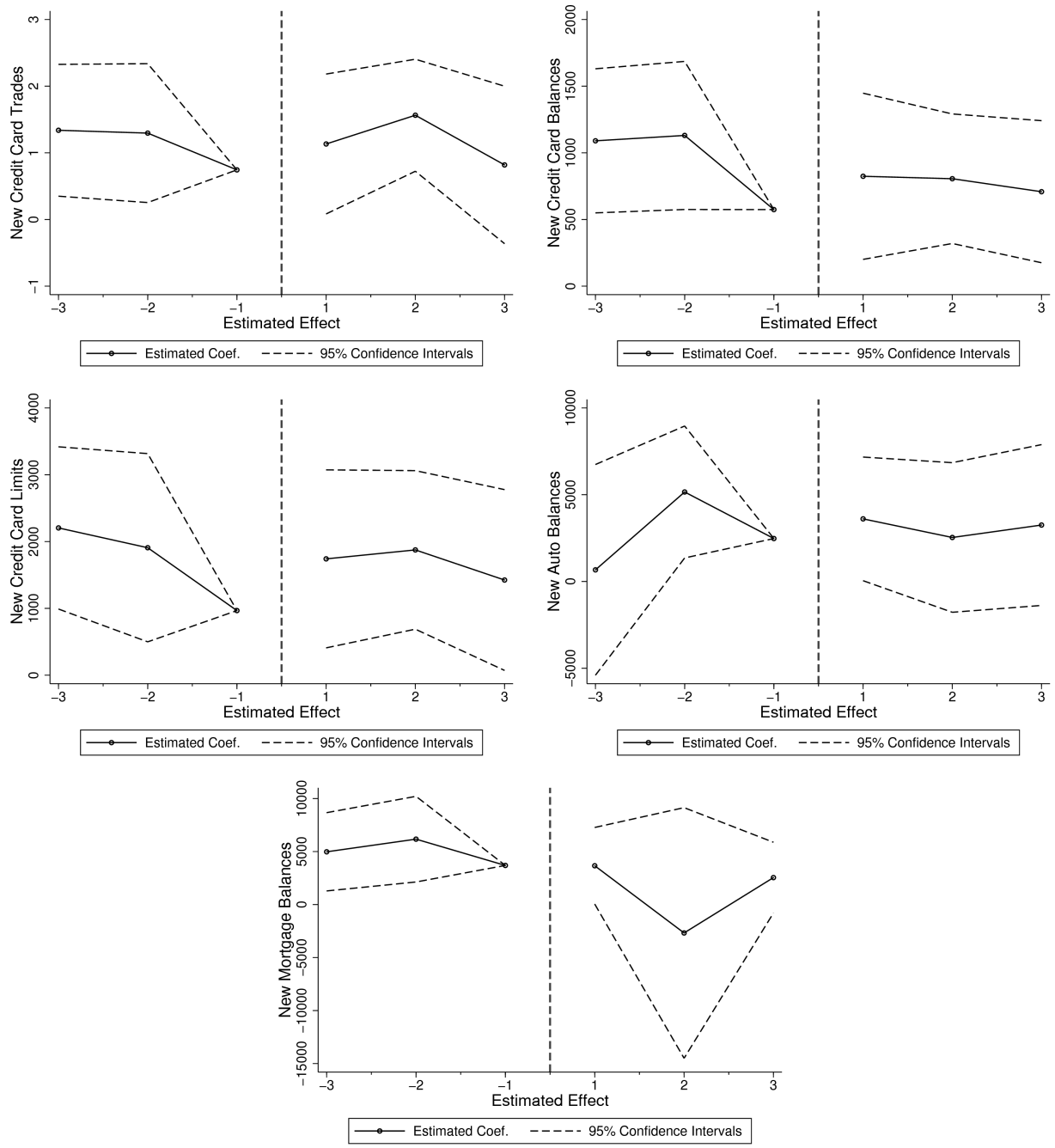
Note: This figure plots event study estimates of the effect of charge-off flag removal *among individuals with a preexisting bankruptcy flag*. The horizontal axis denotes time, in years, relative to the year of charge-off flag removal, which is indicated by the dashed vertical line. The estimated effect is normalized to zero in the year before the charge-off flag removal. See the text for additional details on the specification and the Table 1 notes for additional details on the outcome measures and sample.

Figure A7: Difference-in-Differences: Change in Credit Flag Designation, All Tradelines



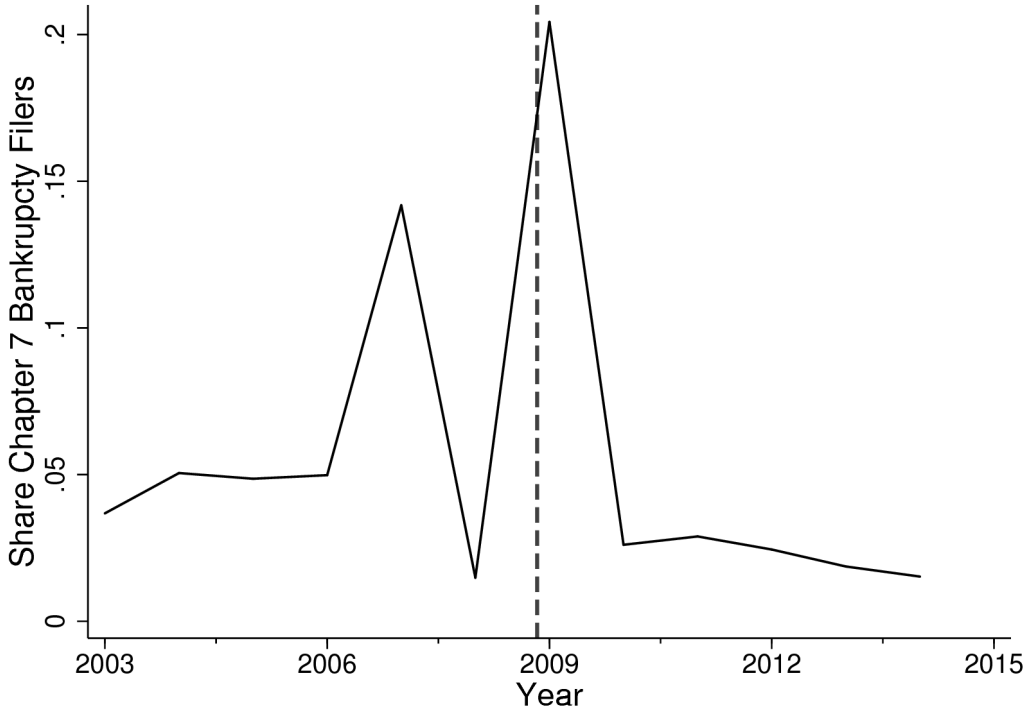
Note: This figure plots difference-in-differences estimates of the effect of changing a derogatory flag to a "discharged in bankruptcy" flag. The horizontal axis denotes time, in years. The date of change, October 2008, is indicated by the dashed vertical line. The estimated effect is normalized to zero in the year before the flag change. See the text for additional details on the specification and the Table 1 notes for additional details on the outcome measures and sample.

Figure A8: Difference-in-Differences: Change in Credit Flag Designation, New Tradelines



Note: This figure plots difference-in-differences estimates of the effect of changing a derogatory flag to a "discharged in bankruptcy" flag. The horizontal axis denotes time, in years. The date of change, October 2008, is indicated by the dashed vertical line. The estimated effect is normalized to zero in the year before the flag change. See the text for additional details on the specification and the Table 1 notes for additional details on the outcome measures and sample.

Figure A9: Difference-in-Differences: Share of Bankruptcy Filers with Change in Credit Flag Designation



Note: This figure plots the yearly share of bankruptcy filers with at least one "discharged in bankruptcy" account marked as derogatory in the year prior but had not been marked as having a verified change in status. The horizontal axis denotes time, in years. The dashed vertical line indicates October 2008, the date at which credit bureaus reportedly made such flag changes. See Appendix B.2 for additional details on sample selection and treatment designation.

B Data Appendix

B.1 Sample and Cleaning of the Variables

This study uses credit bureau data from TransUnion. The full dataset is based on a random sample of 3,000,000 individuals who had credit reports in June 2014. We construct a panel dataset with information on these individuals from June of each year from 2001 and 2015, inclusive. Our sample size naturally decreases in the years away from 2014 due to entry into in the credit reports (e.g., individuals opening their first account) and exit (e.g., due to death or emigration).

In each snapshot, the TransUnion data includes the complete credit record for each sampled consumer including public records (e.g., bankruptcies, civil judgments, and tax liens), credit inquiries, trade lines, and credit score. For a randomly selected 10% of the sample, we all observe tradeline level information (e.g., balances on each credit card, individual collection items) used to construct the standard credit records. Below, we detail how we code each variable used in the analysis.

Credit Score: This measure is the Vantage Score 3.0 measure credit risk. This measure is similar to the FICO score commonly referenced in the consumer finance literature, has the variable named `finscore` in our dataset.

Credit Card Limits: Total open bankcard high credit/credit limit updated in the past 12 months. The variable is named `bc28` in our dataset.

Credit Card Borrowing: Total balance of open bankcard trades updated in the past 12 months. The variable is named `bc33` in our dataset.

Auto Borrowing: This measures the total balance of all auto trades. The variable is named `autbalt` in our dataset.

Mortgage Borrowing: This measures total balance of all mortgage trades. The variable is named `mrtagbal` in our dataset.

Flags There are a number of different flags available in the full sample:

- Number of charge offs: variable name `chrgoff`
- Number of bankruptcies: variable name `bankrpt`

In the 10% sample of tradeline data, we also observe a Manner of Payment (MOP) variable that provides information on whether the account was, for example, charged off as bad debt or in bankruptcy. Table B1 lists the MOP codes observed in the data. We also make use of a "Remarks Code" variable to determine whether an account is designated as Chapter 7 bankruptcy. Table B2 Provides the list of Remarks Codes which designate an account as Chapter 7 bankruptcy in our analysis.

Table B1: MOP Codes

Code	Description
00	No rating
01	Paid or paying as agreed
02	30 days past due
03	60 days past due
04	90 days past due
05	120 days past due
07	Wage earner or similar plan
08	Repossession
8A	repossession
8D	repossession
8P	Payment after repossession
8R	Repossession redeemed
09	Charged off as bad debt
9B	Collection account
9P	Payment after charge off/collection
SL	Slow pay
UC	Unclassified
UR	Unrated or bankruptcy (remarks code will show whether the account is a bankruptcy and, if so, what type of bankruptcy)

Table B2: Remarks Codes Indicating Chapter 7 Bankruptcy

Code	Description
CBL	Chapter 7 bankruptcy
CCD	Account closed by consumer/Chapter 7
CDC	Chap. 7/dispute of account information/account closed by consumer
CDL	Chap. 7/dispute of account information
CRD	Chap. 7/dispute resolved/consumer disagrees/account closed by consumer
CRL	Chap. 7/dispute resolved/consumer disagrees

B.2 Difference-in-Differences Sample Selection Criteria

To construct a difference-in-differences sample with exposure to potential flag reclassification, we include only individuals with at least one account with a remarks code indicating Chapter 7 bankruptcy and at least one account designated as derogatory as of June 2008. Derogatory classifications are defined as MOP codes other than "00", "01", "07", "UC", or "UR". To construct a treatment group of individuals for whom flags were reclassified, we first identify accounts for which the recorded Manner of Payment (MOP) switches from a derogatory classification to "bankruptcy" between June 2008 and June 2009. To more precisely identify flag changes specifically caused by credit bureau reclassification, we then exclude account-specific flag changes which coincide with a change in the account's recorded "date verified." Such "newly verified" accounts may reflect actual changes in account statuses, as opposed to reclassification. We therefore construct our treatment group using all individuals in the sample population with at least one "unverified" change in account-specific MOP.